

Note to File

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1. Introduction

This note contains TMG's view on the requirements for vessel specification on the Gourrock/Dunoon ferry route for the purpose of cost and revenue modelling.

Our incremental approach to this issue means we have had to specify **foot passenger only and passenger and vehicle ferries**.

This specification needed to be proportionate to the task, i.e. we are not designing vessels but attempting to establish outline specifications and broad typical costs. The key requirement was to determine a credible set of vessel related costs for the purposes of financial modelling and the calculation of likely subsidy requirement. Given the level of uncertainty attached to the process, we have given a broad 'level of confidence' attached to each cost element.

Our methodology was to first establish how the existing route operated and the class of vessels currently in service. Secondly we had meetings with all stakeholders to glean their views and ideas (this included operators and Masters of ferry vessels in the Upper Clyde). Thirdly we had meetings with customer groups and in particular with members of the Dunoon Gourrock Ferry Action Group (DGFAQ).

We researched existing ferry services throughout the world of a similar operational parameter to the Gourrock/Dunoon ferry route.

In establishing the optimum dimensions and specifications of the ideal vessel we had to look at: Navigational and Regulatory restrictions; the General Weather conditions for the area; the Tidal range, flow and rate; Significant wave heights; Wave frequency, wave length and period; and, the existing infrastructure at the ports.

2. Service Restrictions

The jurisdiction of the whole of the Upper Clyde (apart from parts of the Gareloch, Loch Long and Loch Goll, which are designated Naval dockyard ports and under the jurisdiction of the Queen's Harbourmaster) is covered by Clydeport Limited, based in Greenock. Local regulations on safe navigation and emergency are published in Clydeport's local Byelaws.

The area of the Clyde estuary where the service operates has a speed restriction for all vessels of 12 knots, imposed by Clydeport under their health and safety management system. Below a line drawn between Cloch Point and Dunoon Pier the restriction is 19 knots. It is questionable if the speed restriction of 12 knots is legally enforceable, not being enshrined in Byelaws and is more a

mutually agreed speed limit by local fishermen, yachtsmen, local harbour authorities and the Royal Navy.

The area (both Cat C & D waters) is designated as a 1.5 significant wave area by the MCA for issuance of certificates. Category C waters apply to tidal rivers and estuaries and large, deep lakes and lochs where the significant wave height could not be expected to exceed 1.2 metres at any time. Category D waters are tidal rivers and estuaries where the significant wave height could not be expected to exceed 2.0 metres at any time¹. The Cat C area for the Upper Clyde is between Cloch Point and the Dunoon Pier northwards, thus making the Dunoon Linkspan and breakwater just in Cat D waters. This line however, moves southwards in summer between March and November (to a line from Bogany Point, Isle of Bute to Skelmorlie Castle and a line from Ardlamont Point to the southern extremity of Ettrick Bay inside the Kyles of Bute²), allowing the **Argyll Fiyer** and **All Cat** vessels to trade as Class V vessels. Both existing vessels are Class IV and Class V designation, though the Class IV vessel operates with a dispensation from carrying a High Speed Rescue Craft (HSRC) and operates with a crew of 3 (instead of 4). The Master has had a weather restriction placed on him and can only proceed to sea in "favourable weather", taken to mean "fine, clear, settled weather, such that as to cause only moderate rolling and pitching"³. The MCA has placed this restriction as the vessel itself will have to act as a rescue craft should a "man-over-board" situation occur, there being no HSRC fitted. Presumably CalMac has decided that the cost of cutting out the extra crewmember far outweighs the cost of having to put a HSRC aboard, maintain it and train an operator, plus the number of sailings cancelled because of the weather.

Distance between Gourrock and Dunoon linkspans is 3.90 nautical miles indicating that with the 12 knot speed restriction and allowing for manoeuvring, berthing and unberthing, the minimum time berth to berth would be 22 minutes, thus allowing only 4 minutes to disembark/dischARGE passengers/vehicles at each end on a 30 minute service schedule. By contrast the Western ferries route between McInroy's point and Hunter's Quay is only 2.30 nautical miles, allowing that company to have a 15 minute voyage time berth to berth and a 20 minute service schedule. By increasing the speed limit by a mere 3 knots to 15 knots, Argyll Ferries would be able to operate a far more competitive service. This of course does not take into account the effect of tidal flow on the speed of the vessel over the ground and it is possible therefore a higher service speed than 15 knots may be needed.

