

Lowland Canals
Steering Group

Freight Project
Group

Lowland Canals
Freight Action Plan
Phase 1
Final Report

Potential for Freight
on the Lowland
Canals



Submitted to
**Lowland Canals
Freight Project Group**

by

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January 2006

CONTENTS

CONTENTS.....	2
1 INTRODUCTION.....	4
1.1 Background to the Freight Action Plan	4
1.2 Policy Background Regarding Canals and Freight.....	5
1.3 Structure of this Report.....	6
2 ROUTES & TIMINGS.....	7
2.1 Forth & Clyde Canal.....	7
2.1.1 Forth & Clyde Route Description.....	7
2.1.2 Forth & Clyde Dimensions	8
2.1.3 Forth & Clyde Canal Timings.....	10
2.2 Union Canal	11
2.2.1 Union Canal Route Description.....	11
2.2.2 Union Canal Dimensions	12
2.2.3 Union Canal Timings.....	13
3 LOADING / UNLOADING POINT CONSIDERATIONS	14
4 VESSEL CONSIDERATIONS.....	16
4.1 General Design Considerations.....	17
4.2 Vessel Configuration Options.....	18
5 LOADS, CONTAINERS AND HANDLING	20
5.1 Load Type	20
5.2 Potential Twenty-foot Equivalent Unit (TEU) Container Loads.....	20
5.3 Handling methods for heavy loads	21
5.4 Lighter unit loads	23
5.4.1 Load types.....	23
5.4.2 Handling methods	24
5.5 Bulk Loads.....	25
6 IDENTIFICATION OF POTENTIAL FREIGHT OPPORTUNITIES.....	26
6.1 Construction material.....	26
6.2 Bulk Loads	26
6.3 Retail Freight	26
6.4 Recycling	27
6.4.1 Glass recycling.....	27
6.4.2 Paper & cardboard	28
6.4.3 Textiles.....	28
6.4.4 Green Waste.....	28
6.4.5 Builders hardcore / recycled aggregate.....	28
6.4.6 Pallets.....	28
6.4.7 Vehicle tyres	28
6.4.8 WEEE	29
6.5 Waste.....	30

7	IMPACTS ON AMENITY.....	31
7.1	Amenity on Forth & Clyde and Union Canals.....	31
7.2	Amenity on Falkirk Wheel.....	33
7.3	Benefits to Amenity Derived from Freight on Lowland Canals.....	34
8	SUMMARY & CONCLUSIONS.....	35
9	APPENDIX A - GLOSSARY.....	36

1 INTRODUCTION

This document has been prepared for the Freight Action Plan (FAP) for the Lowland Canals of Scotland. The report introduces the potential for freight, documenting the opportunities and constraints for the movement of freight using both the Forth & Clyde, and the Union Canals. The information presented in this report is drawn from earlier freight-specific trials and studies, combined with data gathered in the preparation of the FAP, particularly for the Union Canal which, until now, has been less thoroughly investigated.

The preparation of detailed proposals for the implementation of sustainable canal freight projects will be the subject of Phase 2 of the Freight Action Plan, which will pursue the opportunities identified in this study.



Figure 1.1 Forth & Clyde mile marker at Stockingfield Junction

1.1 Background to the Freight Action Plan

To date, a number of studies into the carriage of particular freights on the Lowland Canals have been carried out. These include:

- Carriage of Waste on the Lowland Canals
- Potential Wharves on the Lowland Canals
- Lowland Canals Freight Demonstration Project – WEEE trials on Scotland's Lowland Canals.

However, there is no single summary document available that addresses the overall potential for the carriage of freight on the Lowland Canals, and the possible constraints that may be involved. This document aims to fill that requirement.

In addition to the preparation of this report, Phase 1 of the Freight Action Plan comprised a number of investigations, including:

- Surveys of businesses, business / retail parks and industrial estates in close proximity to the Lowland Canals that might be able to realise the freight opportunities offered by the waterways.

- Identification of resource management industries further afield which may still benefit from the opportunities presented by the canals.
- Identification of potential canal-side development sites, freight facilities and commercial wharf sites.

This document also acts as a companion to the other documents produced in Phase 1 of the FAP, which include:

- A résumé of the project, including the methodology used.
- Records of each business, wharf and development site identified in the surveys, together with appropriate maps.
- A draft approach to Phase 2.

1.2 Policy Background Regarding Canals and Freight

In ‘Scotland’s Canals An Asset for the Future’, the Scottish Executive stated that:

“The Scottish Executive believes that our canals are an asset that, if used wisely, can enhance the future quality of life in Scotland.”

The report continued:

“The Scottish Executive will welcome any plans / ideas to stimulate freight movement onto canals. The Executive will examine any valid applications received from BW (and others) for developing freight that takes lorries off roads.”

As part of its wider transport planning policies, the Scottish Executive issued Scottish Planning Policy (SPP) 17 in August 2005. This guidance document stresses that transport cannot be addressed as an afterthought to development, but needs to consider the transport network infrastructure & services, environmental & operational constraints, proposed or committed new transport projects and demand management schemes. By clearly documenting the potential, opportunities and constraints of using the canals as a freight transport corridor, the Lowland Canals Freight Action Plan enables the Scottish Executive, Local Authorities and developers to consider whether the canals can play a part in meeting the guidance of SPP 17.

British Waterways Scotland, working in partnership with Local Authorities, British Waterways Freight Managers, businesses and other organisations commenced the process of encouraging freight development on Scotland’s Lowland Canals. The Lowland Canal Steering Group established a Freight Project Group with the remit of determining the potential for re-establishing freight movement on the Forth and Clyde and Union Canals. The work of the Freight Project Group includes:

- The Lowland Canals Freight Demonstration Project (WEEE trials) which was recently undertaken by East Dunbartonshire Council and British Waterways;
- A barge building project being led by the Nolly Barge;
- A strategic overview and development of a Freight Action Plan.

The seven local authorities that lie along the route of the Forth & Clyde and Union Canals (West to East) are:

- West Dunbartonshire – F&C Bowling Basin to Linnvale Bascule Bridge.

- City of Glasgow – F&C Linnvale Bascule Bridge to Bishopbriggs, plus the F&C Glasgow Branch.
- East Dunbartonshire – F&C Lock 30 to Netherton Swing Bridge (the northern side of the canal – the boundary with Glasgow City Council lies in the middle of the channel), and Bishopbriggs to Auchinstarry.
- North Lanarkshire – F&C Auchinstarry to Castlecary Bridge.
- Falkirk - F&C Castlecary Bridge to Carron Sea Lock, and the Union Canal - Falkirk Wheel to Avon Aqueduct.
- West Lothian – Union Canal Avon Aqueduct to Almond Aqueduct.
- City of Edinburgh – Union Canal Bridges 30 to 29 (the eastern side of the canal, - the boundary with West Lothian lies in the middle of the channel), and Almond Aqueduct to Edinburgh Quay.

The Lowland Canals, running between Glasgow and Edinburgh, provide an opportunity to build on the close co-operation already established by the Millennium Link projects by using the waterways for business as well as leisure purposes. In addition to the property and tourism developments already being realised as a consequence of the reopening of the canals, the potential for the carriage of freight and the business opportunities it provides will add a third area of development arising from the re-opening of the canals.

