STRATEGIC RAIL AUTHORITY

GIBB Transport Consulting
LAWGIBB Group Member

Island Line Replacement Review

Executive Summary

September 2001

LAWGIBB GROUP

1 Introduction

Remit

The SRA commissioned a review to advise on options to continue provision of passenger services on the existing Island Line route between Ryde Pier Head and Shanklin, beyond the existing Stagecoach franchise period which has now been extended to 27 September 2003. The brief required the scoping of two scenarios, 'heavy rail' and 'light rail', in terms of feasibility of options and the works and equipment investment required, with an assessment of the costs and scale of any passenger revenue benefits likely to arise from each option.

The main outputs required from this study include a strategic review of the existing infrastructure and rolling stock asset condition, the future peak capacity requirements, and potential infrastructure and rolling stock specifications and costs for both 'heavy rail' and 'light rail' scenarios, that would most effectively serve the potential demands for the Island Line existing corridor, including a high level feasibility and cost / benefit analysis comparison of 'heavy' versus 'light' rail options over 10, 20 & 30 year horizons.

The review aims to identify and assess potentially appropriate Development Options to facilitate development of passenger services along the existing Ryde – Shanklin route. Various resource levels and investment schemes for train services, rolling stock options: new electric stock, diesel stock, and light rail, compared with further LUL cascade, and infrastructure e.g. restoring a passing facility at Brading, were considered.

We have carried out a separate study, for the Isle of Wight Council, which considers options for route extension south of Shanklin to Ventnor, and via the IoW Steam Railway through Smallbrook to Newport and on to Cowes.

Description of the Island Line

The Island Line currently extends eight and a half route miles linking the holiday resorts of Shanklin, the southern terminus since 3rd rail electrification in 1966/67, Lake and Sandown, with a combined resident population of 30,000, through the village of Brading, and thence through open countryside, past Smallbrook Interchange (for the Isle of Wight Steam Railway), to the town of Ryde, also of approximately 30,000 population, terminating at Ryde Pier Head, the ferry terminal for Portsmouth nearly half a mile from dry land.

Background to the review

The two year extension of the existing franchise provides SRA and other stakeholders with the opportunity to identify and facilitate the best strategic way forward for Island Line. Various stakeholders have identified the need for investment, e.g. the next heavy overhauls will be due for the existing rolling stock in 2003/04, and have suggested scope for modernisation, conversion, and integration with other passenger services and extension of the system. Some advocate conversion to 'light rail' with the possibility of trams capable of street running. Others have urged for replacing the railway with bus or guided bus solutions. SRA have confirmed that such options involving closure of the railway are not on their agenda for the foreseeable future.

2 Review of existing railway

Market and Passenger Demand

The line is used primarily by a mix of commuters both within the Island, most importantly across to Portsmouth by ferry, and to a limited extent beyond to London; by residents for leisure journeys, and for holiday makers and day tourists for trips from the mainland, and thence within the Island on holiday.

A key feature of Island Line is its role as a contributory feeder to/from the mainland, primarily the main line to Waterloo. Nearly half of Island Line passengers travel via the ferry at Pier Head. Approximately half the Portsmouth-Ryde ferry passengers use Island line along the pier. Overall on Island Line passenger demand in July/August is over three times higher than that in January/February. The classic Saturday to Saturday holiday traffic using ferries via Ryde Pier Head during school summer holidays, after decades of slow decline, appears to have stabilised in recent years at over 10,000 passengers on peak Saturdays.

A period of Island Line passenger decline in the first half of the 1990's has been stabilised with evidence of modest traffic growth in recent years.

Train Service

To achieve the existing Passenger Service Requirement service level of two trains per hour, the service interval is currently skewed to 20/40 minute intervals each hour, rather than a regular 30 minute clockface headway, as a result of the constraints of existing rationalised single line infrastructure at the southern half of the line and provision by two diagrams in traffic.

Train services attempt to connect with every ferry at Pier Head. The constraints described above severely constrain the timing of trains to optimise connections with ferries and connections are too tight to be robust as ferry services can often run a little late, especially in the summer, due to conflicting traffic in the Harbour at Portsmouth, on the Solent, or adverse sea conditions.