Clydeport issues all Masters of ferries in the Upper Clyde with a pilot's Exemption Certificate (PEC). The Masters are certified as Boatmen by the MCA on the **All Cat** and **Argyll Fiyer**. RoPax vessels may be required to have the Master certificated to a higher level.

3. Upper Firth of Clyde Weather

General Weather

The weather on the West Coast of Scotland is very variable at any time, being influenced by the passage of depressions from the Atlantic, and rapid changes can frequently be experienced. The prevailing wind is between South and West, with a higher proportion of Northerly and Easterly winds in May and June, when an anticyclone is more likely to become established to the North of Scotland. Except in September and the winter months, gales are not common, although they may occur at any time. Fog as such is rare and visibility of less than 2 nautical miles is unlikely on more than 3 days per month in summer. Low cloud however may more often obscure the tops of hills and heavy rain may reduce visibility for a time. On the whole the best weather may be expected during May and June. October is often found to have better weather than August⁴.

¹ MCA Marine Notice MSN 1827(M)

² MCA Marine Notice MSN 1827(M)

³ Glasgow Marine Office MCA

⁴ Imran: Firth of Clyde Cruising Club Sailing Directions.

Gales

Gales (Beaufort Force 7 and above) in the Upper Clyde region are infrequent.

The nearest Meteorological recording station is Greenock⁵. This gives an average recording taken over 21 years as being 14 days, viz:

January	3.3 days
February	2.9 days
March	1.6 days
April	0.5 days
May	0.3 days
June	0.2 days
July	0.1 days
August	0.3 days
September	0.5 days
October	1.3 days
November	1.4 days
December	1.6 days
Total	14 days

HMS Gannet at Prestwick reports 15 days per year taken over a 19-year recording.

The predominant wind is S through SW though gales can usually be expected from SW through to W but are known from all quarters. The average duration of a gale depends on exposure and may last between 5 and 7 hours in exposed places. Gales from S and SE are usually short lived. Storm force winds (force 10 and above) in the Clyde area are very infrequent and are only 2-3% (less than 10 hours per annum) of all winds above Force 7. Wind speeds in the Upper Clyde may vary greatly within very short distances due to the different degrees of shelter and the distance from a leeward shore. Thus a SSW Force 7 may affect berthing at Dunoon but be relatively sheltered in Gourrock. Conversely a NE gale will affect berthing in both Dunoon and Gourrock.

Visibility

Fog occurs in Greenock 8 an average days a year (stats over a 21 year period), mainly in December.

Rainfall/Snow

Precipitation is high, averaging 232 days over a 19-year period. Although evenly distributed throughout the year precipitation occurs more in winter months than summer. Considering the latitude of the Upper Clyde, there is relatively little snowfall at lower levels.

4. Tides and Tidal Flow

Spring Tides are about 1.6 times Neap Tides. Spring Tide Range is 3.0m and Neap Tide Range 1.9m. This is not excessive, but could be significant when looking at embarkation/disembarkation of passengers other than from a linkspan.

Tidal flow seldom reaches more than 1 knot at just before HWS in both directions, generally flowing up or down the line of the Firth. The stream does however split 1 nm north of Cloch Point, one stream following the river and the other flowing into Loch Long.

5. Significant Wave height.

The enclosed nature of the Firth of Clyde with its characteristic narrow fjords has a dampening effect, which limits the wave field affecting the coastline of this area. Wave climate modelling⁶ indicates that the majority of the waves in the region come from the southwest and west. Significant

⁵ Admiralty Sailing Directions NP 65 and Imran Clyde Cruising Club Sailing Directions.

