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Navigation on the river Tawe – Swansea: Landings and Links

Introduction

This report has been commissioned by the Swansea Community Boat Trust into facilitating and extending navigation of the River Tawe, Swansea, and has been funded by the European Union. This report is in four parts covering the Tawe itself, links via the Fendrod to Clydach and via Port Tennant to a new basin at Crymlyn, and a summary of benefits resulting from the overall scheme.

The idea of linking the Tawe to other waterways and extending navigation is not a new one, it was first suggested in 1992 in a report prepared By WS Atkins (as they were then), and had its genesis in an earlier age when Swansea was at the focus of the local waterways, the Swansea Canal ran the length of the Swansea Valley from Abercrave to the North Dock, The Neat Canal did similar in the Vale of Neath, and the Tennant Canal (the longest private canal in the UK and originally called the Swansea and Neath Union Canal) connected the Neath Canal to the Tawe at Swansea via the Prince of Wales Dock at Port Tennant. Historically the same boats did not cover the entire network but had these waterways survived intact to the leisure era then undoubtedly pleasure cruisers would have crossed the Tawe between the Tennant and Swansea Canals and made their way inland on both waterways.

The Swansea Canal has vanished south of Clydach and the Tennant Canal now disappears just north of Fabian Way, so new canal links are proposed to reconnect the Tawe to each canal. The previous studies (1992 and 2002 – both Atkins) looked at this in some detail and MNY have done significant work on the Swansea Canal and its links to the Tawe. However these studies have treated the Tawe as a movement corridor which will carry boats between canal sections and the city centre, indeed even the links to the historic waterway have been treated in this way, a means of connecting Clydach and Neath to Swansea Marina rather than entities in their own right.

This study therefore looks in rather more detail at the possibilities for the Tawe itself, and given that these possibilities focus on the potential for commercial passenger carrying vessels this study also looks at the potential for such vessels to travel the new links. Thus, the potential for navigation on the Tawe, and to Clydach and Crymlyn, is examined in its own right rather than simply as a means of connecting historic waterways.

Part 1 - Navigation on the Tawe

The river Tawe is navigable from the sea to Swansea Marina via the lock in Swansea Barrage. This lock retains a level rather above mid tide and thus the river is navigable (but seldom navigated) at all states of tide for some way upstream of the Marina to the confluence with the Fendrod and probably beyond. Use of the Tawe for navigation is not a new concept, in the late 18th century there were active wharves at the copper works at Morfa on the west bank and at white rock on the east bank, and upstream of this wherever industry was found up to the tidal limit. In 1996 the narrow boat “Progress” arrived by sea and travelled upstream as far as the location present day Morfa Stadium, which had

not then been built. This voyage is documented in the video “A Canal Too Far” by Laurence Hogg Productions.

Copper Jack has navigated the river upstream from Swansea Marina for some years but does not make land and has until recently been prohibited from passage under the rolling bridge at Morfa due to safety concerns. The bridge span has been removed for refurbishment and thus the danger to navigation has also been removed – this danger related to the condition of the span and thus navigation will be safe even when the span is reinstated.

No other large craft regularly navigate this section and navigation is not encouraged or promoted. Small craft such as canoes are used throughout the length. Once the Swansea Canal is restored and the Fendrod made navigable, then inland craft will regularly make passage between the Fendrod and Swansea city centre.

The length between Swansea barrage and the Fendrod is semi tidal and thus some fluctuation in level occurs on an almost daily basis (neap tides do not come over the barrage but mid-to-spring tides do) and the river is also subject to increased flow and raised river levels after heavy rain. If this occurs coincidental with spring tides then levels are higher again and passage under bridges upstream of the marina becomes problematic or impossible. However, some fluctuation in level will occur and the river still be navigable.

The immediate objective examined by this report is to allow Copper Jack or similar vessels to reach the Fendrod and to be able to stop for passengers to board and alight at various locations. There are currently no official moorings at all and none of the unofficial moorings are suitable for such a large vessel to serve fare paying passengers – the best that might occur at present is that a private motor boat might be able to moor and its crew scramble ashore.

Trip Boat Landings on the river

The brief calls for an examination of mooring locations along the river between the Marina and The Fendrod. The primary purpose of this is to serve as boarding and alighting points for Copper Jack and any similar craft that may be commissioned to work the river in future. Such vessels are fully disabled accessible and require moorings that can provide full disabled accessibility. In this respect the height of the river banks and the changing levels of the river are material factors – the owner of a private pleasure craft can use the roof of the craft for access and even scramble up the river bank if they choose, whereas Copper Jack requires wheelchair access, which requires a level and stable landing at a fixed height relative to the vessel – that is, can be adjusted for water level variations.