On high summer Saturdays previous practise of operating a more frequent service together with a pier shuttle train to augment the Shanklin service had been discontinued for a number of years with reports of overcrowding at peak times when train connections are missed. A third Ryde Pier – Shanklin train per hour has run on peak summer Saturdays in 2001 with Wight Link funding.

Train service provision at two trains per hour throughout the year is similar in level to that during the winter for much of the last three decades. On summer Saturdays however this service level represents a significant reduction from past decades, driven by reductions in demand and in ferry operations.

Based on passenger counts carried out during the Saturday of the late August Bank Holiday Weekend 2001, and observations on Saturdays in June 2001, we have assessed that a train service incorporating 12 vehicles per hour of capacity would be required for existing demand levels.

Rolling Stock

The existing vehicles are former London Underground 1938 tube stock, brought over to the Island in 1989/90, converted to operate on the 3rd rail DC electrification system. This initial fleet of eight 2-car sets has been reduced marginally to leave seven 2-car sets on the Island of which one is out of commission and off-lease, having not been put through the most recent programme of heavy repair. Rolling stock is maintained at Ryde St Johns depot, including overhaul, with support from LUL's Acton Works who supply spares and recondition key components.

The present rolling stock appears to be quite acceptably reliable, and maintainable with the railway industry in its present form. The proposed fragmentation of LUL may reduce the part that LUL is able or willing to play in keeping the fleet running, or it might simply increase their prices.

Damage has been caused by flooding in autumn/winter 2000 to both rolling stock and depot equipment. This problem affected a wider area of residential and commercial property and although not usually as severe as last year, can occasionally present a problem, not only to the operability of the depot, but also of the railway through Ryde St Johns with running lines flooded.

The current rolling stock does suffer from rough riding and bogie component wear. This is considered to be due at least partly to permanent way condition.

Based on our experience and discussions with those currently responsible for maintenance of the fleet, and the LUL rolling stock engineer, we have established assumptions for this strategic evaluation concerning the cost and longevity of the existing fleet in operational service. Heavy repair will be required by 2004 and again in 2009. The cost of this heavy repair is likely to escalate on each occasion given the obsolete components involved. Our view is that it would be a reasonably robust assumption that the existing fleet can be kept operational until 2014, i.e. for two further heavy overhauls. Beyond then it is unlikely that component support for further heavy repair would be available. In any event subject to the timing of availability of more ex LUL rolling stock, cascade replacement is likely to become the economic solution assuming that vehicles can be purchased at little more than scrap value.