⁶ National Hydraulic Laboratory, Wallingford (1996)

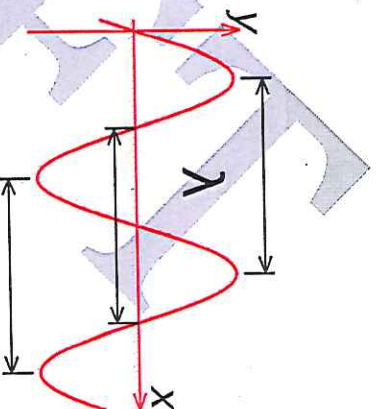
wave height in the off shore zone rarely exceeds 1.6m in height whilst in the inshore zone they rarely exceed 1.2m in height. The Firth of Clyde is therefore not greatly affected by swell waves since they rarely extend into the area from the Irish Sea. The fjord coastline within the Firth of Clyde has inherently low wave magnitudes due to the shelter afforded by the surrounding landscape. Shelter will in effect reduce wind speed that in turn lessens wave fetch, resulting in a marked reduction in wave energy in comparison to more open areas of the Scottish coastline, outside the Firth of Clyde⁷. The assumption that significant wave is seldom above 1.25 metres seems to be borne out in interviews with route ferry Masters.

Significant wave height for a SSW force 7 wind near gale (28kts) is recorded as being 1.542 m off Cloch Point.⁸

The highest recorded significant wave height between Cloch Point and Dunoon is about 2.5 metres during Southerly Storm Force winds⁹.

6. Wave Frequency, Period and Length

Wave period (or frequency) (X) can be described as the time it takes for two successive wave crests to pass a given point. The wavelength of a sinusoidal wave is the spatial period of the wave—the distance over which the wave's shape repeats.¹⁰ It is usually determined by considering the distance between consecutive corresponding points of the same phase, such as crests, troughs, or zero crossings, and is a characteristic of both travelling waves and standing waves, as well as other spatial wave patterns. Wavelength is commonly designated by the Greek letter *lambda* (λ). The frequency (X) is the velocity that the wave crests pass at a given point. The combination of these two wave phenomenon, plus the significant wave height (Y), directly affects the motion of displacement vessels. The wave height can also be affected by the depth of water, proximity of adjacent landmasses or shallow water and a tunnelling effect such as is found in fjords and estuaries. Shoaling water has a significant dampening effect on frequency, significant wave height and wave period. Likewise tunnelling effect can dampen frequency by friction and this phenomenon is sometimes recognized by having high winds and relatively low frequency and wave heights. This is generally known in enclosed waters as the "fetch" of the sea.



There is no data on wave period and frequency for the Upper Clyde region, though it can be safely assumed that it will not have a frequency above 5 seconds. However with professional experience and knowledge of other areas the consultant can comment as follows:

It is known that the upper reaches of the English Channel usually produce wave periods of 7 to 10 seconds in SW gales. The frequency can and will shorten if the tide direction is against the wind direction, which tends to "heap" the sea. Conversely, wind and tide from the same direction tend to "flatten" the sea and make frequency longer. A wave period of 9 seconds usually equates to a wavelength of about 70 metres. By extrapolation, wave frequencies of 7 seconds equate to about 60 metres and 10 seconds to about 85 metres. It thus follows that a period of about 3 or 4 seconds would produce a wave length of about 20 to 30 metres and a 5 second frequency about 40 metres.

7. Vessel selection for the Gourock/Dunoon Ferry Route.

Criteria and assumptions used by TMG in considering suitable vessels, both passenger only and vehicle and passenger (RoPax), are as follows:

⁷ Admiralty Sailing Directions NP 65, Imran Clyde Cruising Club Sailing Directions and Met Office Assessment of significant wave height in UK coastal waters – 2011.

⁸ Clydeport Ltd. This statement is not validated or confirmed.

⁹ Admiralty Sailing Directions NP 65 and Met Office Assessment of significant wave height in UK coastal waters – 2011.

¹⁰ Wikipedia

- The service requires vessels of high availability and reliability. (The target being to provide a weather related reliability rating of 99.5% or better)
- The vessels should be of proven design suitable for service in fairly open estuarial waters.
- The service across the Clyde estuary should be compared with vessels operating a similar essential service and in similar sea conditions.
- The vessel type and design should be capable of operating all year round in the prevailing Clyde estuary weather and sea conditions. This applies to vessels specially built for the service or existing vessels acquired for the service.
- The vessels must be capable of maintaining the service speed of 12 knots in all but the most extreme weather conditions experienced on the route.
- Propulsion systems fitted in the vessels will provide high manoeuvrability.
- The vessels will be able to use the berthing facilities at both Gourock and Dunoon.