1.3 Structure of this Report

Section 2 of the report provides route descriptions, dimensions and timings for the Forth & Clyde and Union Canals. The next section (Section three) deals with loading / unloading potential and requirements. Sections four and five investigate vessel design & configuration options and loads, containers and their handling requirements. In Section six the report identifies potential freight opportunities on the Lowland Canals. Positive and negative impacts on amenity are considered in Section seven. The report concludes with the summary and conclusions in Section eight, and the glossary.

2 ROUTES & TIMINGS

The Lowland Canals of Scotland comprise two waterways:

- The Forth & Clyde Canal, which runs from Bowling Basin on the Clyde Estuary, to the Forth Estuary via the River Carron. There is also a short canal arm leading to the centre of Glasgow.
- The Union Canal, which runs from Falkirk in the west, to the centre of Edinburgh in the east.

The two canals are linked by the innovative “Falkirk Wheel” a mile to the west of Falkirk.

The following sections describe the two waterways, giving dimensions, details of locks and timings for travelling along different sections of the route.

2.1 Forth & Clyde Canal

2.1.1 Forth & Clyde Route Description

The Forth & Clyde Canal is divided into five distinct sections. East to West, these are:

- Bowling Basin to Maryhill / Stockingfield Junction
- F&C Glasgow Arm (Stockingfield Junction to Port Dundas)
- Stockingfield Junction to Banknock
- Banknock to Falkirk
- Falkirk to Grangemouth

The canal starts at Bowling Basin with a sea lock entering the canal from the Clyde Estuary four miles west of Clydebank. Passing through the two basins, the canal commences a climb through 19 locks over a distance of nine miles to the summit at Maryhill. The canal passes through suburbs of Glasgow, including Clydebank, Drumchapel and Temple.

Half a mile above Maryhill, the canal divides at Stockingfield Junction. The short two-and-a-half mile arm to Port Dundas heads off to the south. Port Dundas lies about half a mile from the centre of Glasgow. There are a number of currently redundant wharves, which provide potential for freight handling.

East from Stockingfield Junction the canal runs along the summit of the Forth & Clyde to Banknock: a lock free distance of about 16 miles (over 18 miles including the Glasgow Arm). The settlements of Bishopbriggs, Kirkintilloch, Twechar and Kilsyth lie along this stretch of canal, with other settlements nearby. Cumbernauld is also within two miles of the canal. The last three miles of this stretch run across Dullatur Bog, and is a broad, deep section of waterway.



Figure 2.1 The wide part of the Forth & Clyde over Dullatur Bog

At Banknock, the canal commences its descent towards the east. Four locks in two miles drop the canal to a four-and-three-quarter-mile pound along which lie the settlements of Milnquarter, Bonnybridge and Camelon. One mile from the end of this pound lies the junction with the Union Canal at the Falkirk Wheel. This stretch of canal ends at the edge of Falkirk, where another flight of locks starts at the Union Inn.

From the Union Inn, a flight of 14 locks over three miles takes the canal to Carron Basin. At the basin there is a sea lock which leads into the river Carron. From the River Carron it is possible to enter the Firth of Forth. The original terminus of the canal was at Grangemouth Docks, one mile to the east of Carron Basin. British Waterways Scotland still aspire to restore this final destination, although funding is not currently available.

2.1.2 Forth & Clyde Dimensions

The maximum published dimensions of the Forth & Clyde Canal are shown in Table 2.1 below. These figures are taken from “The Lowland Canals Skippers’ Guide, Spring 2004”

Canal	Length	Width	Headroom	Draught	Headroom + Draught
Forth & Clyde Canal	63’0” 19.2m	19’8” 6.0m	9’10” 3.0m	6’0” 1.83m	15’ 10” 4.83m
F&C Canal Glasgow Branch	63’0” 19.2m	16’6” 5.02m	9’10” 3.0m	6’0” 1.83m (*see note)	15’ 10” 4.83m

** Note skipper’s guide issue 2004 quotes this as 4’6” / 1.4m, but notes that dredging programme will increase depth.*

Table 2.1 Maximum Canal Dimensions – Forth & Clyde Canal

Forth & Clyde locks do not have any form of by-wash or spillway; all excess water in the pound above the lock is passed over the top of the gates. This can result in flows of water over the gates: any vessel designed to maximise lock capacity on the F&C should be designed to take this into account.

Hand rails/walkways on locks are set on the inside of the bottom gates, allowing high, straight-sided vessels to enter locks. This optimises the freight potential through the locks, however vessel design and staff training should be used to ensure that when the gates are shut, the vessel does not foul the walkways.



Figure 2.2 Forth & Clyde Canal gates showing overhanging walkways



Figure 2.3 – A typical Forth & Clyde Lock

The dimensions of the Glasgow branch of the Forth & Clyde canal are narrower than the main line of the canal, although the other dimensions are unchanged. Whilst this is not expected to substantially affect freight loads the smaller dimensions of the waterway would need to be considered when designing vessels for containers.

2.1.3 Forth & Clyde Canal Timings

This section presents the timings for the different sections along the Forth & Clyde Canal. The timings are derived from actual timings obtained during route investigations of the canal using a narrowboat (approx. dimensions 6'10" wide, 2' draught, 4'6" air draught). The timings obtained empirically have been merged with those provided by BW staff from their standard timings sheet (used to calculate times between points to facilitate assisted passage on the Forth & Clyde), the Skippers' guide for passage along the Forth & Clyde, and exemplar timings from the WEEE freight trials of 2005. The times provided in the table below are considered to be robust and repeatable, although it should be noted that during summer months, leisure traffic might on occasion cause delays. For interest, the record coast to coast is 11h 52min, but this is not considered to be a practical timing for freight carriage.

Times in minutes	Grangemouth (Carron Basin)	Lock 16 (Falkirk Wheel)	Lock 20	Auchinstarry	Twechar Bridge	Hillhead Bridge	Stockingfield Junction / Maryhill ²	Clydebank	Bowling Basin	Spiers Wharf (Glasgow Branch)
Grangemouth (Carron Basin)		200	300	360	385	435	555	855	975	595
Lock 16 (Falkirk Wheel)	200		100	160	185	235	355	655	775	395
Lock 20	300	100		60	85	135	255	555	675	295
Auchinstarry	360	160	60		25	75	195	495	615	235
Twechar Bridge	385	185	85	25		50	170	470	590	210
Hillhead Bridge	435	235	135	75	50		120	420	540	160
Stockingfield Junction / Maryhill ²	555	355	255	195	170	120		300	420	40
Clydebank	855	655	555	495	470	420	300		120	340
Bowling Basin	975	775	675	615	590	540	420	120		460
Spiers Wharf (Glasgow Branch)	595	395	295	235	210	160	40	340	460	

Notes:

1. Times allow for assisted lockings and bridge movements as per current British Waterways procedures.
2. Due to close proximity (approx. 5 minutes) Maryhill & Stockingfield Junction are shown in the same cells.