Infrastructure

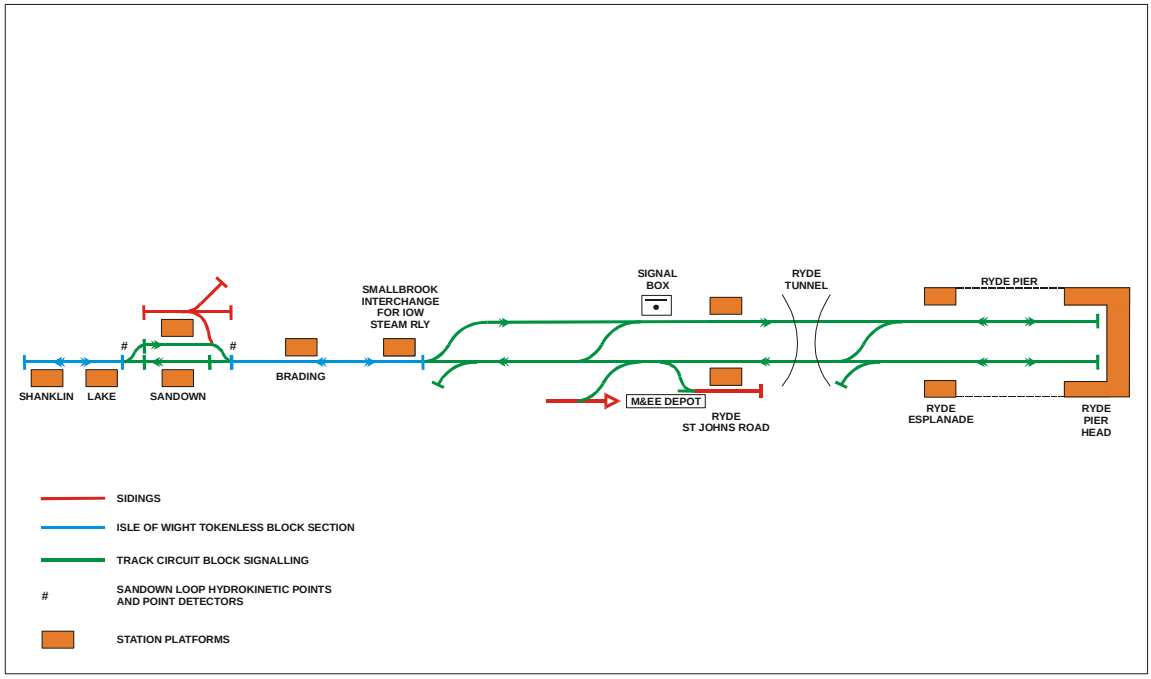
Overview

The existing infrastructure has been rationalised since the introduction of electric traction in 1967 and now allows a 20-minute regular interval service between Ryde Pier Head and Shanklin, a distance of 8.4 miles. The maximum line speed is 45 mph and existing Class 485 rolling stock has a vehicle weight of 27.5t and a gross weight of 31.5t. Based on the existing service, the Track Category is 5 and the Route Availability is 1.

The southern half of the Island Line was rationalised and resignalled approximately 10 years ago with Brading and Sandown signal boxes closed, track singling through Brading to Sandown, and with double track retained at Sandown station as a passing loop with hydrokinetic points. The single line section between Smallbrook and Sandown is not track circuited but is signalled by IOW tokenless block. The section south of Sandown is similarly tokenless and operated on a one train in section basis. After rationalisation up to three trains per hour (20 minute headway) can be accommodated on this southern section.

The section of the line north of Smallbrook is double track unidirectionally signalled with track circuit block to a crossover north of Ryde Tunnel just south of Ryde Esplanade station. From this trailing crossover south of Esplanade station to the Pier Head the route is signalled as two bi-directional lines, one line is only configured for a 'pier shuttle' train, latterly only required on high summer Saturdays, and is currently not used.

The infrastructure on the island is leased to the operator, a situation unique on the British railway network. A 25 year lease between the landlord, Railtrack plc, and the lessee, Island Line Limited, governs the responsibilities for maintenance and renewal of the infrastructure since 1994. Island Line is responsible for the maintenance of the infrastructure generally e.g. track, signalling, electrification equipment and buildings, however Railtrack is responsible for the maintenance of structures, earthworks and the formation below 450mm from the underside of the sleepers. Railtrack is responsible for renewals except permanent way and the non-structural elements of stations.



Permanent Way

Two thirds of the 10.4 track miles of permanent way are flat bottom rail and the remainder of bullhead rail. There are ten switch and crossing units on the running lines together with two sets of traps. All the units are bullhead with the exception of a set of traps. The track is laid generally on shingle ballast although recent maintenance has used imported limestone ballast. No significant track renewals appear to have been undertaken over the last six years, although rail on the Pier has been replaced this year following identification of excessive chair gall. Generally track condition is typical of minor lines and the existing policy of piecemeal renewal can continue to meet the requirements of the existing service indefinitely, subject to the continuing availability of materials, particularly bullhead switch & crossing components.

Structures

The structures comprise Ryde tunnel, Ryde pier, Esplanade station structure, 8 underbridges, 9 overbridges, 7 side of line bridges, 6 footbridges, 3 subways, and 3 culverts. Ryde Pier according to Railtrack is currently assessed to be in sound condition (RA 10). Ryde Esplanade station supporting structure was examined during 1999 and expenditure on the substructure is planned within the next three years. Subject to normal maintenance e.g. painting and re-pointing, it is unlikely that the major structures will need to be reconstructed during the next thirty years, however it is probable that it will be necessary to replace the superstructures of three cattle creeps over this period. With regard to the overbridges, although some repair works are evident to the arches, it is probable that all of them can continue to be maintained in the long term. However, the intermediate supports to the concrete bridges in the Ryde area could require significant road vehicle derailment protection works. Rowborough Road Bridge suffers from regular road vehicle collision damage to its parapets due to poor road alignment on the approaches and works will be required to strengthen the parapets. The footbridges at Ryde St. Johns and Brading have been reconstructed recently, and two further footbridges will probably need to be reconstructed during the next thirty years.