In consideration of the above factors, TMG has looked at other ferry operations in the UK and overseas. Together with our own extensive experience in ferry operations globally, we have concluded that as an example, the ferry crossings to the Isle of Wight (IoW) operate similar services in similar (or slightly worse) sea conditions to those of the Upper Clyde, (allowing that traffic numbers, numbers of passengers and operating restrictions with regard to vessel speeds are different to those required for the Dunoon/Gourock service).

We have studied the data provided for the passenger only Gourock/Dunoon service which has been operating on the route since July 2011 and noted the many comments, qualified and unqualified, regarding the service performance. The Consultants have travelled the route on both vessels and reached the conclusion that vessels of a more suitable design and specification would provide a better sea keeping performance and more comfort for passengers. However, the passenger only vessel, subject to the MCA's service restrictions above regarding weather limits on sailing, may not noticeably improve the service. If the vessels carried a safety boat it would allow more leeway in regard to sailing in less than moderate weather but may produce more motion sickness among the passengers. The addition of a HSRC may also require an additional crewmember, which would increase staff costs.

Regarding the RoPax service, the Consultants have looked at the Western Ferries operation and apart from all the considerations of berths, facilities ashore and on board, distance of route etc., they have a fairly good record in maintaining a regular service even in bad weather. Again, TMG has studied the data available and comments regarding the service from various sources as well as travelling on the route in person. The vessels are obviously suitable generally for the route, though very basic with regard to facilities for passengers. We note the tendency for heavy seawater spray coming over the car deck in rough weather, causing damage to cars. The ramps at either end are short and the adjacent bulwarks and gunwales are the same height, offering very little protection. This should be considered in the design of new RoPax vessels for the Gourock – Dunoon route.

TMG do not think the GT (Gross Tonnage) figure plays a significant part in what constitutes an ideal vessel for the route (but it does affect port dues); the length, breadth and draft are more important with sea keeping qualities.

Though by no means scientifically tested in our study, experience shows that to find a vessel that will give a similar performance to the "*Streakers*" of a weather down-time of 0.9% or better, the overall length of a vessel must be above the most likely worst scenario case of wavelength, in this case assumed to be 40 metres. Significant wave height will be assumed to be a worst-case scenario of 2.5 metres.

The vessel will also need to fit the link-spans at both Dunoon and Gourock and this is taken to be a maximum of 65 metres.

We therefore feel an outline specification of the vessel(s) needed is:

1. LOA: 40 to 50 metres, (though a RoPax can be up to 65 metre)
2. Beam: 11 to 15 metres
3. Draft: 2 to 2.7 metres
4. Service speed: 14 to 15.5 knots
5. Navigational: X-Band Radar, Magnetic compass, Gyro compass, AIS, GPS, E/S, Speed Log, VHF though not limited to. (Navigational equipment fit to comply with MCA Merchant shipping Notice MSN 1823 (M) paragraph 19.1).
6. Capable of operating with a crew of 4.
7. Passenger: 200 to 250 seated and under cover (i.e. not seated on open decks)
8. Vehicles (cars): 40 (RoPax vessel only), with adequate protection from sea spray.
9. Adequate, compliant and safe access for embarkation/disembarkation of passengers and crew at all times.
10. Vehicular ramp at both ends of vessel (RoPax only) to facilitate swift loading/unloading of vehicles.
11. Vessel to be capable of operating day and night as a double header type of vessel (RoPax only).
12. GT should be as low as possible.
13. The vessel will need to be highly manoeuvrable to allow quick turn-rounds in port.
14. Capable of operating from both Gourock and Dumoon Linkspans

This above specification applies to both Passenger only vessels and RoPax vessels (except where specifically mentioned).

We caveat this assumption, as it is based on knowledge of other similar routes with similar weather/wave patterns and is given as our own best professional judgement. To ascertain the hull form of an ideal vessel for this particular route is outside the project's TORs and would require further funding. A technical feasibility project would be needed to produce a 12-month hydraulic study of wave patterns, tidal flow and weather for the Upper Clyde. Such a study would require accurate weather, wave and tidal data over a number of years. Whilst the weather and tidal data may be available it is doubtful if wave data exists with any accuracy, as wave rider buoys have not been in use in the Upper Clyde. A naval architect would then have to base hull form calculations on the findings of the hydraulic study to find the ideal ship and to model tank test his design.