Table 2.2 Timings for the Forth & Clyde Canal

2.2 Union Canal

2.2.1 Union Canal Route Description

There are two distinct sections to the Union Canal:

- The new Falkirk Wheel section between the Forth & Clyde Canal and Greenbank Aqueduct (Falkirk), and
- The original canal from Greenbank Aqueduct to Edinburgh.

The Union Canal is connected to the Forth & Clyde Canal by the Falkirk Wheel. The section of the canal from the F&C Canal to Greenbank Aqueduct is new, developed as part of the Millennium Link Project. The entrance to the basin below the Wheel is accessed by locking up through Golden Jubilee Lock (Lock 3). The route then passes through the Wheel, through the new Roughcastle Tunnel, and through a further two locks arranged as a staircase, the top gates of the lower lock (Lock 2) forming the bottom gates of the lock above (Lock 1). Once through the locks, the new section of canal runs another half mile to Greenbank Aqueduct.

The second section (the original canal with the exception of a few small deviations for roads built since the canal's closure in 1965) starts at Port Maxwell, a small basin adjacent to Greenbank Aqueduct. This section of canal runs for 31 ½ lock-free miles from Falkirk to Edinburgh. The canal runs to the southern edge of Falkirk, passes through the Falkirk Tunnel, and on past the settlements of Westquarter, Brightons and Polmont. The Avon aqueduct, near to Whitecross, is crossed prior to the canal reaching Linlithgow, 10 miles from Port Maxwell. From Linlithgow, the canal runs through agricultural land and past shale bings, before reaching the settlements of Winchburgh and Broxburn. After crossing the Almond Aqueduct, the canal reaches Ratho, 23.5 miles from Port Maxwell, and eight miles from Edinburgh. The remaining section into Edinburgh initially runs through agricultural land. On reaching the Scott Russell Aqueduct over the A720, the canal starts the five miles of navigation through Edinburgh, reaching the terminus of Lochrin Basin, about half a mile from Edinburgh Castle.

2.2.2 Union Canal Dimensions

The maximum published dimensions of the Union Canal are shown in Table 2.2 below. These figures are taken from “The Lowland Canals Skippers’ Guide, Spring 2004”

Canal	Length	Width	Headroom	Draught	Headroom + Draught
Union Canal	70’0” 21.3m	11’6” 3.5m	8’10” 2.7m	3’6” 1.06m	12’4” 3.76m
Falkirk Wheel	70’0” 21.3m	19’8” 6.0m <i>* see note</i>	8’10” 2.7m	5’0” 1.5m	13’10” 4.2m
Golden Jubilee Lock 3	70’0” 21.3m	12’6” 3.83m	9’0” 2.74m	5’0” 1.5m	14’ 0” 4.2m

** Note this figure gives the maximum capacity of the Gondolas of the wheel, but Golden Jubilee Lock 3 between the Falkirk Wheel and the Forth & Clyde Canals determines the maximum dimensions of a single vessel.*

Table 2.3 Maximum Canal Dimensions – Union Canal

The three locks on the Union Canal are all new, being an integral part of the route through the Falkirk Wheel. Lock No. 3 is the Gauging lock for the Union Canal, which means that breasted-up barges will need to be singled out to pass through the lock, although the Wheel gondolas are sufficiently wide to take breasted-up barges of up to 9’10” / 3m beam. Locks 1&2 are a staircase, and will necessitate each barge being locked through separately.



Figure 2.5 The Falkirk Wheel Aqueduct

2.2.3 Union Canal Timings

This section presents the timings for the different sections along the Union Canal. The timings are derived from actual timings obtained during route investigations of the canal using a narrowboat (approx. dimensions 6'10" wide, 2' draught, 4'6" air draught). The timings obtained empirically have been compared with those provided in the Skippers guide for passage along the Union Canal. The times provided in the table below are considered to be robust and repeatable, although it should be noted that during summer months, leisure traffic might, on occasion, cause delays.

Times in minutes	The Falkirk Wheel	Port Maxwell	Reddings (Br 56)	Linlithgow	Winchburgh	Broxburn	Ratho	Slateford Aqueduct	Lochrin Basin
The Falkirk Wheel		70	130	250	360	400	490	600	640
Port Maxwell	70		60	180	290	330	420	530	570
Reddings (Br 56)	130	60		120	230	270	360	470	510
Linlithgow (Manse Rd)	250	180	120		110	150	240	350	390
Winchburgh (Bells Mill)	360	290	230	110		40	130	240	280
Broxburn (Port Buchan)	400	330	270	150	40		90	200	240
Ratho	490	420	360	240	130	90		110	150
Slateford Aqueduct	600	530	470	350	240	200	110		40
Lochrin Basin	640	570	510	390	280	240	150	40	

Notes:

1. Times allow for assisted lockings and bridge movements as per current British Waterways procedures.

Table 2.4 Timings for the Union Canal

3 LOADING / UNLOADING POINT CONSIDERATIONS

This section introduces the requirements for loading / unloading areas that might be required in support of the reintroduction of freight on the Lowland Canals. As carrying on these canals has not existed in the last 50 years, there are very few wharves that could be used without some reinstatement work. In addition, it should be recognised that due to the shifting patterns and types of businesses and residential areas in the intervening years, existing wharves may not be suitable for most modern-day freight types.

During the route investigations a number of possible sites at which vessels could be loaded and unloaded were identified. The sites identified include the sites of old wharves, and possible locations for new developments to serve nearby businesses. They are of varying size and their utility would depend in part on the nature of the freight to be carried, whether containers were to be used (and the container design), and the handling methods that could be used to load and unload vessels. Key considerations affecting the viability of each site include:

- Road access.
- Piling requirements.
- Towpath / amenity issues.
- Whether there is space to construct a basin.
- Whether vehicles could load / unload at the waterside
- Whether wharves would need to bear mobile cranes and their loads
- Security & safety

The sites identified for the two Lowland Canals vary from derelict wharves, which could be re-opened, to areas of land where the requirements outlined above could be met.



Figure 3.1 Temporary wharf during WEEE Trials 2005

In most cases, road access is essential. If loading / unloading area are to be used for large-scale freight movements, the road would need to be capable of bearing heavy goods vehicles. For smaller movements, such as the removal of local residential and boater's recycling and refuse, only minor access may be required in case this has to be

removed by road in the case of canal engineering work. Only at construction sites, where vessels could be loaded / unloaded by tracked vehicles, cranes or all-terrain vehicles, is the need for road access less important.

Where vehicle access is required to the wharf edge, the suitability of wharf sides would need to be checked. Some locations already have walling or piling, but the stability of this would need to be checked. Not all loading and unloading points would need stable wharf edges: locations where cranes or other such long reach methods could be used may not require wharf walls, however the surface should be capable of supporting the loading vehicle, the load being lifted and the levering effect of the jib.

For security and safety it is not desirable that the public should have access to the loading / unloading point when loading operations are taking place. Where potential loading points are on the towpath side, this can be addressed by providing either:

- a towpath diversion around the site,
- a basin beyond the towpath with a towpath bridge across the entry to the basin, or
- a very short term closure of the towpath (a few minutes) may be possible.