Earthworks

There are two locations where cuttings and embankments present problems. At Rowborough the embankment is unstable and has regularly been subject to temporary speed restrictions. Investigations to determine appropriate remedial measures are in hand to achieve stabilisation of the site. At Sandown there is an unstable cutting slope which Railtrack propose to regrade.

Signalling

Signalling maintenance is the responsibility of Island Line and renewal the responsibility of Railtrack. All the signalling is controlled from the signal box at Ryde St. Johns Road. The interlocking has had numerous major alterations during its life, principally at the time of electrification in 1966/67 and subsequently in association with schemes to abolish the other signal boxes and rationalise track layout. The Sandown interlocking has received only minor alterations since installation in 1986. Recent work has included a major service of the mechanical locking and in 1999/2000 the replacement of outdoor equipment in the Ryde area and the installation of a new 48-core cable in trough between Ryde Esplanade and Sandown. An Automatic Train Protection substitute has been provided on the line by modifying and reactivating the LT trainstop equipment fitted to the trains and providing the necessary lineside equipment interlocked with the existing signalling.

A Railtrack review in 1997 reported that the mechanical locking frame had received recently a 10 yearly service and the electrical locking was also in good condition and being regularly serviced. At that time there were no known problems with spare parts for the lever frame, locking tray and electrical controllers for the foreseeable future. During 1999/2000, outdoor equipment in the Ryde area was replaced and a new 48-core cable was installed in trough between Ryde Esplanade and Sandown. A recent Inspection Report for Stagecoach Island Line describes the signalling equipment as being in a generally good condition and well maintained. However, wire degradation has been reported in location cupboards and is being managed currently by spot replacement of individual wires. In a similar manner the deterioration of the location boxes is being managed by spot repairs. A number of issues have been identified in earlier reports which suggest that investment will be required

to replace equipment that is becoming life expired including the 27 core cable, wiring in location boxes, and relays, and on the structure of Ryde Relay Room.

Telecoms

Railtrack undertook a survey of the communications systems in 1995 to consider their condition and anticipated life. The customer information and public address systems at Ryde Pier Head and Esplanade were installed in 1991 with a ten-year life subject to maintenance in the aggressive environment. The signal post telephone system and communications power supplies were installed in 1992 again with an estimated ten-year life. Other equipment is of a minor nature and can be replaced on an as-required basis.

Electrification

The Isle of Wight system is electrified on the third rail 630v dc system and the supply equipment, which was originally installed in 1967, is considered to be unique on the network. The power supply system comprises three substations located at Ryde, Rowborough and Sandown fed directly from a 33kV supply through fault thrower switches and associated auto isolators. Each substation has a 630 volt traction rectifier and transformer unit connected to a dc switchboard of medium speed circuit breakers. The system is controlled from Eastleigh electrical control room. In general, Island Line is responsible for maintenance and Railtrack for renewal of the electrification equipment.

An overview of the condition and future investment requirements of the electrification equipment has been obtained from a condition audit undertaken for Railtrack, together with a recent audit of equipment for Stagecoach Island Line. The outdoor equipment includes the conductor rail, insulating pots, connecting cables, hookswitches, bonds and negative reinforcement. Reports identify routine maintenance items and do not identify any requirement for major investment in the foreseeable future. This is reasonable given the nature of the equipment.

The original audit of the substations recorded a number of defects that were assumed to be due to the lack of planned maintenance although major remedial works appeared to have been carried out to a high standard. Railtrack's Table of Projected Maintenance and Renewal Expenditure included in the lease provisionally allowed for renewal expenditure on certain dc switchgear and transformer/rectifiers by 2004. Recent reports confirm that regular inspections are being undertaken and do not identify any imminent major renewal works.