It does not take an especially sophisticated analysis to come to the conclusion that there are two obvious sites at the Copper Works and the Liberty Stadium and a third site almost opposite, the Copper Works, White Rock. In addition, there are other sites that suggest themselves at the city centre end of the river where passengers might board or alight without going to the Marina.

Until the Fendrod is navigable the Liberty Stadium forms the obvious upstream limit of operation for any passenger boat operation. The stadium is an attraction in its own right and the volume of parking in the area coupled with nearby residences, businesses and leisure uses makes this location both an

attraction for visitors and a start point for trips to the city centre. Further, this is the location for the proposed “Skyline” to make land at the lower end and would thus be a hub for two related sightseeing attractions if trip boats were also to have a landing here.

The Copper Works was once a major source of industrial traffic on the river, and the regenerated area has a significant residential population and a level of heritage interest for the visitor. There would be benefit in having moorings at both the Copper Works and the Liberty Stadium but if only one landing is pursued either would work adequately in the short term. It is likely that the Copper Works, with the various attractions and facilities located there, will attract regular daily traffic that would be well served with only a short walk from the landing. The Liberty Stadium would appeal for events and also for those seeking to start their journey at this end and use the boats to reach the city centre. The walk between the two is tolerable but not ideal, however the landing should be at one or the other not halfway between the two.

White Rock is a minor informal attraction based around the Smith’s Canal and associated ruined furnaces. Aside from the heritage interest the site is an attractive spot for informal recreation and could be a venue for events such as local fetes and festivals. The site has road access and is well connected with footpaths and a cycle way. It is also an awkward and lengthy walk from the Morfa stadium so a separate stop can be justified although the impact of a third stop on the route would need to be considered – it would be wise to consider this and any other additional calling points once the principle of moorings for trip boats has been accepted.

If and when the river is opened up to pleasure craft, then the river would benefit from informal visitor moorings in addition to the fixed moorings for passenger trip boat businesses.

Design of mooring

The usual design of moorings to deal with change of level is a floating pontoon, sometimes in the form of a moored barge. However, as a passenger trip boat is only moored at a boarding point for a few minutes this is not the only form of mooring possible. The primary advantage of a floating mooring is that there is no need to adjust the ropes securing the boat, but a trip boat at an intermediate landing is not at the mooring long enough for that to matter. It would also be possible to mount a hinged gangway on the bank with bankside bollards to secure the boat whilst passengers board and alight.

The following design constraints must be considered

- The water level will change, and the land must withstand this structurally and be capable of operating within part of that range, that is, passengers must be able to board and alight with changed water levels. This suggests a floating mooring
- The flow can come from either direction; therefore, the mooring must be tethered at both ends. This means it cannot simply be anchored or moored. If anchored, that is tethered from below, it won’t rise with water levels, if moored (tethered from above) it will become loose and be free to move in raised water levels, putting undue strain on the ramp mountings. The loosening would not only allow the pontoon to move backwards or forwards but outwards from the bank.
- The result of this is the pontoon really needs to be on risers not tethered to anchors or cleats by cables or ropes.

In addition, Copper Jack is wheelchair accessible, and other operators craft are likely to be wheelchair accessible or at least popular with ambulant disabled passengers, and thus the landing needs to be DDA compliant.

On a final note with regard to design, we are aware that the river bed is controlled by a third party, although there is no clarity on what control that third party has beyond an awareness that certain things require consent and that consent must be paid for. (Rights of navigation are discussed elsewhere in this report). We have not adapted design criteria to avoid these issues as (1) that severely limits design options (2) without knowing what needs consent it is impossible to develop a design that avoids that need (3) in our view the regulatory regime on the river needs an overhaul if the river is to see more use, and this includes a framework agreement with the party controlling the river bed.

Costs for a floating pontoon on the River Tawe for use by Copper Jack and similar vessels

The costs have been based on the pontoon pictured below, which is on the river Avon in Bath. The pontoon allows a boat to moor against it with level deck access, regardless of the level of the river, and then gives step free access to the riverbank above.



There are three main elements

- The mushrooms (the vertical piles that allow the pontoon to rise and fall)
- The pontoon itself
- The gangway connecting the pontoon to the bank.