For wharves on the offside, this is less of a problem, although provision will need to be made against trespass, in line with requirements for any industrial site. In addition, as with any freight business where loads are easily portable or of higher value, there may be a need to provide security and secure fencing, to protect the load and the staff.

Where freight vessels are likely to have to wait for loading / unloading, it may also be necessary to provide space for them to moor while waiting their turn. Space may also be required for marshalling vessels. Where a basin is provided, this may not be a problem, however where a loading / unloading point is “on-line”, there may be a need to provide a lay-bye for this purpose.

It may also be necessary to provide welfare accommodation for vessel crews and wharf staff. These can be easily provided using the container welfare facilities already designed for leisure boater’s facilities. Where wharves are likely to be more permanent, more substantial structures could be provided.

4 VESSEL CONSIDERATIONS

Consideration of general vessel design and configuration options needs to take into account a number of factors. To make the best commercial case for freight on the waterways, vessels should, ideally, be designed to maximise carrying capacity. This will be affected by a number of factors particularly the dimensions of locks, bridges, tunnels, turning requirements, and any tight bends. It should be noted that the two canals have different lock / bridge sizes, while the Falkirk Wheel has a third set of dimensions, all of which have their own implications for vessel design. The Union Canal dimensions are both longer and narrower than the F&C, the Falkirk Wheel's gondolas are wider than the locks on the Union Canal, but not wide enough to take two Union Canal vessels at once. A vessel designed to work on both the F&C and the Union Canal would be limited in carrying capacity compared to a vessel designed for one or other of the canals. Such a vessel would have to have maximum dimensions of 63' by 11'6" (19.2m x 3.5m) giving a total area of 67.2m² whereas a dedicated F&C vessel would have 115.2m² and a dedicated Union Canal vessel would have 74.55m². It is clear from these figures that it would have approximately 90% of the hold area of a Union Canal vessel and 60% of the hold capacity of an F&C vessel.

The maximum dimensions for all the Lowland Canals are as shown below (Taken from "The Lowland Canals Skippers' Guide. Spring 2004") – see also section 2 for route descriptions of the two canals:

Canal	Length	Width	Headroom	Draught	Headroom + Draught
Forth & Clyde Canal	63'0" 19.2m	19'8" 6.0m	9'10" 3.0m	6'0" 1.83m	15' 10" 4.83m
F&C Canal Glasgow Branch	63'0" 19.2m	16'6" 5.02m	9'10" 3.0m	6'0" 1.83m <i>(*see note)</i>	15' 10" 4.83m
Union Canal	70'0" 21.3m	11'6" 3.5m	8'10" 2.7m	3'6" 1.06m	12'4" 3.76m
Falkirk Wheel	70'0" 21.3m	19'8" 6.0m	8'10" 2.7m	5'0" 1.5m	13'10" 4.2m
Golden Jubilee Lock 3	70'0" 21.3m	12'6" 3.83m	9'0" 2.74m	5'0" 1.5m	14' 0" 4.2m

Table 4.1 Maximum Canal Dimensions

Vessel designs also need to address the facilitation of loading and unloading methods and the handling of the vessel in an inland waterway environment. Particular emphasis should be given to the handling of vessels in locks and in lock flights, and on narrower reaches of canal. In addition the need to keep manpower and vessel

construction and operating costs to a minimum should be borne in mind, as should the need to work the vessels in a safe manner given the leisure amenity value the Lowland Canals.

4.1 General Design Considerations

Vessels designed to carry freight on canals should include the following design elements:

- maximise the capacity of the vessel within the limits of canal dimensions,
- facilitate loading and unloading methods,
- ensure protection for the cargoes, and
- maintain the performance / handling of the vessels.

The ideal shape of a vessel to maximise the carrying capacity is a rectangle. However the optimum shape for vessel handling is smoothly curved, pointed at the front and rounded at the rear (boat shaped!). Vessel design therefore has to be a trade-off in hull design between maximum capacity and maximum performance.

In many original canal craft, hulls were built with a single skin. However single skin vessels require bracing between the two sides with bulkheads or chains across the middle of the hold to avoid the tendency to spread under load. The disadvantage of chains and bulkheads is that they constrain the potential loads that can be carried, a single hold being the most versatile for potential loads. It is therefore recommended that the hulls be built in such a way as to avoid the need for bracing: this would also facilitate loading and unloading. The sides of the hold should be smooth sided, so as to avoid loads catching when being loaded or unloaded – any lashing points which might be required should either be set flush into the hold sides / floor or be set outside the loaded area. The hold side should ideally be flush with the inside of the gunwale so that there is no opportunity for loads to become caught under it.

The floor should be smooth (apart from flush-fitting lashing points if they are deemed necessary) and the vessel constructed on a dry bilge principle. If the produce is likely to be in close proximity to the floor, it is recommended that a secondary floor of wood or steel be inserted above the base-plate in order to avoid the risk of bilge water contaminating the load. An automatic bilge pump should in any case be provided, to remove any water that may get into the hold. In the case of dumb barges, the bilge pump could be operated by battery with solar power charging, or with a landline hook-up.

Provision should be made for covering the load, irrespective of whether or not the individual containers inside are sheeted. Such covers that may be used should be removable quickly and easily. Roller sheets could be used, in a similar manner to those on goods vehicles.

Where loads are sensitive, such as retail freight, an alternative approach could be to design the vessel with a roof and side walls in a manner similar to a leisure boat shell, which would provide secure storage for loads in transit or awaiting unloading. If this approach were to be used, there would need to be a well at one end to allow loading and unloading via a “tail lift”, crane, forklift or other such loading method. If a tail

lift approach were used, unpowered vessels would need to be fitted with on-board or shoreline power to operate it.

4.2 Vessel Configuration Options

Earlier studies have identified four main configuration options for the carriage of freight on the Lowland Canals:

- Dumb barges & push tugs.
- Large self propelled vessels to maximise capacity within the constraints of canal dimensions
- Smaller self-propelled vessels sized to fit Union Canal beam
- Containers with self contained floatation devices.

The advantages and disadvantages of each approach are detailed below.

Vessel configuration	Dumb barges & (push/pull) tugs.
Advantages	Cheap to construct. Can have multiple barges and, where relevant for freight type, multiple sets of containers Could be stored at suitable lay-byes or wide areas. Large loads can be cheaply transported along longer pounds using one tug working more than one barge. Removes reliance on ‘winding holes’ (turning points) and thereby reduce the journey times
Disadvantages	Handling – dumb barges will need extra handling to work them through locks etc. For practical purposes, you would need to assign a tug to each barge down the flights of locks. There are practical & safety considerations that might preclude the use of towlines - public amenity use of towpaths is at a high level, especially in the Falkirk area and use of long towlines has safety implications. However, use of a push-tug pushing one barge, and towing two or three others is a possibility, particularly if towlines are short.

Table 4.2 Dumb barges & push tugs

Vessel configuration	Large self propelled vessels sized to fill F&C Locks
Advantages	Fill locks so no roping needed. Self contained so no problems with towing. Multi-purpose – can be used for different cargoes
Disadvantages	Expensive to build, so need to be operating as many hours as possible to get return on investment. Need more than one to handle most potential traffic types, so more capital outlay is required to move large quantities of freight.