Buildings

Although no details of the existing condition of the buildings are available, Railtrack anticipated expenditure on Ryde Esplanade and St. John's stations by 2011. As discussed above, a recent inspection has confirmed the requirement for extensive remedial works to the supporting structure at Esplanade station. A proposal for a new transport interchange terminal at the Ryde Esplanade would replace the existing main station building. The development of this scheme is at an early stage but is being developed by IOW Council with implementation by 2004/5. It is assumed that the scheme would be entirely local authority / external grant funded and that no significant provision should be assumed to be made by Railtrack for this scheme. In addition, a scheme has been identified for Park and Ride facilities at Ryde St John's station.

Summary

Railtrack summarised the future anticipated works in the lease document based on continuing like-for-like renewal of the existing assets in modern equivalent form. Expenditure by Railtrack appears to broadly follow the predicted average although not necessarily on the predicted items. Examination of the various reports and subsequent discussions with Island Line, their consultants and Railtrack have confirmed that this is a reasonable strategy based on the status and utilisation of the line. However, development of our own Base Case suggests that track renewals expenditure on the present basis will be insufficient to maintain a steady state throughout the whole duration of the lease from Railtrack. Therefore there is concern that this approach, combined with fragmentation of responsibilities defined in the Lease, could lead to short term solutions to maintenance and renewal expenditure potentially detrimental to infrastructure condition in the long term.

3 Stakeholder Consultation

Stagecoach Island Line Management

The Stagecoach management team and Island Line staff have been most helpful in providing GIBB every assistance for this study including several meetings, access to information, site visits and access to their engineering consultants in the course of the study. Stagecoach believe that the opportunity should now be grasped to decide between various strategic choices for the future form of Island Line now, in time before the next large spend on heavy repairs for the existing rolling stock has to be triggered.

Stagecoach have had to encourage Railtrack to invest in asset renewals to meet the level set down in the lease e.g. the recent signalling renewals in the Ryde area, and consider that the level of spend as set out in the lease is about right to sustain renewals of Railtrack assets. However Stagecoach confirm that there have been no significant track renewals since privatisation. They explained that there is little incentive for the TOC with a short term franchise to do much more than ensure that the existing track is maintained in safe condition rather than develop a programme of long term 'steady state' track renewals when such assets have a 60 year life. Stagecoach have pointed out however that the ride quality is considered to be having some adverse impact on the rolling stock and passenger perception.

Views have been expressed that the best solutions may not be achieved by the short term renewal of the passenger franchise beyond the present extended term ending in 2003, i.e. simply another five years, but that relatively long franchise period may be appropriate to facilitate investment. While it is acknowledged that the railway could continue in its present form with renewals when necessary, investment solutions may involve light rail / tram technology.

Railtrack

Railtrack consider that there is no reason why the railway can not continue for the foreseeable future, taking account of the condition of the key assets and structures. They consider that the level of spend set out for them in the lease agreement is broadly right for the future.

Wightlink

Wightlink operate the passenger ferry services between Portsmouth Harbour and Ryde Pier Head. They enjoy close co-operation with Stagecoach both with Island Line and importantly with South West Trains.

Wightlink consider that the existing track infrastructure does not allow sufficient flexibility in timetabling to enable robust connections to be provided between train and ferry. Wightlink sailings are timed to connect with SWT key London arrivals and departures and this, together with the current Island Line 20 / 40 minute irregular service interval pattern, means that every other connection is very tight (3 to 4 minutes). Even when running on time the elderly, infirm and those with heavy luggage can struggle. Wightlink believe that connection margins should allow in the region of at least ten minutes for interchange.

Wightlink would like to see at least a third service per hour throughout to Shanklin at peak bank holiday weekends and throughout the summer months. This would 'do away with the sardine can experience customers must currently put up with on peak dates'.

Rail Passengers' Committee

The RPC for Southern England have produced notes of the presentation material and subsequent discussions at a public conference they held in Ryde on 28 February 2001 to debate the future of the Island Line. This together with a discussion with the RPC chair has provided useful input to this study.