Taking each in turn

We have assumed a 70 foot/21m pontoon and a 70 foot/21m gangway, supported by 4no. 6m mushrooms

- The mushrooms cost approximately £1,000 per metre length plus installation – mushrooms 6 metres long will cost £15,000 installed – four are needed thus the cost for the mushrooms is estimated at £60,000
- pontoons vary in price, but it would be wise to avoid the cheapest – we have therefore assumed £20,000 per 3m section, installed – total cost £140,000
- The ramp has been estimated at £5,000 per 3m section – at this stage, the length of ramp has not been determined but the one illustrated is 21m long and would thus cost £35,000

Thus, the ballpark estimate at this stage is

Mushrooms	£_60,000
Pontoon	£140,000
Gangway	£_35,000
Total	£235,000

This is based on catalogue prices for the components and experience of installation costs elsewhere., as detailed design evolves a greater degree of cost certainty can be established. These costs are broken down in more detail below

It should be noted that whilst a pontoon of the type illustrated will work well on the Tawe, there are design elements to it that are bespoke to the particular location and thus may not be strictly necessary. The pontoon illustrated is for a lock-landing for boat crews, it needs to be narrow so as to fulfil that function without being in the way of the navigation. The landing shown is also alongside the river towpath which is only 1.5m wide and is on a ledge some 1.5m above the water and 2m below the parallel road, thus intrusion into the bank was not possible. There is considerably more latitude for design variations on the Tawe.

It would be possible to save on the cost by replacing the prefabricated pontoon element with an old barge moored in position, and have the ramp extend from that. This would save £140,000 less whatever the barge cost: we would estimate a second-hand barge would cost around £50,000 plus transport to site plus suitable modification.

A more effective cost saving measure might be to commission a steel pontoon from one of the mainstream builders or a steel fabricator. Collingwood Boats, based in Liverpool, sell canal boats shells (hull and superstructure in steel, no fitting out, engine or domestic systems) – a 20m by 4m shell costs

approximately £30,000 plus VAT. Boats such as this can take a significant roof loading without stress to the structure and without becoming unstable. To replace the cabin superstructure with a stiffened flat deck would be relatively straightforward and would be within the same order of costs, the resulting pontoon would need ballast within the hull and access into the hull for maintenance purposes. This would provide a larger flat pontoon at a lower price than the pontoon element of the structure described above. However, being steel ongoing maintenance would be more of an issue.

It would also, in theory be possible to manage with a shorter pontoon, the minimum being a single 3 metres section. However the ramp needs to travel along the pontoon as levels rise and fall or a short pontoon would need to be able to move rather than remain in a fixed position, and on a short pontoon this is impractical unless that movement takes place on land. It is also more difficult to secure a long boat to a short pontoon, and thus the boat could not remain at the pontoon for any length of time, and the act of mooring the boat so passengers can get on and off becomes more cumbersome.

On a final note, it is possible to have no pontoon at all, and simply have a hinged gangway that will meet the entry doors on the boat, however the boat will still need something to tie to and such an arrangement needs a land-based operator to lower the gangway. The gangway must also be secured in such a way as to not be an obstruction within the river when not in use. Further, this arrangement would either extend over the river or, as the boat will generally be lower than the river bank, a channel would need to be cut into the river bank to allow the ramp to be lowered below bank level.

A floating pontoon has the advantage that it self-adjusts to changes in the water level and is a permanent floating feature thus easily managed and easily marked within the navigation. It is suggested that the gangway without pontoon is not considered further.

The landing stage at each location would be to the same design, the only difference being the height above retained water level, which in turn may affect the length of the ramp.

Costs

Landing as illustrated

Item	Unit/cost	Total cost
Mushrooms	£1000 per metre (6m height*4 mushrooms)	£24,000
Pontoon segments	£20,000 per 3m section (*7 sections)	£140,000
Gangway	£5,000 per 3m section (*7)	£35,000
	Subtotal	£199,000
	(Approximately)*	£200,000
	Design Fees 4%	£8,000
	Contingency 10%	£20,000
	Prelims 10%	£20,000
	Installation	£40,000
	TOTAL	£288,000

* The subtotal is rounded to avoid spurious accuracy in the following figures derived from it

The costs above have then been adjusted for the same design but a shorter pontoon

Landing as illustrated but with 6m pontoon

Item	Unit/cost	Total cost
Mushrooms	£1000 per metre (6m height*4 mushrooms)	£24,000
Pontoon segments	£20,000 per 3m section (*2 sections)	£40,000
Gangway	£5,000 per 3m section (*7)	£35,000
	Subtotal	£99,000
	(Approximately)*	£100,000
	Design Fees 4%	£4,000
	Contingency 10%	£10,000
	Prelims 10%	£10,000
	Installation	£40,000
	TOTAL	£164,000

* The subtotal is rounded to avoid spurious accuracy in the following figures derived from it

It should be noted that the reduction in design fees, contingency and prelims is slightly spurious as the overall design has hardly altered. However, it is possible that this shorter pontoon would only need two mushrooms to hold it, thus reducing costs