Table 4.3 Large Self-propelled vessels sized to fill F&C locks

Vessel configuration	Smaller self-propelled vessels sized to fit Union Canal beam
Advantages	Enable use of Falkirk Wheel & Union Canal Fill Union Canal locks so no roping needed. Self contained so no problems with towing. Multi-purpose – could be used for different cargoes Could be designed shorter and narrower than Union Canal to enable two to be worked breasted-up on the Forth & Clyde Canal as well.
Disadvantages	Working singly through locks either side of wheel increases journey time. Each boat would need crew to work the Falkirk Wheel & Union Canal section. Requires approximately twice as many boats (and crew) to move a load than a single vessel only using Forth & Clyde

Table 4.4 Smaller self-propelled vessels sized to fit Union Canal beam

Vessel configuration	“Tom Pudding” type boats / containers with self contained floatation devices.
Advantages	Make up loads steadily, with spare empties. Can store at locations along the canals to await onward passage. Cheap to construct. Large loads can be bulked together and quickly & easily transported along longer lock-free stretches of canals e.g. the summit pound on the Forth & Clyde canal (also the 4 ¾ mile pound between Locks 17 & 16).
Disadvantages	Each individual “pan” is likely to have different loads - Trimming each container to team up with other containers could be time consuming. Handling – will need extra handling to work them through locks, Falkirk Wheel etc. For practical purposes, each configuration would need a separate tug to work the flights of locks, - there are practical & safety considerations that might preclude the use of long towlines.

Table 4.5 “Tom Pudding” type boats / containers with self-contained floatation devices

5 LOADS, CONTAINERS AND HANDLING

The dimensions of the canals determine the maximum dimensions of the vessels to be used on them. However the type of loads to be carried, the use of containers, and the handling methods to be used will also need to be considered. Different methods have different advantages and disadvantages, and will have a bearing on the design of both the wharves and vessels.

5.1 Load Type

Section 6 identifies the potential loads for the Lowland Canals. These include:

- Construction materials
- Bulk loads (e.g. aggregates)
- Retail Freight
- Recycling, and
- Waste

Each load has its own requirements with regard to containers and handling methods, although they can be divided into three broad methods:

- Shipping and other heavy load containers.
- Lighter unit loads.
- Loose bulk loads.

In parallel with the consideration of freight handling methods, proposals for carrying freight will also need to consider methods for loading / unloading containers into canal vessels. The use of industry-standard container / load handling equipment is likely to enable quick and easy transfer of containers between transport modes. Options include vehicle, vessel and shore-based handling methods.

Unloading and loading equipment requirements are dependent on the size of container being used. Smaller containers take longer to tranship, but can use “tail-lifts” and manpower, or small forklifts. Large containers require larger lifting equipment.

The following sections detail some of the advantages and disadvantages of different methods of handling both large and small containers.

5.2 Potential Twenty-foot Equivalent Unit (TEU) Container Loads

Given the dimensions of the two waterways, and the published sizes for common types of containers, the theoretical maximum number of containers per single vessel is approximately six 20ft containers per vessel on the Forth & Clyde Canal and three 20ft containers per vessel on the Union Canal. However this does not allow space for engines, cabins or storage of equipment. It should be noted that where industry standard sizes do not optimise vessel capacity, it would be feasible for containers to

be purpose built to suit the specific requirements of a contract, bearing in mind that it may be necessary to use road vehicles for part of the journey.

The theoretical maximum numbers of containers per load per canal are shown in Table 5.1 below.

Single Container Nominal capacity m ³	27 m ³	30 m ³
Length of single container	6.1m (20')	6.1m (20')
Width of single container	2.5m (8.2')	2.5m (8.2')
Height of single container	2.5m (8.2')	2.8m (9.2')
Maximum number of containers on Forth & Clyde vessel	6 total, lengthwise in vessel. 3 long x 2 wide (162m ³)	6 total, lengthwise in vessel. 3 long x 2 wide (180m ³)
Union Canal (length-wise) max (m ³)	3 total, lengthwise in vessel. 3 long x 1 wide (81m ³)	3 total, lengthwise in vessel. 3 long x 1 wide (90m ³)

Table 5.1 Theoretical maximum number of containers per vessel

5.3 Handling methods for heavy loads

Methods for handling heavy loads, particularly containers, are detailed in Table 5.2 below. Advantages and disadvantages of the different methods are also shown.



Figure 5.3 Skip loading into a vessel

Methods for Loading, Unloading & Handling Heavy Containers		
Handling method	Advantages	Disadvantages
Skips	Enables barge-vehicle transhipment without intermediate lifting equipment. One-man operation. Vehicle can also be used for collecting / tipping containers.	Requires load-bearing wharf to water's edge at correct height to assist with procedure. Skip has to be at correct height on vessel to allow loading/unloading. Skip lorry needs extending lifting arms.
Hook lift	Enables barge-vehicle transhipment without intermediate lifting equipment. One-man operation. Vehicle can also be used for collecting / tipping containers.	Requires load-bearing wharf to water's edge at correct height to assist with procedure. Requires container to be at correct height on vessel to enable hook lift operation.
Land cranes – wheeled	Heavy lifting capacity Flexible method for craning. Crane can be moved between wharves.	Needs hard standing capable of withstanding point load of stabilisers. Needs space for manoeuvring & stabilisers. Requires qualified crane driver and slinger or container-grab. Expensive to buy.
Land cranes – fixed / tracked	Heavy lifting capacity. Less space required. Only requires crane base area to be sufficiently load-bearing	Crane permanently at wharf-side. One crane per wharf required. Requires qualified crane driver and slinger or ISO container-grab. Expensive to buy. Will need security if wharf not operating 24 hours a day.
Vessel-mounted cranes	Less space required on wharf-side.	Stability of boat when craning loads limits the maximum load. Requires one crane per vessel or dedicated crane vessel using up basin capacity. Requires qualified crane driver and slinger or container-grab.
Container top-lift vehicles / reach-stackers	Can handle standard containers flexibly & efficiently. Requires only one man to operate.	Requires load-bearing wharf to water's edge. Expensive to buy. Will need security if wharf not operating 24 hours a day.
Specialised container gantries	Can handle standard containers efficiently. Requires only one man to operate.	Limited flexibility. Considerable infrastructure & investment required, therefore extremely expensive. Specialist operators and maintenance requirements.

Table 5.2 Methods for loading, unloading & handling heavy containers

5.4 Lighter unit loads

Lighter unit loads include all types of freight that may be handled in small quantities, particularly retail freight, packaging materials and recycling. It should be noted that such materials could also be carried within larger containers e.g. TEUs, at which point the considerations outlined in 5.2 would apply.