Isle of Wight Council

Discussions have been held with IOW Council officers and Councillors. In addition to urging for retention and development of the existing Island Line, the IOW Council have commissioned GIBB to carry out further work alongside this study to examine the feasibility and economics of route extension.

Other Stakeholders

The IOW Council arranged an opportunity for GIBB to meet with various user and interest groups, which augmented the record of their input at the RPC Conference. These bodies included:

- Wight Track
- IOW Transport 2000
- Ventnor Railway Association
- Isle of Wight Tramway

The potential benefits that light rail might bring and the essential requirement to retain Island Line were discussed.

4 Selection of strategic options

Strategic choices identified

Options have been developed comprising compatible combinations of choice:

Train service choices

Enhancements examined include additional trains on peak dates, 30 minute regular interval services, journey time improvements, frequency enhancements to 3 and 4 trains per hour, both on the pier and to Shanklin, and service extension into Shanklin town centre.

Traction and Rolling stock choices

Retention of the present 1938 Tube stock is compared with replacing with more recent 1983 or 1972 ex-LUL Tube stock, new build tube gauge vehicles, and new light rail vehicles. Traction options for new build examined include 3rd rail DC, overhead DC, dual pick-up electric, diesel and 3rd rail DC/diesel.

Operational Staffing choices

Retention of conductor/guards is compared with investment in driver only operation with passenger ticket machines at stations. Revenue protection would be carried out by retail staff and could be achieved by enhancing the manning at stations or on trains, or a combination of the two. The existing train delays sometimes experienced at stations due to the conductor completing a retail transaction on the train prior to door release and/or train dispatch could then be avoided. The economics of train service frequency enhancement are significantly improved with DOO and this is explored in the strategic option evaluation.

Infrastructure choices

The infrastructure choices address the following areas of choice:

- line speed
- track and signalling capacity
- route and station choices
- traction choices will potentially trigger electrification infrastructure works and depot modifications

Options have tested enhancement of line speed from 45 to 55 mph, the addition of a passing loop at Brading, rationalisation at Sandown and Smallbrook- St John's Road. Conversion to light rail, de-electrification or conversion to overhead line equipment and street running loop to Shanklin town centre.

The primary choice with respect to track capacity is mix and location of double and single track sections and any passing loops on the route. Half hourly (or 15 minute frequency) requires trains to cross just north of Brading, or with line speed improvements at Brading station.

Any significant track and signalling alterations are assumed to require bringing forward signalling interlocking, frame and panel replacement from 2011.

Selection of options for review evaluation

From the significant number of available choices from the above key parameters we have identified the following strategic options comprising compatible combinations of infrastructure, rolling stock, new stations and train service specification.

These have been developed for the purposes of this report, to assist in the examination of the likely transport case for the route reopening.

- ***A options: Base Case – no infrastructure changes***

  A1. Do Minimum. Retain existing rolling stock until 2014, replace with cascaded ex LUL tube stock. Retain existing train service on existing infrastructure. Renewals when necessary.

  A2 Replace rolling stock in 2004 with cascaded ex LUL vehicles. Retain existing train service on existing infrastructure. Renewals when necessary.

  A3 Replacement cascaded ex LUL vehicles in 2004. Enhanced service: Regular half hourly to Shanklin and two pier shuttle trains per hour.

- ***B options: 'Heavy rail' investment – retain 3rd rail***

  B1 Replacement cascaded ex LUL vehicles with enhanced train service as in Option A3 in 2004. Invest in conversion to Driver Only Operation.

  B2 Invest in track upgrade to improve journey times and enable 10 minute metro style frequency on Ryde pier, incorporating a regular half hourly service to Shanklin. Otherwise as Option B1 with cascaded ex LUL replacement stock in 2004 and DOO.

  B3 Invest in track upgrade and provision of Brading loop with DOO and cascaded ex LUL stock in 2004. Introduce clockface half hourly service and operate additional trains on peak summer Saturdays.

