Carno Station Action Group

CARNO TRANSPORT APPRAISAL

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CARNO TRANSPORT APPRAISAL

1. INTRODUCTION

The village of Carno has seen significant growth in recent years, driven not only by the increasing desire to live in an attractive rural area but also by the employment opportunities provided by the Laura Ashley factory in the village.

Since the closure of the Laura Ashley factory in 2005, local job opportunities have declined sharply, and the need for better access to jobs further afield has become painfully apparent.

The sparseness of existing public transport in the area means that the vast majority of existing journeys to local centres are made by car. However, the threat of climate change has led to the realisation that this needs to change, pointing up the desirability of public transport provision that is frequent enough and comfortable enough to be attractive to motorists, as well as to those without access to a car.

This report is an appraisal of the options available for developing an attractive public transport service for the village of Carno and its hinterland.

2. PROBLEMS AND OPPORTUNITIES

2.1 Problems

2.1.1 Travel to work

As noted in the introduction, Carno has suffered a large loss of local employment with the recent closure of the Laura Ashley factory, which employed 200 people. At the same time, over 50 new houses have been built in the last few years and another 50+ are planned, further exacerbating the mismatch between population and local employment. As a result, growing numbers of Carno residents face the need to travel away from the area to work. Although some can find suitable employment in the nearest town of Newtown, the job opportunities available would be expanded considerably if better transport links existed to centres further afield, such as Welshpool, Aberystwyth, Shrewsbury and Telford.

The existing bus service consists of six buses each way per day between Newtown and Machynlleth. These make it theoretically possible for some people to commute to Newtown by bus, but few choose to do so, presumably because the bus times are tailored to the needs of Coleg Powys students rather than those of shop, office or factory workers. Commuting to destinations beyond Newtown is not attractive because of poor bus or train connections.

As far as travel in the opposite direction is concerned, the first bus to Machynlleth leaves too late (at 9.45 am) to be of use for commuting. As a result, it is not possible to commute even to the major centre of Aberystwyth by public transport

2.1.2 Other outward travel

Travel to destinations other than Newtown and Machynlleth by public transport is awkward, because of poor connections with trains and other bus services at Caersws and Newtown. Moreover the buses do not actually go to either railway station.

Those with access to a car have the option of driving to Caersws station to access the train. However, Caersws station car park often becomes full in the day time, facing prospective passengers with the risk of having to find an alternative place to park at the last minute and potentially missing their train. Moreover, people are reluctant to leave their cars at the car park overnight because of fears of vandalism. These fears are not groundless, as incidents of low-level vandalism in the car park occasionally do occur.

Travel to Newtown or Machynlleth by bus for evening entertainment is not possible, because the bus service ceases early in the evening.

2.1.3 <u>Access to Carno by visitors</u>

The range of visitors that can be attracted by tourist enterprises in Carno is restricted by the limited public transport available - in particular the lack of through services from England. This consideration is particularly important for nascent Green Tourism businesses, which would benefit if they could compete with other locations in Wales offering sustainable holidays not dependent on the motor car.

Carno Community Centre is a popular venue for All-Wales conferences, because of its central location, but is very difficult to reach by public transport. Wales would clearly benefit if this geographically well located conference venue was served by fast public transport links.

2.2 Opportunities

Carno is located on the Cambrian main railway line, which is served by a two-hourly service of semi-fast trains between Aberystwyth and Shrewsbury. Carno is on the section between Caersws and Machynlleth, which, at 22 miles, is the longest stretch of railway line without an intermediate station in Wales, so the line currently passes through a large swathe of Mid Wales without directly benefiting it. The opportunity therefore exists to re-open the station and dramatically improve Carno's connectivity, without the need to introduce any new train or bus service. Llanbrynmair would also benefit significantly, as the distance from the village to the nearest railway station would be halved.

The main road linking Carno and Caersws, the A470, is relatively uncongested, so an alternative strategy for improving Carno transport links would be to introduce a dedicated shuttle bus service between the village and Caersws station, connecting with the trains. Unfortunately, rearrangement of the timetable of the existing Machynlleth-Newtown service could only provide limited connections, given the current train service pattern.