5.4.1 Load types

Container Type	Advantages	Disadvantages
Pallets – common ISO pallet measures 100cm x 120cm x 12cm	Can fit pallets lengthways or crossways in hold to obtain the optimum loading. Can be made of wood, plastic or metal. Raise the load above floor level allowing space for fork-lift forks. Reduces risk of ingress of damp from below. Vessels can be trimmed easily. Compatible with existing delivery methods.	Load may need covering. Handling each pallet individually for transshipment is time-consuming. Pallets can be awkward to unload in smaller retail environments.
Cages – “A” Frame roll container	Can fit cages lengthways or crossways in hold to obtain optimum loading. Raise the load above floor level reducing risk of ingress of damp from below. Vessels can be trimmed easily. Compatible with existing delivery methods.	Load may need covering. Handling each cage individually is time-consuming. Hard to use with a fork-lift.
Boxes / Crates (e.g. large stack & store boxes)	Very flexible loading configurations possible. Plastic crates keep damp out from below and can be lidded from above. Compatible with existing delivery methods.	May require bespoke handling methods.
“Pods”: Unit containers such as those designed to be lifted into and out of the new BW vessels.	Design already established and vessels built. Loads would not require sheeting.	Dimensions of pods may not be compatible with vehicles used on other legs of supply chain. Cannot be stacked / folded down, so restricts nature of

		possible return loads. Pods not designed to optimise loadings for Lowland Canals
Bespoke larger covered containers carrying a number of smaller loads e.g. cages	Can be tailored to suit the dimensions of vessels. Can be loaded and unloaded swiftly from boats for onward journey or re-configuring for onward journey on land.	Bespoke design could cost more. Dimensions for vessels may not be compatible with lorries / delivery vehicles. Cannot be stacked / folded down, so restricts nature of possible return loads.

Table 5.3 Methods for handling lighter unit loads

5.4.2 Handling methods

Methods for Loading, Unloading & Handling Pallett & other Lightweight Containers		
Method	Advantages	Disadvantages
“Tail Lift” on boat	Low Cost Flexible Method Good for pallets, containers with wheels (e.g. “A” frame roller container) etc. Loads can be moved by man (with pallet truck if no wheels). Can be used at other wharves or on towpaths without major infrastructure requirements – making it suitable for serving other canalside locations. Suitable for public areas.	Method of stabilising vessel required for loading / unloading. Requires landline hook up or generator for power. Requires one lift to be fitted to each vessel.
Fork lift	In common use. Variety of sizes / capacities available. Good for small / medium containers.	Need to equip containers to enable lifting from above to lift them from vessels (alternatively slings could be used). Needs safe working area so not applicable for public areas.
Manpower	No infrastructure required. Can be used at other wharves or on towpaths without major infrastructure requirements – making it suitable for serving other canalside locations. Suitable for public areas.	Only suitable for small crates / boxes. Very labour intensive. Health & safety considerations regarding lifting.

Table 5.4 Methods for loading & unloading lighter unit loads

5.5 Bulk Loads

Methods for Handling Bulk Loads		
Handling method	Advantages	Disadvantages
Loose load	Does not require separate containers. Grabs for unloading / loading are readily available.	Unloading by grab or conveyor can take time. Requires man to enter hold to sweep out remains of load. Can result in damage to side of hold.
Skips	Enables barge-vehicle transshipment without time consuming handling. One-man operation. Vehicle can also be used for collecting / tipping containers.	Requires load-bearing wharf to water's edge at correct height to assist with procedure. Requires skip lorry with extending lifting arms.
Hook lift	Enables barge-vehicle transshipment without intermediate lifting equipment. One-man operation. Vehicle can also be used for collecting / tipping containers.	Requires load-bearing wharf to water's edge at correct height to assist with procedure. Requires container to be at correct height on vessel to enable hook lift operation.

Table 5.5 Methods for Handling Bulk Loads

6 IDENTIFICATION OF POTENTIAL FREIGHT OPPORTUNITIES

A range of potential freight opportunities has been identified for the Lowland Canals of Scotland. Each opportunity requires detailed investigation, through the Freight Action Plan. Specific businesses that could use the canals are identified in the report of Phase 1 of the FAP. The opportunities identified to date are summarised in this section.

6.1 Construction material

There are a number of developments planned or already in progress along the route of the Lowland Canals. Building on the restoration of the canal under the Millennium Link work, there is considerable interest in residential, retail, office and industrial developments. Development sites hold potential for using canal traffic for alleviating the impact of road traffic related to construction traffic

Details of projects already under way or being considered are identified in the Millennium Link Reports.

Consultation with Local Authorities along the Lowland Canals indicated that they would be willing to work in partnership with developers who are able to transport construction materials by water assuming that it is feasible. It is likely that this would not be made a condition of planning as it may not be possible to get developers to accept this as a condition – there being no precedent, and appeals could be time consuming, expensive and may not be defensible. However, where developers prove to be receptive to the idea, a partnership approach would be likely to work best.

6.2 Bulk Loads

There are a number of bulk loads that could be carried on the Lowland Canals. Potential bulk load types include building materials such as timber, concrete decks, brick, paving and tiles. Other potential bulk loads include loose materials: aggregates, stone and ready-mixed concrete. The Grangemouth refinery provides the potential for distribution of bulk fuels along the route of the Lowland Canals. This type of bulk load has been used over a long period of time on the Aire and Calder navigations in the East of England.

6.3 Retail Freight

The central retail areas of Glasgow and Edinburgh are each within half a mile of the Lowland Canals. There are also three major retail parks lie along the route of the canals: Clydebank Shopping Centre, Strathkelvin Retail Park at Bishopbriggs and Central Retail Park, Falkirk.

There are three ways in which canals might be used for retail freight.

- Longer freight journeys from suppliers and retail freight distribution centres, to the major urban areas, where sufficient bulk may be moved to make waterways freight viable. Opportunities may exist for good such as DIY products: including bagged aggregates, timber, garden composts etc, and non-perishable goods from centres such as the ASDA distribution centres at Grangemouth to stores along the route of the canals.
- To take products from distribution centres on the edge of the city into the city centre, where smaller, more environmentally sustainable vehicles could be used to deliver items to particular stores. This option is particularly useful for cities with congestion charging, sensitive historic centres, or where the canal extends into the city centre. The only opportunity for this on the Lowland Canals is Edinburgh, although as the recent referendum on congestion charging rejected its introduction, the case for this freight traffic is less than it might have been.
- Packaging waste for recycling is the third potential freight traffic related to retail areas and retail parks. Retail deliveries can result in considerable amounts of packaging waste, and while many delivery vehicles remove such waste, others do not and many retail outlets have considerable volumes of packaging to dispose of. Such packaging could be removed by canal, particularly if it were taken direct to recycling companies near to the waterways.

6.4 Recycling

There are a number of opportunities for recycling traffic on the Lowland Canals these include:

- Glass recycling
- Paper & cardboard
- Textiles
- Green waste
- Builders hardcore / recycled aggregate
- Pallets
- Vehicle tyres
- Waste electrical and electronic equipment (WEEE).

These are discussed in greater detail in the sections below.

6.4.1 Glass recycling

Local Authorities and their contractors collect considerable quantities of glass for recycling at local “bottle banks”, household waste sites and as part of their wider recycling collections.