Landing as illustrated but with fabricated steel pontoon

Item	Unit/cost	Total cost
Mushrooms	£1000 per metre (6m height*4 mushrooms)	£24,000
Pontoon	£40,000 (see note below)	£40,000
Gangway	£5,000 per 3m section (*7)	£35,000
	Subtotal	£99,000
	(Approximately)*	£100,000
	Design Fees 4%	£4,000
	Contingency 10%	£10,000
	Prelims 10%	£10,000
	Installation	£40,000
	TOTAL	£164,000

* The subtotal is rounded to avoid spurious accuracy in the following figures derived from it

It should be noted that the reduction in design fees, contingency and prelims is slightly spurious as the overall design has hardly altered.

The cost of the pontoon includes delivery – whereas the 3m pontoon segments can be delivered in the back of a van if required, the steel pontoon will need craning and special haulage. Again, based on the cost of moving a boat of similar size we would expect the cost to be around £5,000.

Potential Passenger Boat Operations

At present there is no significant management of the river as a navigation and this needs to be considered before options in addition to Copper Jack are considered. The river as far as the Liberty Stadium is a category B waterway under the MCA regulations – upstream of the stadium the waters

are not categorised, this is presumably because classification has never been sought rather than these waters being intrinsically more or less hazardous than the length down to the city centre.

Category B waters are defined as: *wider rivers and canals where the depth of water is generally 1.5 metres or more and where the significant wave height could not be expected to exceed 0.6 metres at any time*

Category A waters are the least hazardous and Category D the most – The Swansea Canal is a category A waterway and the water between the barrage and the end of the breakwater in Swansea is Category D. The categories apply to smooth and partially smooth waters, beyond the breakwater is regarded as open sea.

Examples of issues that need to be addressed are:

- Speed limit
- Rules for the avoidance of collisions
- Licensing/registration

It may also be desirable to seek conditions on the size and type of craft using the river

Somerset Estates have authority over the bed of the river, but it is not clear whether this gives them any authority over navigation. Navigation rights may be open as the river was (and to some extent still is) tidal – there are common law rights to navigate wherever tide ebbs and flows although in some instances (such as where a port authority exists) this right is modified and the regulation of navigation on the Tawe, at least in the vicinity of the marina, is likely to be vested in the Port of Swansea or Swansea City Council, or possibly both at different locations.

For significant use of the river to occur it would be advisable to ascertain who has what powers and to reach agreement between these bodies for one navigation authority (at least above the barrage) to lead on these powers. It is extremely unlikely that any of the interested parties has the right to prohibit navigation, but they may have the right to place conditions upon it.

Taking the above examples of areas where regulation may be useful

Speed limits

This is basically a safety issue, although in locations where the riverbanks are soft speed limits can help reduce erosion through wash. It is likely and desirable that a range of vessels will use the river, and speed limits reduce the risk to all users. Masters of smaller vessels that can travel quickly present a risk at excessive speed due possible loss of control: this affects their interaction with both larger craft and unpowered vessels. A vessel as large as Copper Jack is unlikely to represent a problem as the speed through the water is limited by their hull shape, but semi-displacement vessels that can get onto the plane when under power must refrain from doing so. In practice waterways similar to the Tawe tend to have a 6mph or 8mph speed limit.

Rules for the avoidance of collisions

It has been established on many occasions that COLREGS, intended for shipping at sea, also apply on inland waterways unless other local rules apply. It would be appropriate to consider whether local rules are required and also to establish a system of navigation markers and signals (if required) to

delineate the channel and any course that vessels should take. It may be appropriate to establish rules around the landing stages and also a system of notices to mariners.

Licence/Registration

A licence/registration system is useful as it allows vessels to be identified in the event of a collision (with another boat or with navigation equipment such as markers or even landings) or a breach of regulations. However there does need to be a statutory mechanism for enforcing this and it should be investigated as to whether one exists for the Tawe.

Characteristics for passenger boat operations

The distances along the route are as follows

Marina mooring to:

River Tawe – 0.4km

A483 bridge – 1.1km

Copper Works/White Rock – 2.9km

Liberty Stadium – 3.9km

Fendrod Confluence – 5.2km

Once on the river a boat such as Copper Jack can cruise at 6kmh, probably more, subject to any current or future speed limit, although it is necessary to go more slowly in the marina. These factors give a cruise time to the Liberty stadium of around 45 minutes with no intermediate stops. An intermediate stop would add between 5 and 10 minutes depending on how many passengers board and alight.