Finding such a ship (or two) is no easy task and there are not many available that fit the bill.

TMG have looked at the current market and consulted with ship broking associates within the group and have not found any suitable vessels for sale that would meet the criteria for operating the route or be economical to operate.

Our research shows the following passenger only vessels are available (throughout the world) and are shown here to give an indicative second hand price, though some are slightly outside our recommended specification criteria.

Cezayorli Hasan Pasa GT 2,695t, built 1997, in Australia. LOA 59.90 m x 17.50 m beam x 3.25 m draft. 490 Pax, Class DNV, speed 24 kts. Price US\$4.7/4.8 mio.

Turgut Reis GT 2,695t, built 1997 in Australia. LOA 59.90 m x 17.50 m beam x 3.25 m draft. 490 Pax, Class DNV, speed 24 kts. Price US\$4.7/4.8 mio.

Sea Star GT 887t, built 1991. LOA 45.25 m x 10.50 m Beam x 2.50m draft. 400 Pax, speed 12 kts.

Price US\$2.3/2.4 mio
Cloud X, GT 1,010, built 2012, LOA 37.52m x 18.09 m beam x 3.5 m draft. 365 Pax, speed 20kts, price US\$1.4/1.5 mio (we have inspected this vessel, currently laid up in Florida).
Begonia Express built 1972, GT 630t, LOA 51.59m x Beam 10.04m x Draft 2.92, 250 Pax, speed 13kts, price Offers.

As part of the research TMG visited Clyde Marine (as requested by Transport Scotland) and examined their vessel **Clyde Clipper**, at Greenock. The MD of Clyde Marine stated that the vessel was designed and built specifically for the route in anticipation of winning the contract. It is 27m LOA x 11.2m x 2.2 m draught. Whilst it is larger than the two current vessels on the route, 1m longer than the **Argyll Flyer** and 4m wider in the beam and should perform better than either of the current vessels, she does not conform to our specification and would only produce a short-term solution. She was used on the route for a short period when the **Argyll Flyer** was being readied for service, when she suffered some technical problems, and more recently last summer as an extra vessel during the Cowal games period. There appears to be no data regarding winter service to compare.

The new **CMAL Hybrid** Ro Pax ferry to be introduced during 2013 is considered too small and too slow, though a larger vessel of this class would probably serve the route well:

LOA 43.5m (142ft) x Beam 12.2m (40ft); DWT35t; Speed 9 knots; Passengers 150, Cars 23, Commercial Vehicles 2 Fully laden 44t HGVs, but with space for 4. Reported to be at a cost of UK£10 million each.



The Consultant's research has concluded that the Wightlink Ferries, Ryder Class passenger catamaran vessels, **Wight Ryder I** and **Wight Ryder II** providing a service between Portsmouth and Ryde (IoW) would probably be a suitable type of passenger only vessel for the Dunoon/Gourock crossing. Built in 2009 with LOA of 41.5m x 12m beam x 1.6m draft, 260 Pax, speed 20 knots, they have a 100% operating efficiency in all weathers experienced, since coming into service. The area of operation of all Wightlink ferries namely the East and West Solent are classified as Category C waters¹¹. A vessel of this design with a reduced speed of 14/15 knots would provide a reliable passenger only service with a high availability. The Wightlink vessels were Built by FBMA in the Philippines at a cost, including shipment, of UK£3.125 million each. They are not built as High Speed Craft.



TMG looked at various RoPax vessels including CMAL vessels operated by GallMac, however we have concluded that the best example of a suitable RoPax vessel for the Dunoon/Gourock route would be that of the Lymington/Yarmouth (Isle of Wight) ferry crossing. Wightlink Ferries operate two RoPax services to the IoW from Portsmouth and Lymington. The Lymington vessels are too large for the service, but a scaled down version of a similar design with some modifications and increased speed, would be a suitable type of vessel. They are 62m LOA x 16.03 x 2m beam x 2.3m draught, speed 11knots, double-ended RoRo with a capacity for 360 passengers and 65 cars. They have a floating mezzanine deck for cars and have Voith Snyder propulsion units. Built in Croatia at a cost of €10 million. The mezzanine deck was 25% of the cost and the sophisticated propellers 15%. Thus, if the mezzanine deck and propulsion units were scaled back, the vessel could be built for a cost in the region of Euro €6 million (UK£5.2 million).