Much of this glass is recycled at Alloa Glass, and could be transported there either by canal to Carron and transhipped onto road vehicles for a short motorway journey, or taken onto the Firth of Forth and up the estuary to Alloa.

6.4.2 Paper & cardboard

Paper and cardboard is extensively recycled along the route of the Lowland Canals. There are a number of firms that deal in paper/ card recycling; examples are Snowie and Stirling Fibres. To take Snowie as an example, this firm has a large depot at Grangemouth. Deliveries could be made using the waterway, although a short (one-mile) road journey would be required. As the Snowie depot is located immediately adjacent to the Forth & Clyde dock in Grangemouth, potential would be enhanced by restoration of the link between the restored canal and the docks, if this were the case then the road leg of the journey could be reduced.

6.4.3 Textiles

Textiles collected at clothing banks are recycled by companies such as Nathans Wastesavers at Denny, north of Bonnybridge on the Forth & Clyde Canal. Some of these textiles could be brought from areas alongside the Lowland Canals, reducing the road element of the journey to some three miles.

6.4.4 Green Waste

Many households with gardens, landscaping companies and municipal planting schemes produce green waste. Some recycle this waste at source in compost bins, however, much is sent to landfill or is collected by Local Authorities. In addition, as a result of weed cutting on the canals, British Waterways Scotland also generates green waste. Green waste can be recycled at composting plants (Windrows) where it is converted to compost for re-sale. Green waste would make a suitable return-load for aggregate loads, assuming a suitable site could be identified.

6.4.5 Builders hardcore / recycled aggregate

As there is currently considerable re-development of brownfield sites along the Lowland Canals, there are a number of demolition companies along the route which could use the canals to move rubble for recycling as hardcore / recycled aggregates. Using the canals to remove rubble could help to reduce the impact of lorries travelling between the demolition areas and the recycling sites.

6.4.6 Pallets

Pallets used in distribution of goods are often re-used, and the canals provide an opportunity for returning them to pallet suppliers, particularly as a return load. If they are beyond re-use, they can be chipped for use as a wood-chip fuel. There are pallet businesses located along the Lowland Canals.

6.4.7 Vehicle tyres

A number of industrial estates along the course of the Lowland Canals contain vehicle sales, repair and tyre businesses. Tyres can be recycled in a number of ways, and have already been identified as a potential load on the Birmingham Canal Navigations in England. Similar reprocessing could be carried out near to the Lowland Canals in Scotland, collecting tyres for recycling using the canals.

6.4.8 WEEE

In 2005, a six-week trial of moving Waste Electrical and Electronic Equipment for recycling on the Forth & Clyde Canal. East Dunbartonshire Council led the trial, working in partnership with the Freight Sub Group of the Lowland Canals Steering Group. The trial was intended to prove the potential for carrying WEEE on the Lowland Canals, and demonstrate an environmentally sustainable alternative to transporting it by road.

Objectives of the trial included:

- Testing the potential for using wide-beam carrying vessels on the Lowland Canals.
- Testing loading and unloading methods.
- Testing the use of various skip designs.
- The potential for creating training and employment opportunities.

The Leeds & Liverpool Canal short-boat “Clitheroe” was used for the trial, which operated on the Forth & Clyde Canal between Bishopbriggs and Twechar. The objectives of the trial were fulfilled, and areas where improvements for roll-out of such services would be needed were identified. Such improvements included the need to provide additional welfare facilities for vessel crew, and safety additions to the vessel. The need for skilled, trained crew was also highlighted, particularly given the leisure use of the canal.

The report provides details of the vessel used in the trial, the loads carried, and the routes and wharves used for the trial. In addition it documents loading / unloading methods that were tried, the timings & constraints for the traffic and the costs of conducting the trial. There is a section on lessons learned during the trial. The appendices to the report provided details of individuals and groups involved in the trial, with contact details where appropriate, press & publicity associated with the trial, the breakdown of WEEE carried during the trials, and the freight schedule provided by Robert Mcleod of BW who arranged the vessel movements.



Figure 6.4.8 Part of the trial load during the 2005 WEEE Trials

6.5 Waste

The first study on the freight potential of the Lowland Canals was the Carriage of Waste on Lowland Canals, carried out in 2003. This study investigated the potential for moving waste from a household waste site at Mavis, Bishobriggs to the landfill tip at Avondale west of Linlithgow.

Examination of the potential concluded that carrying the waste (from just one local authority) on the Lowland Canals could provide savings in road miles of up to 794,975 miles over a five-year period. As no actual emission figures were available for any of the vehicles considered in the scenarios, it was not possible to compare the emissions for each scenario. However a comparison of fuel consumption per tonne moved showed that all four waterborne options would use less fuel per tonne moved than either of the road options. When this saving in fuel was added to the saving in road miles, with their attendant noise and disturbance, it became clear that there were considerable environmental benefits to carrying the waste on water. Indirect benefits to the newly restored Lowland Canals, included potential new jobs being created.

If a grant were available to assist the water-borne options, then the five-year costs of the four options considered in the study would be considerably reduced, with some options being far cheaper than use of road haulage. Generally, grants are only made to cover capital costs, and usually cover a maximum of 50% of the capital outlay.

7 IMPACTS ON AMENITY

Since the re-opening of the Forth & Clyde and the Union Canals, and in particular, since the opening of the Falkirk Wheel in May 2002, the Lowland Canals of Scotland and the Wheel have become major tourist attractions. The Forth & Clyde Canal is being used for an increasing number of passages coast-to-coast, particularly by sailing craft wishing to sail off the West of Scotland. Furthermore, since opening in May 2002, the Falkirk Wheel has become one of the most popular tourist attractions in Scotland.

Use of the Lowland Canals for freight will have an impact on the amenity of the canals. This includes the volume of freight traffic interacting with tourist vessels, non-waterborne users of the canals, and with the traffic using moveable bridges to cross the canal.

7.1 Amenity on Forth & Clyde and Union Canals

Route investigations both of this study and earlier studies highlight that some parts of the waterways are used extensively by walkers, cyclists, joggers etc. However it was also clear that (with only rare exceptions), the sight of a boat on the waterway was of interest and enjoyment to passers by and other waterway users. Therefore, so long as any vessel used for freight is neat and tidy in appearance it will not adversely affect the visual amenity of the waterway, and may in fact increase the amenity value by adding interest to the waterscape. Moving boats, particularly if they are negotiating a lock or a moveable bridge are of particular interest to children and parents, even if the boat in question is of no particular visual merit – non waterborne users of the lowland canals appear to enjoy boats passing.



Figure 7.1 Walking & Cycling on the Union Canal

The Millennium Link is promoted for walking and cycling as much as it is for waterway traffic, and some sections have lengths of the National Cycle Network running along the towpaths. The presence of large numbers of pedestrians and cyclists

using the towpaths for leisure and travel means that the use of long tow lines, to move vessels either in long pounds or between locks, is not desirable during daylight hours. Similarly, it will not be practicable to tow un-powered vessels from the towing path, which might have been an option for the Falkirk - Carron section. (n.b. there are places on the canals where the towing path is some distance from the water, so this method would not be suitable in these areas.)