Copper Jack

Copper Jack runs trips from the Marina but at present turns in the river near the Liberty Stadium and returns to base without stopping. Copper Jack is available for public trips and for private charter, can carry 50 passengers and is fully disabled accessible. (All these facts relate to the pre-Covid situation – no trips have been run in 2020). In 2021 Copper Jack will commence operations again with a standard fare of £10 per adult.

With one or more landing stages upriver, there is the scope for Copper Jack to vary its operation and act as a waterbus offering return or single journeys between different points on the river. However, it should be noted that Copper Jack is one vessel, and if it is operating excursions it is not operating a waterbus service, and if it is doing either it is not on a charter trip. There is room in the market for more than one vessel

Other large vessels/operations

Waterbus services need a degree of reliability – the market for such services is harmed if the trips don't run because a more lucrative charter has been engaged, and if the service is to connect, say the city centre with the Skyline attraction then such interruptions cannot be tolerated. Further there is a risk that a single boat becomes a (Copper) Jack of all trades and thus master of none. Restaurant boats and party boats form a valuable part of the water-based offer in many river towns and the Tawe is easily a big enough navigation for such vessels to have appeal. The boats could be bespoke build or

more likely be converted commercial boats such as Keels, Peniche or Luxemotor that have reached the end of their working days.

Smaller Vessels

Copper Jack can carry approximately 50 passengers and the river is big enough for vessels with an even greater capacity, however small vessels also have a role to play, especially boats that carry no more than twelve passengers and three crew. These vessels can operate a more responsive service for both passenger transport and charter services, the waterbus element responding to smaller groups “on demand” and the charter able to respond to families or special interest groups that cannot fill a larger vessel. These trips will benefit from multiple starting points as (1) the starting for Copper Jack is not available if Copper Jack is moored and (2) there is a significant distance from that mooring to potential sites of interest on the river, smaller vessels may benefit from running (say) Liberty to White Rock and/or Copper Works as special interest heritage tours for example.

Diversification

There is a significant and underutilised fishing fleet based on the Tawe just upstream of the Barrage, and an operational boat repair centre at the same location – both could benefit from a diversification of trade on the river with the fishing vessels adapted to serve the smaller boat section of the leisure market and the boat repair facility gaining more regular trade from servicing passenger boats.

Potential revenue for operators

Copper Jack will be charging £10 per passenger (with concessions) next season – when calculating revenue it is often advisable to make concessions the baseline and the treat full fares as a bonus, grandparents taking grandchildren might well all count as concessions and it is for this reason that on many tourist operations the reduction for concessions is limited to perhaps £1-2 rather than the more normal half or two-thirds fare common on public transport. Family tickets are a useful incentive, but these also erode the cash-per-head equation.

Smaller vessels can have more flexible charging regimes and more flexible operations – it is economic for a small vessel to charge less for full vessel charter, and to charge more per head for bespoke trips. There is a cut off point for small vessels at a maximum capacity of 12 passengers and 3 crew, above which full MCA compliance is required. This tends to result in vessels having capacity for 12 passengers or not less than about 30 passengers as the increased costs of operation require a significant uplift in numbers. Thus, we have based our conclusions on a mix of boats with 12 passenger capacity and larger boats with 40+ passenger capacity.

Looking at figures for trip boats elsewhere the operators may reasonably charge £10 a head for a basic trip and might expect to operate on 100 days a year (weekends April-September and school holidays). A smaller vessel (up to 12 passengers) could expect a revenue of £10-£30k per annum dependent upon how many trips per day were operated, plus the vessel would be available for other purposes on non-operational days. Larger vessels could see proportionately larger income but of course also have higher operating costs. Bespoke tailored tours, day long charters, “special occasion” charters and similar can all increase revenue over and above these basic figures. In addition, basic catering on board can provide additional revenue.

Landside revenue

Passengers on boats spend money elsewhere in the local economy during their trip, this is especially true when the visitors are not local but even local users will tend to spend more on a day out than they would if staying at home, and by creating local attractions this is kept within the local economy rather than being lost to another area or town.

Passengers on boats also spend money bankside, and others come “to see the boats” – this extra expenditure occurs because of the increased dwell time of visitors as a result of linked attractions. Whilst a visitor to the distillery might spend two hours on site, a visitor who arrives at the distillery by boat has linked this trip to time at the Marina and made a half day or even a full day of the visit.

Typically, a family or group drawn to the river will spend around £10 a head in addition to any expenditure on the boat fare. This revenue will go to outlets alongside the river assuming such outlets exist. From this perspective the landing at the Copper Works (see below) is particularly attractive as there will be outlets there that can benefit from extra expenditure.