  B4 Invest in track upgrade, Brading loop, DOO, cascaded LUL replacement stock in 2004 and introduce a 15 minute clockface frequency timetable between Ryde Pier Head and Shanklin. No pier shuttle trains. Train would be 2 car with some four car operation on some summer Saturday trains. Overall vehicle mileage would be similar to the existing situation.

- ***C options: 'Light rail' investment – DC electric***

  C1. Dual pick-up DC electric new light rail vehicles in 2004. Retaining 3rd rail Ryde- Shanklin and electrification with overhead line equipment on an extension to Shanklin town centre. Otherwise as Option B3.

  C2 Convert entire line to OHLE electrification with Shanklin town centre extension in 2004. New overhead pick up light rail vehicles. Otherwise as Option B3.

- ***D options: De-electrify – diesel light rail***

  D1. New diesel light rail vehicles in 2004. De-electrify. Otherwise as B3.

  D2 New diesel vehicles in 2004 as Option D1, with the addition of the Shanklin town centre extension. Otherwise as Option B3

Table 1 : Indicative incremental initial outlays for options evaluated

Incremental initial outlays above that required in the existing Base Case are shown below to the nearest million pounds at current 2001 price levels.

Option	Incremental outlays at 2001 prices above Option A1 existing base case
A2	-
A3	-
B1	£1m
B2	£5m
B3	£6m
B4	£6m
C1	£11m
C2	£27m
D1	£9m
D2	£11m

5 Financial and Economic Evaluation

An outline financial and economic appraisal of the strategic options outlined above has been carried out including the Base Case. This includes the results from the following tasks:

- Assessment of rolling stock requirement and indicative outlays
- Assessment of infrastructure requirements and indicative outlay estimation (prepared to Railtrack level 2 status)
- Estimation of annual operating and maintenance costs including rolling stock vehicle maintenance: traction energy / fuel,train crew; and infrastructure maintenance.
- Estimation of annual passenger demand and revenue effects. Passenger demand and revenue assessment are based on a review of existing and historic CAPRI revenue results together with results from our own demand spreadsheet model built specifically for this study. This model is in effect an Isle of Wight MOIRA model using Passenger Demand forecasting Handbook recommended assumptions. The model incorporates ferry timings and takes account of delays to the ferry service (averaging 5 minutes delay). UK Rail incremental earnings associated with Island Line travel are included as economic benefits. As this incremental demand is mostly off-peak and small compared with total travel on these mainline routes, we assume that it can be carried at no additional cost to mainline operators.Island Line revenue gain is also shown and is used for the financial evaluation.
- Estimation of economic benefits to rail users and road users. The UK Economic value of each option comprises the incremental rail revenue to all operators plus unpriced benefits and costs incurred on the Isle of Wight. This approach is based on our assessment that the incremental demand (which is largely off peak) can be carried at no additional cost to mainline operators and that there are negligible unpriced impacts on the mainland (where most of the passengers new to the Island Line would have the same travel options as previously). The basis for our conclusions is a maximisation of this economic NPV which provides the best value for money in situations where available subsidy is not constrained. We note SRA use a variety of evaluation measures in their decision making which include both quantified and unquantified factors (such as those representing integration and accessibility). Additional measures including, for example, Benefit/Cost ratio and NPV/ Subsidy are used to enable benchmarking taking into account limits placed on the total subsidy available. Economic benefits are increased at a rate of 2.25% - in line with forecast GDP growth.
- Calculation of Present Values and economic performance measures. A 30 year life and 6% discount rate is assumed for the economic evaluation.

We have assumed no underlying growth in demand. Our basis for this assumption is an analysis of CAPRI revenue data, looking at intra-Island and to/from Mainland flows, and ferry passenger data. While there is some evidence of demand following the economic cycle the underlying trend is static in each case in our view. An assumption of passenger growth would strengthen the case for rail service enhancements at the level we recommend.