It is not anticipated that the carriage of freight on the Lowland Canals will have any impact on the ecology of the area. It should be noted, however, that some areas such as Dullatur Bog are Sites of Special Scientific Interest (SSSI) which may affect the positioning of lay-over or barge storage points e.g. on the summit level of the Forth & Clyde.

One area where the passage of freight might affect the amenity value of the canal is when boats require passage through the moveable bridges at busy times of day. Due to the nature of the road layout near some moving bridges (e.g. Bonnybridge & Twechar), the road traffic management requirements for stopping traffic on the roads approaching the bridges means that traffic travelling parallel to the canal is stopped as well as traffic crossing the bridge. Therefore there is potential for the bridge to cause significant hold-ups at rush hours. There is a goodwill agreement whereby British Waterways Scotland undertake not to move the bridges for an hour in the rush hours during term time (although this is generally extended to school holidays as well if practicable).



Figure 7.2 Hillhead Bridge

In the first year of operation there were 120 boat passages from Falkirk to Bowling or vice versa, this figure doubled in the second year of operation and has since risen further. The number of hire boats on the Lowland Canals has risen rapidly since the canals re-opened and the number of private vessels is also increasing. Boat hire companies on the Lowland Canals include those listed in the table below. Hire boats and private boats are intensively used throughout the summer seasons. The crews of hire boats may be complete novices, so may not respond to other traffic (particularly larger craft) in the most efficient manner.

Hire company	Base
Alvechurch	Falkirk Wheel
Black Prince	Falkirk Wheel
British Waterways	Auchinstarry Basin
Capercaillie Cruisers	Falkirk Wheel
Camelon Cruisers	Auchinstarry Basin
Thistle Boats	Linlithgow (Union)

Table 7.1 Hire Boats using the Lowland Canals

There are a number of trip boats using the Lowland Canals. These are mainly focussed on the Union Canal, or in the vicinity of the Falkirk Wheel. Professionally crewed, and with increasing regulation of crews imminent, these are unlikely to present a hazard to freight traffic on the waterways.

Trip boat operator	Base
Bonny Barge	Falkirk Lock 16 (F&C)
British Waterways	Falkirk Wheel
Edinburgh Canal Centre	Ratho
Forth & Clyde Society	Glasgow Road Bridge (F&C)
Linlithgow Union Canal Society	Linlithgow Canal Centre
Nolly Barge	Hamiltonhill, Glasgow Branch

Table 7.2 Trip Boats operating on the Lowland Canals

7.2 Amenity on Falkirk Wheel

It is clear from the passages made on the Wheel in the course of route investigations that any freight movements up or down the Wheel would be restricted by the heavy daytime usage. The best way to overcome this would be to schedule freight passages through the wheel to out of hours periods. The list of trip-boat and hire-boat operators detailed above already provides an indication of the level of demand for this hub of the Lowland Canal system. However, given that the Wheel is a significant tourist attraction, it must be borne in mind that visitor numbers can be expected to remain high, and there is a possibility of future evening traffic – including restaurant boats. Therefore in future, “out of hours” may become confined to the hours between midnight and dawn, although the extended hours worked by wheel staff could make evening working cheaper or improve the flexibility for scheduling.

In 2005 boat users on the Lowland Canals were offered the opportunity to moor in New Port Downie for a supplement of £10.00 per night. Occupied boats moored in the basin overnight could conflict with the passage of freight barges through the Wheel, although as the space in the basin is limited, and the revenue generated is small, withdrawal of this to enable freight passage would have a limited impact on amenity.



Figure 7.3 Falkirk Wheel – Trip boat in the Gondola

The capacity of the gondolas exceeds that of the locks above and below the wheel. This is apparent on Saturday afternoons when hire boats, which have just been collected, wish to move up to the Union Canal. As private boats become more common on the Lowland Canals, the locks above and below the wheel may become significant daytime bottlenecks.

7.3 Benefits to Amenity Derived from Freight on Lowland Canals

The use of the Lowland Canals for freight could also provide benefits to the amenity value of the canals. While the rural areas of the canals are deemed to be highly attractive, some sections of the canals run through more deprived areas where the presence of leisure boats can generate resentment towards those enjoying the waterways. During the course of route investigations, researchers using hire-boats have had stones thrown at the boat, been spat on from bridges, and hit substantial objects in bridge-holes, which had been deliberately put into the canal to impede the passage of boats. Regular passage of freight will help to dilute the impact of leisure boats passing along the canals, and will help to keep the bridge-holes free of rubbish. As employment generators, it is possible that the canals may be more respected as a result.

As with most waterways in the UK, there are some parts of the canals that are less popular than others. In these cases the lock mechanisms and gates tend to be harder to work than more popular areas. Regular passage of freight would help smooth the working of these mechanisms, and the crews would be able to spot and report incipient faults before they became major problems.

8 SUMMARY & CONCLUSIONS

The Lowland Canals, running between Glasgow and Edinburgh, provide an opportunity to build on the close co-operation already established by the Millennium Link projects. In addition to the property and tourism developments already being realised as a consequence of the reopening of the canals, the potential for the carriage of freight and the business opportunities it provides will add a third area of development arising from the re-opening of the canals.

This report, prepared as a part of the Freight Action Plan (FAP) for the Lowland Canals of Scotland, introduces the potential for freight, documenting the opportunities and constraints for the movement of freight using both the Forth & Clyde, and Union Canals. Information presented in the report has been drawn from earlier freight-specific trials and studies, combined with data gathered in the preparation of the FAP, particularly for the Union Canal which until now has been less thoroughly investigated than the Forth & Clyde Canal.

The report introduces the routes, dimensions and timings for the Forth & Clyde and Union Canals, and highlights the potential loading and unloading points together with their requirements. Vessel design considerations and configuration options are discussed, as are loads, containers and their handling requirements. Potential freight loads are also introduced, as a precursor to business specific potential detailed in the results of Phase 1 surveys. Positive and negative impacts on amenity are also considered.

9 APPENDIX A - GLOSSARY

Term	Definition
Air Draught	Headroom above the surface of the water
Breasted-up	Canal boats travelling tied up side-by-side (usually where one boat is dumb)
Cill (Sill)	Horizontal part of lock against which the bottom of lock gates close
Draught	Depth of water
Dumb boat	Unpowered boat
DWT	Dead Weight Tonnage
F&C	Forth & Clyde Canal
Locking up	Going up hill through a lock
Locking down	Going down hill through a lock
MCA	Marine & Coastguard Agency
Singled-out	Canal boats travelling one-behind the other (usually one powered vessel towing a dumb one)
Spill-way or By-wash	Channel around the side of a lock to let surplus water above the lock run round, rather than over the top of the gates.
TEU	Twenty foot Equivalent Unit (container)
Winding point	Turning point for vessels with a length greater than the width of the canal
Pound	Length of water between locks – usually refers to canals (see also reach)
Reach	Length of water between locks – usually refers to rivers (see also pound)
Sluices or Paddles	Device for controlling admission of water into / out of locks
Sluice or Paddle Gear	Control operating mechanism for Sluices / Paddles
UC	Union Canal