3 TRANSPORT PLANNING OBJECTIVES

The limitations of the existing public transport serving Carno explored in Section 2.1 lead naturally to the Transport Planning Objectives, as set out below.

The priority is to expand the job opportunities available to residents in Carno and its hinterland, and the simplest way of achieving this is to enable people to travel beyond the nearest local centres of Newtown and Machynlleth for work. This is consistent with the Wales Spatial Plan, which calls for regions to be planned "around strong integrated transport systems that meet more people's needs for commuting to work" (page 27, penultimate paragraph).

In view of the Welsh Assembly Government's legal duty to promote sustainable development, this travel should be by a more rather than less sustainable form of transport, particularly as the distances involved are large.

Thus the first TPO is:

1. Enable non car-owners to access jobs in Welshpool and the regional centres of Aberystwyth, Shrewsbury, Telford and Birmingham.

and, in the context of the Wales Spatial Plan objective of "achieving sustainable communities", the second TPO is:

2. Enable car owners to access jobs in these same locations without the need to drive.

In view of the likely new housing development on the former Laura Ashley factory site, amounting to over 50 new houses, these TPO's also dovetail well with the Wales Spatial Plan's call for the location of "new development, especially significant new housing development, in places that are highly accessible by public transport, so that more people have the choice to go by means other than the car."

The need to travel encompasses a wide range of purposes beyond employment – access to education, shops, hospitals, leisure facilities and to friends & relatives all have to be considered too. The Wales Spatial Plan (page 30, 6th bullet point) recognises this in calling for "improved links between settlements, their hinterlands, and with regional centres in sparsely populated areas to provide access to employment, shops and services appropriate to the need of the local population".

Although the majority of such journeys are currently made by car, the drive towards sustainability requires that increasing proportions of journeys are made by public transport. This leads to the third and fourth TPO's, as follows:

3. Increase the proportion of journeys from Carno to Newtown and Machynlleth made by public transport to 25%.
4. Increase the proportion of longer distance journeys from Carno made by public transport to 50%.

One sector of the population that is particularly ill-served is the young. Young people have no options available to them for travelling to nearby towns for an evening out - other than begging lifts from their parents – because the local bus service ceases early in the evening. For the same reason adults without access to a car are unable to enjoy evening entertainment outside the village. Accordingly the fifth TPO is:

5. Enable young people and other non-car owners to access evening entertainment in nearby towns.

Finally, consideration must be given to those who want to come to Carno as visitors. Two groups would benefit particularly from improved transport links to Carno – Green tourists and conference delegates – and, in turn, these visitors would benefit Carno. Thus the last two TPO's are:

6. Enable people in the West Midlands and beyond to travel directly to Carno for Green holidays.
7. Enable Carno Community Centre to be accessed by public transport for All-Wales conferences.

4. IDENTIFICATION AND DESCRIPTION OF POSSIBLE SOLUTIONS

The Cambrian line between Shrewsbury and Aberystwyth, which is served by a relatively fast train service every two hours, passes through Carno. Trains used to stop at Carno station, which was situated at the West end of the village, until closure as part of the Beeching cuts in 1965, so one obvious solution would be to re-open the station so that trains could call once more. Although the obvious location for the new station is at the original site, an alternative option is to site it at the East end of the village, nearer the larger housing estates.

An alternative approach to capitalising on the benefits of the Cambrian line is to provide a bus service to Caersws Station connecting with the trains there. Two options are suggested:
- A dedicated minibus service (which could also serve Llanbrynmair) to provide connections into Eastbound trains in the morning and out of Westbound trains in the afternoon and evenings.
- Modification of the X85 Machynlleth-Newtown service to provide these same connections.

There would be little point in attempting to connect with trains to and from the West, as travelling to Caersws by road and back to Carno by rail would add too much to the journey time compared with the existing bus service direct to Machynlleth.

A further route to the improvement of Carno's transport links would be the establishment of a long distance coach service passing through Carno. As the railway already provides a good service in the East-West direction, any such coach service would be more likely to run North-South than East-West. Given that the additional destinations opened-up by such a service are likely to be too small or too distant to attract many Carno travellers and that the introduction of such a service would have to be justified at the strategic level, this option is not considered further here.