The scale of incremental investment to achieve enhancements that may be justified will depend upon the criteria (i.e. commercial, UK rail financial or wider economic criteria), and project life assumed (10, 20 or 30 year evaluation). The principal results suggest:

- replacing the rolling stock with more modern cascaded tube stock in 2004 with investment in vehicle refurbishment and in Driver Only Operation appears justified from either a commercial or economic perspective, even with just a 10 year time horizon (Option A2 plus DOO);

- Survey and analysis of peak traffic volumes indicates a requirement for 12 vehicles diagrammed in traffic. This implies a fleet size of either 7 two-car units or 5 three-car units. The former would be preferable in terms of flexibility to match loadings, however the latter may prove more cost effective as fewer modifications to ex-LUL stock would be required as they are already three-car units. Detailed cost evaluation of these alternatives will be informed once purchase and conversion costs of replacement LUL vehicles are established.

- Service enhancement to provide four trains per hour on the Pier incorporating an even 30 minute interval Shanklin service appears justified within this 10 year horizon in the economic evaluation albeit commercially unprofitable. This enhancement would appear to become financially worthwhile from a UK rail financial perspective within 20 years (option B1);

- Further enhancement to deliver four trains per hour (15 minute clockface interval) through to Shanklin, requiring track upgrading to improve journey times and a passing loop at Brading appears worthwhile over a 30 year economic evaluation (Option B4).

Alternative measures lend themselves more readily to comparison against benchmark values. Using either the Benefit/Cost ratio or the NPV/subsidy ratio, option B1 offers a much more substantial improvement over A2 (the optimised base) than the incremental improvement from B1 to B4. B2 performs less well than B4 in a comparison with B1 providing further support for its exclusion from our recommendations.

SRA Planning Criteria encompass, in addition, unquantified benefits. In our view option B4 performs significantly better than B1 regarding accessibility and integration, as the higher frequency service is required to provide robust Connections with Wightlinkferry services.

6 Conclusions

Overall Island Line demand has recovered since 1998 from a period of earlier decline. Island Line contributes to the Island economy by carrying 300,000 passengers per year through Ryde Pier Head of which 70% are travelling between ferry and the Shanklin / Lake / Sandown conurbation. On peak summer Saturdays an estimated 6,000 passengers per day are carried by Island Line on Ryde Pier.

Train services attempt to connect with every ferry at Pier Head. The infrastructure constraints severely constrain the timing of trains to optimise connections with ferries. The existing service is considered inadequate both in terms of providing reliable connections, as connections are missed whenever a ferry is slightly delayed and in terms of capacity on peak dates causing crowding and congestion problems.

The present rolling stock appears to be quite acceptably reliable, and maintainable, although the passenger environment is perceived as a weakness, in particular in terms of in vehicle noise and ride quality. Heavy overhaul is anticipated to escalate in cost in future given the obsolete components involved. Our view is that the existing fleet can probably be kept operational until approximately 2014 if necessary.

As far as the infrastructure is concerned, expenditure by Railtrack is anticipated to broadly follow the predicted average spend assumed in the lease. We consider this to be a realistic strategy. Our assessment of track renewals, however, suggests that a continuation of the existing approach will lead to a significant backlog of work and is not sustainable in the medium to long term. This activity is currently not covered by Railtrack's responsibilities in the lease and falls to the TOC. The TOC continues to maintain a safe railway but takes an approach consistent with their relatively short period of tenure. Having identified the need to add in track renewals investment, we have not identified any significant infrastructure issues that are likely to prevent long term continuation of the railway with this maintenance and renewal programme.

Priorities emerging from stakeholder consultation have informed the development of the strategic development options and include:

- enhancements to infrastructure to enable flexibility in timetabling to establish robust connections with ferries and to remove the uneven 20/40 minute interval;
- enhanced service provision with sufficient capacity to avoid peak crowding;
- system modernisation, ideally capturing the benefits of rapid transit / light rail.

Recommendations

It is suggested that the SRA should give consideration to:

- establishing dialogue with LUL concerning the potential purchase of surplus 1983 or 1972 tube rolling stock, to resource 12 vehicles in traffic,

- the apparent shortfall in track renewal activity to achieve a 'steady state' future given the existing franchise and lease arrangements and obligations;

- how best to progress those potentially worthwhile service development and infrastructure enhancement options; and

- forthcoming findings from the IOW Council sponsored study into route extension.