The estimated acquisition costs for new vessels used in calculating the business plan should be, viz:

¹¹ MCA marine Notice MSN 1827(M)

Passenger only vessel: UK £ 3,000,000
 RoRo Passenger vessel: UK £ 6,000,000

When looking at new vessels the specification should also consider the resale attractiveness to potential buyers worldwide.

TMG does not consider additional crew would be needed over and above the crew numbers currently operating the *Argyll Flyer* and the *All Cat*, though a higher class of certification may be required for the Master of a RoPax. Four crewmembers operate the Wightlink passenger only ferries and Western Ferries operated their RoPax vessels with crews of four.

8. Infrastructure

Argyll and Bute Council have put forward a plan to relocate the Dunoon Linkspan to alongside the old Dunoon Pier and this would seem to be an excellent idea as it would not only shorten the route slightly, but it would also allow berthing into the prevailing and worst condition wind quarter. The change would also bring the Class back into category C waters. If the Breakwater were to be extended say by 25 metres this would give a better lee for the old pier and assist in berthing.

The Linkspan at Gourrock needs refurbishment to bring it up to standard prior to inauguration of a new vehicle service from Gourrock. It may be cheaper to renew it.

9. Vessel Outline Specifications and Estimated Operating Budgets

We have used AFLs figures where we consider there will be no change. Cost estimates are for one vessel.

Below find an approximate table of operational costs:

Vessel Outline details	Passenger only Vessel	Passenger & RoRo Vehicle Vessel
LOA	40-42m	45 – 65m
Beam	12 – 15 m	14 – 16m
Draft	1.2 – 2.5 m	2.3 – 2.7m
GT	200-500 (median 350)t	700 – 1400 (median 1050)t
Service Speed	14-15.5 knots	14-15.5 knots
Type	Catamaran (Displacement)	Monohull RoPax
Passenger No.	Min 250	Min 250
Car No.	N/A	40 min
Propulsion System	Propellers	Azimuth propulsion system for high manoeuvrability
LSA	Life rafts	Life rafts (+HSRB) (MES)
Construction	Steel/Aluminium or composite materials	Steel or steel hull/aluminium superstructure

Engine power region	780KW	1100KW
Est Consumption	1.24mt/day	1.68mt/day
Fuel	MGO LS	MDO LS

Level of Confidence in assumptions	Ship Costs per Vessel (Direct) (*€1000)	Passenger vessel	only	Passenger & RoRo Vehicle Vessel
High	Crew	390		390
High	Crew agency	10		10
Medium	Staff cost/overheads	130		130
Medium	Fuel ¹² & Lub oils (subject to price variation)	332		451
Medium	Ship maintenance & repairs	85		111
Medium	Spare & stores	28		42
Medium	Docking costs	54		82
	Vessel Charter	N/A		N/A
	Berthing & traffic dues		MVA to provide	MVA to provide
	Marketing		MVA to provide	MVA to provide
	Insurance		TBA (TMG to provide)	TBA (TMG to provide)
High	Management fees	104		104
	Other costs			
	Total Expenditure	€1,133		€1,320

10. Noted Suggestions:

- Approaches should be made to the MCA to have the Category C/Category D delineation line moved from Cloch Point to Dunoon Pier to Cloch Point to the head of the new Breakwater (a distance of 80 metres). This will allow the vessels to be in Category C water at all times and allow them to trade as Class V vessels.
- Approached should be made to the MCA to allow other approved methods of rescue for Man-over-board other than a HSRC. i.e. lasso method used by Wightlink on their Class IV vessels *Wight Ryder I* and *Wight Ryder II*
- Approaches should be made to Clydeports Limited and Upper Clyde users to increase the speed restriction from 12 knots to 15 knots.
- Consideration of moving the new linkspan at Dunoon to work off the old Pier.

5. Consideration should be given to extending the existing new breakwater at Dunoon by 25 metres.
6. Jetty at Gourrock needs refurbishment. Linkspan needs urgent refurbishment or replacing.

DRAFT