The four options identified above are now described in more detail.

4.1 Option 1: Reopen Carno railway station at original site

The original railway station consisted of a passing loop with two platforms, adjacent to the level crossing on the unclassified road to Llanfair Caereinion at the West end of the village. Following closure in 1965, the passing loop was removed, the Eastbound platform demolished and the line slewed about 3 metres away from the Westbound platform to improve the alignment. The original station building remains on the Westbound platform and has been in the ownership of Laura Ashley for many years. Most of the Westbound platform has been demolished, leaving only a 26 m length in situ. It is divided in half longitudinally by a new boundary fence demarcating railway ownership from the strip of platform now in the ownership of Laura Ashley.

It is evident from the above that a new platform could be built on the South (village) side of the railway line wholly on land already owned by the railway. Pedestrian access would be from the Llanfair Caereinion road. There would, however, be a need to purchase land for a car park. A portion of the extensive car-parking area owned by Laura Ashley on the West side of the Llanfair Caereinion road would be suitable if purchase could be negotiated.

4.1.1 <u>Technical and Operational Feasibility</u>

Network Rail has indicated in its written evidence to the NAW hearing (4.9.07) into the Carno Station Re-opening Petition that a new station would require derogations from standards relating to gradient and curvature set by Her Majesty's Railway Inspectorate. These standards are now set out in the Office of Rail Regulation publication "Railway Safety Principles and Guidance" (RSPG).

With respect to gradient, Network Rail points out that Carno is located on "a continuous steep gradient over 7 miles from Caersws", so that the siting of a station there "is not operationally indicated". However, Network Rail's gradient profile indicates that the track is level over 400 metres at the site of the former station itself, so a platform there would conform to para 23(b) of the RSPG Part 2 Section B "Guidance on stations" (paper version 1996, web version 2005), the first part of which states "Stations should be constructed with straight platforms and on the level or on a gradient not steeper than 1 in 500."

It is understood that Network Rail is concerned about the gradient that would be encountered by Westbound trains *after* leaving the station. They would initially face a gradient of 1 in 149 for about 600 metres, but the gradient then eases to a gentle 1 in 462 or less for the next 1300 metres. However, Network Rail's predecessor, Railtrack, agreed to the opening of a new station at Warwick Parkway on a 1 in 605 gradient at the beginning of the 2.5 mile long Hatton Bank, which has a steady gradient of 1 in 110.

With regard to curvature, the radius of curvature of the railway line through the former station site is about 1100 metres, so it is clear that a new station would require a derogation from para 23(b) of the RSPG Part 2 Section B "Guidance on stations", which states that platforms should be straight. However, paragraph 5.32 of the DfT/SRA document "New Stations: A guide for promoters" (2004) states that the horizontal alignment of track at a new station site "should be straight or not less than 1000 metres radius". This criterion would be met.

A separate technical consideration in relation to the opening of a station at this site is the effect it would have on the operation of the automatic half-barrier level-crossing. It is likely that a cost would be incurred

in altering the control settings to cater for Westbound trains stopping just before the level crossing. This will require investigation by Network Rail.

4.1.2 Platform length

Paragraph 24(a) of the RSPG "Guidance on stations" states that "Platforms should be as long as the longest train booked to call at the station", which mirrors the advice in paragraph 5.19 of "New Stations: A guide for promoters".

Currently the standard formation for trains on the Cambrian line is 4-carriages, as a result of the WAG decision to fund the leasing of extra units to ease overcrowding. The position after the introduction of the hourly train service is less clear – all trains may revert to 2-car length or (more likely) the existing trains would remain 4-car and the new trains would be 2-car.

On the latter assumption, the RSPG "Guidance on stations" would indicate a 4-car platform length unless only the new trains stopped at Carno, in which case a 2-car platform length would be adequate.

However, the Carno Station Action Group (CSAG) has questioned the wisdom of adhering to the RSPG "Guidance on stations" advice rigidly on less heavily-trafficked lines, bearing in mind that the foreword of the document states that it is "intended to give advice and not set an absolute standard".