These figures relate only to the use of the river as a result of encouraging commercial use through the provision of landing stages, a free standing project that is not dependent upon the delivery of the projects identified in reports 2a and 2b. There will be further uplifts if other forms of use are encouraged such as use by private or self-steer hire vessels and if navigation on the river is extended as described in reports 2a and 2b

Stakeholders

The following organisations or groups have an interest in the proposed improvements and enhanced use of the river:

- City of Swansea Council
- Marina Operator
- Fishing Fleet operators (the fleet is a collection of boats each in individual ownership)
- Boat Repair Yard operators
- Swansea Community Boat Trust
- Swansea Canal Society
- Welsh Government
- SBFlag Partners
- Natural Resources Wales
- CADW
- Friends of the Copperworks
- Duke of Beaufort/Somerset Estates
- Tawe Rowing Club
- Tawe Angling Club
- Other river users
- Local communities along the riverbank

Summary

There are at least three potential landing locations for passenger craft on the river: Liberty Stadium, Copper Works, and White Rock. There is probably potential for a fourth in the city centre on the river away from the marina. The city centre (marina or river) plus three outward stops give potential for a timetabled service and a variety of one-off excursion or charter trips – e.g. city centre to the stadium on match days.

The increased potential of the river with landing stages presents the opportunity for additional vessels of varying capacity and for different purposes, it also presents the opportunity for diversification and repurposing of existing businesses and river boats.

Part 2 - Swansea to Clydach

Navigation from Swansea Marina

Swansea Marina is intended to serve coastal yachting and boating. The Bristol Channel is a very popular area for yachts and motor boats and the scenery of the south Wales and North Devon Coasts coupled with the local harbours and ports that readily accept visitors makes it a popular base for those both local and living some distance away. The Tawe is navigable to the sea from the Marina, and this is greatly facilitated by the lock and barrage which extend the times that navigation to the sea is possible

The river Tawe is also navigable from Swansea Marina to the confluence with the Fendrod, and probably navigable upstream of the Fendrod with the limit of navigation varying dependent upon the size and draft of the craft attempting passage. For the purpose of this study, navigation is only relevant between the marina and the Fendrod.

Part one looks at navigation between the Marina and the Liberty Stadium, this section of the report examines navigation to Clydach in the Swansea Valley, and Part 3 examines navigation to a new basin at Crymlyn on the Tennant Canal.

Copper Jack has navigated the river upstream from Swansea Marina for some years but does not make land. No other large craft regularly navigate this section and navigation is not encouraged. Small craft such as canoes are used throughout the length. Once the Swansea Canal is restored and the Fendrod made navigable, then inland craft will regularly make passage between the Fendrod and Swansea city centre.

The length between Swansea barrage and the Fendrod is semi tidal and thus some fluctuation in level occurs on an almost daily basis (neap tides do not come over the barrage but mid-to-spring tides do) and the river is also subject to increased flow and raised river levels after heavy rain. It is however well within the capabilities of inland navigators, comparable with, say, the Bristol Avon between Netham and Keynsham, or the Severn between Gloucester and Tewkesbury.

The Fendrod Link

The navigation between The Tawe and Clydach is formed by two distinct navigation sections. From the Tawe to the M4 the navigation is largely in the canalised Nant-y-Fendrod, from the M4 north the navigation is an entirely new canal.

The Swansea Canal carried boats similar in size to English narrow boats, and at present works related to the Swansea Canal are proposed to accommodate slightly these slightly oversized narrow boats. The standard canal boat of the English Midlands is 72 feet long by 7 feet wide (22m by 2.1m). The Swansea Canal locks were slightly wider than this and the Neath/Tennant canal locks were wider and shorter, and so the proposal is to accommodate boats up to 9 feet wide and 72 feet long on the new waterways connecting the two canals (2.7m by 22m).

Copper Jack is designed for river use and is 15 feet (4.6m) wide, which has major advantages in terms of passenger operation. The river has no restrictions to such a large vessel but clearly but could not proceed up the Swansea Canal above Clydach as locks and structures are too narrow. However as the Fendrod works have not yet been constructed they could be built to allow passage of boats such as Copper Jack, the original concept was to connect the canals to Swansea, however when this concept is turned around, connecting Swansea to Clydach, it makes sense to allow river craft on the canal.

The critical dimension is beam of craft – the reason for allowing river vessels onto the link is for commercial passenger craft to benefit, although some private pleasure boats based in Swansea may also choose to make the journey. These vessels need not be any higher above the water than an ordinary canal boat, indeed Copper Jack is basically a narrow boat with an increased beam.

The Fenrdod

The Fendrod is an unnavigable watercourse that has a confluence with the Tawe opposite Beaufort Road. The Fendrod (full name Nant-y-Fendrod) proceeds on a roughly north easterly course to the Enterprise Lake. This watercourse, and the Fendrod beyond towards the M4, is proposed to be canalised as part of a link between the Tawe and the Swansea Canal at Clydach. The Fendrod would have four locks on its 1.5km length and would feature four bridges, all of them culverts carrying the Fendrod under existing roads and all would need enlarging for the passage of canal craft. As the critical factor for the passage of larger vessels is width rather than height above water these bridges are made only marginally more expensive by increasing the gauge of boats.

M4 to Clydach

This length will be a new artificial canal, passing under the M4 in the existing opening for the river Tawe and Garth Road. This canal will feature 7 locks, one bridge, five lift bridges and one large aqueduct. The aqueduct is necessary because the new canal is on the east bank of the Tawe whereas at Clydach the existing Swansea Canal is on the west bank. Ideally a corridor on the west bank of the Tawe would have been found, or the original line reinstated, but modern development precludes this. It is intended that the aqueduct will be of similar design to the modern aqueduct carrying the Neath Canal over the River Neath at Ynysbwlllog.

The works from the Tawe to Clydach are summarised below

Item	Number/distance/note
Canalisation of Nant-y-Fendrod	1450m of channel
New Canal Fendrod to Clydach	1850m of channel
Locks	11
Bridges	5
Lift Bridges	5 (one electrified, four manual)
Aqueduct	1

Of the five bridges, one is a new tunnel under the A4067, the others are enlargements of existing culverts on the Nant-Y-Fendrod. Four of the lift bridges are for accommodation purposes, the fifth carries Garth Road over the canal.

In 2002 these works were estimated at £18 million pounds, a straightforward inflation factor would indicate a 2020 cost of approximately £30 million.

Part 3 - Port Tennant Link

Navigation from Swansea Marina

Swansea Marina is intended to serve coastal yachting and boating. The Bristol Channel is a very popular area for yachts and motor boats and the scenery of the south Wales and North Devon Coasts coupled with the local harbours and ports that readily accept visitors makes it a popular base for those both local and living some distance away. The Tawe is navigable to the sea from the Marina, and this is greatly facilitated by the lock and barrage which extend the times that navigation to the sea is possible.

Tawe to Crymlyn

We have already examined the options to navigate north from the Marina. The Port Tennant Link is intended to allow navigation eastwards to the Tennant Canal. As with the Swansea Canal, The Tennant Canal was designed for relatively narrow inland boats, in this case approximately 9 feet beam by 64 feet length (roughly 3m by 20m) whilst the Tawe can carry vessels significantly larger.

The original plan from 1992 onwards has envisaged a link in two parts, from the Tawe to The Prince of Wales Dock, and then across the Dock to a new canal linking to a canal basin at Crymlyn. Since the original report the Tawe Barrage has been built and the ship lock into the Prince of Wales Dock has been closed thus the link is essential if inland craft are to make this voyage as the alternative is the massive ship lock serving the Kings Dock, the entrance to which is virtually at sea.

Report one in this series looks at navigation on the Tawe itself, report two looks at the Fendrod link to the Swansea Canal at Clydach, and this report examines the Port Tennant Link from the Tawe to a new canal basin at Crymlin.

There is also an aspiration to run large trip boats such as Copper Jack to the Tennant Canal at Crymlin. The proposed link between the Tawe and Prince of Wales Dock is already intended to be large enough for Copper Jack. The link from the Prince of Wales Dock to The Tennant Canal is proposed to cross unused industrial land – the 2002 report marks a route that passes along landscaping adjacent to an internal road within the docks system – this landscaping strip is typically 20 metres wide. This is not the most direct route, but it does have the advantage that it is basically unobstructed and is likely to remain so and is remarkably close to the historic route for much of the length.

More direct routes could be achieved by

- Making full use of the length of the Prince of Wales Dock

- Routing navigation through the Kings Dock, the eastern end of which is considerably closer the Tennant Canal

Both these routes are capable of navigation by inland boats, but the Prince of Wales route is currently obstructed by dockside premises, and the Kings Dock is an operational dock where transiting canal boats would be regarded as a nuisance and a hazard.

The proposed route exits the Prince of Wales Dock via a flood lock of flood gates – the level in the dock varies and there will be a need to protect the canal from either flooding or draining. The canal continues at the same water level as the dock, following in the most part a landscaped strip some 20m wide until passing under the railway line into the docks and then under Fabian Way. Once under these the route will then lock up to the level of the Tennant Canal.

It is noted that the railways into the docks are not currently used and they may be abandoned, if this is the case then not only would the railway bridges be unnecessary, but it may be possible for the canal to go under Fabian way using the railway bridge. This option has not been examined but is noted for future consideration.

The works from the Tawe to Clydach are summarised below

Item	Number/distance/note
New Canal Prince of Wales to Crymlyn	2100m of channel
Locks	1
Flood gates/locks	1
Bridges	2

The lock is proposed between the Tennant Canal and Fabian Way, and would have a fall of approximately 2m. Detailed surveys may allow the lock to be relocated or dictate that the fall should be split between two locations.

The two bridges are substantial structures under Fabian Way and the railway into the Docks – however the railway south of Fabian Way appears to be disused and this bridge may no longer be required.

In 2002 these works were estimated at £4 million; a straightforward inflation factor would indicate a 2020 cost of approximately £6 million.

The channel width was determined in 2002 to be the minimum channel in which two narrowboats could pass. However the channel would be at the Prince of Wales Dock water level for much of its length and thus the water level would be some 2-3m below ground level between concrete walls, a navigable link but hardly an attractive one.

The landscape strip is some 20m wide, aside from widening the channel itself there are various measures that could be taken to increase the aesthetic appeal of the new canal. These include

- Using the full width of the landscape strip to provide sloping, landscaped sides to the canal
Or
- Using locks at each end to lift the water level to ground level, with pumps to maintain the water level

We have looked at costs based on a wider waterway in a landscaped channel. There would be some savings in construction costs if the channel were also raised but these would offset by the cost of two extra locks.

Benefits

The proposals see three distinct elements of an integrated scheme to extend the use and navigable length of the River Tawe, these are:

- pontoons that will encourage waterborne commercial passenger traffic on the river and may contribute to additional private leisure use of the river
- A canal extending navigation for river traffic to Clydach, where a basin and associated development will form a junction with the Swansea Canal
- A canal extending navigation for river traffic to a new basin at Crymlyn, where there will be a junction with the Tennant Canal.

At Clydach and Crymlyn further navigation is dependent upon restoration of those canals, and if navigation is possible these canals will be a smaller scale than the navigation leading to them – however the prospect of through navigation to Pontardawe and Neath for private leisure boats of less than 2.2m beam is a very real one.

The 2002 Atkin study examined two schemes – the full integrated waterway from Glyn Neath to Ynysmeudwy via Neath and Swansea, and a partial scheme that ran from Glyn Neath to Swansea. The forecast economic benefits (adjusted for inflation) were £6.9 million and £2.4 million, respectively. Extension of the Tawe to Clydach and to Crymlyn creates a waterway comparable to the partial scheme of 2002 at a present-day cost of £36 million. A fairly rudimentary cost-benefit analysis indicates that benefits from construction (construction cost spent in the local economy) and ongoing benefits of £2.4 million per annum would yield a positive NPV 14 years after opening.

This finding takes no account of non-fiscal benefits nor of the value for supporting certain sectors of the economy. The proposed extensions would result in a new 10km long navigation suitable for large commercial passenger vessels and enable a boost to boat-related industries in Swansea providing an entire new sector to serve this market.

This 10km waterway would link Clydach to Crymlyn via Enterprise Lake, Liberty Stadium, The Copperworks, Swansea City Centre, and SA1. This would open up other opportunities for water-based tourism and in time the system could be extended to Neath, Aberdulais, Glyn Neath and Pontardawe.

Future development of navigation.

It would be remiss to conclude this report without mentioning the imminent decarbonisation of inland waterways. Whilst inland waterway traffic is only a very small percentage of CO2 emissions, and is arguably beneficial compared with the alternatives of either car based leisure or extensive foreign travel by plane, there is still a government led imperative for boats to cease use of fossil fuels. The target dates at present are:

- 2025 – all new boats to be capable of conversion to non-fossil fuel motive power
- 2035 – all new boats to be non-fossil fuel power
- 2050 – removal of grandfather rights from older boats – all boats to be non-fossil fuelled.

A new waterway market has a head start here in that decarbonisation can start now – the extensions to the system could be designed for and limited to non-fossil fuel vessels, whilst the new floating pontoons could be developed to assist a transition to electrical propulsion on the river.

Summary

The proposals each form part of a plan for a 10km leisure waterway centred on Swansea – the previous concept of these elements being links between historic waterways has, by accommodating larger commercial trip boats on the new canal links, been turned into freestanding waterway that can be extended along the historic canals beyond Clydach and Crymlyn, but has a purpose in it's own right.

Significant further work is needed to refine this proposal, and some of this will be included in further iterations of this report, but the potential of the Tawe and it's extensions has been demonstrated to be a worthwhile project of economic value to the city of Swansea. Restoration of the canals beyond will further add to that value.