CSAG have pointed to the example of Beauly Station, which was opened in 2002 with a platform only 10 metres long (excluding ramps) as indicating that the guidance on platform length need not be rigidly applied. At the NAW hearing (4.9.07) into the Carno Station Re-opening Petition, Network Rail acknowledged that the railway authorities had approved the short platform at Beauly, but only on the basis of an expected low usage – 15 passengers a day. In fact, the station has been very successful, with a daily usage of about 100 passengers, so that – according to the Network Rail representative - the short platform would have failed its risk assessment if the actual usage had been known.

The conclusion may therefore be drawn that, if the short platform had been ruled out because of a rigid interpretation of the RSPG safety guidance, the station cost estimate would have been much higher and Beauly would probably not have gained what, in the event, has proved to be a very successful (and safe) station. Thus, despite the positive outcome, Beauly station provides a warning of how the imposition of unnecessarily high standards could price worthwhile projects out of existence.

Given the uncertainty about the appropriate platform length, the cost estimates in the next section will be based on a range of platform lengths.

4.1.3 Station Cost

The best yardstick for the estimation of the cost of a new station is the cost of a recently opened station of similar size at a site with similar topography. The new station at Llanharan outside Cardiff has been selected for this purpose, as it was opened very recently (December 10th, 2007) and was constructed on the site of the original station. The two 4-car platforms are furnished with waiting shelters and connected with a DDA compliant footbridge. The total cost of £4.3 million also includes CCTV, real-time passenger information displays and car parking for 54-cars.

The single platform station at Carno would not require a DDA compliant footbridge, because the platform would be constructed on the side of the railway nearest to the village. A reasonable estimate of the cost of a station with a single 4-car platform and modest car parking provision can be obtained by subtracting the cost of the DDA compliant footbridge from the Llanharan station cost and dividing the result by two.

Report 513/05 to the Angus Council Infrastructure Services Committee (para 6.7) quotes estimated costs of three options for providing Mobility Impaired Access between platforms at Montrose station as follows:
   • Option 1 – new bridge link with access ramp £1,592,000

       • Option 2 – new subway with two passenger lifts £1,101,000
       • Option 3 – new footbridge with two passenger lifts £ 876,000

However, the report goes on to state:

> 6.8 Further, Network Rail have advised that these cost estimates are not full delivery prices and exclude project management costs and site investigation costs. In respect of Option 3 (the cheapest and recommended option) Network Rail draw comparisons with a similar project at Lockerbie Station where indicative emerging total costs are £1,250,000.

Based on this range of estimates, it is concluded that the cost of a DDA compliant footbridge is unlikely to be less than £1.0 m. This leads to a likely cost of a station with a single 4-car platform and car park of £1.7 m.

It is likely that the total cost of an unstaffed station with minimal station furniture will be dominated by the cost of the platform and other costs, such as platform fencing and lighting, that vary pro rata with the length of the platform. If it assumed that 80% of the cost elements of a 4-car platform station are in this category, then the cost of a 2-car platform station would be 3/5 the cost of a 4-car platform station – ie £1 m. Similarly the cost of a station with a 10 m platform would be 3/10 the cost of a 4-car platform station – ie £0.5 m.

There is likely to be an additional cost associated with adjusting the timing settings for the control of the automatic half-barrier level crossing, but it is expected to be small enough in relation to station construction costs to be ignored at this stage.

Network Rail is currently working to reduce the costs of new stations considerably. According to its Chief Executive, Ian Coucher, "we can produce a high quality, high tech station for about a million pounds. The first one is going into a station in south London, at Eastfields…" Eastfields station is to consist of two 8 car platforms with a connecting footbridge, implying a dramatic cost reduction compared with Llanharan.

Optimism bias

The HM Treasury Green Book requires an allowance for optimism bias to be made in cost estimates, recommending an upper bound increase of 44% for standard engineering projects. However, in view of the fact that the cost estimates above are based on recent out-turn costs on a similar project, and of Network Rail's announcement that a station much larger than Llanharan can be built for only £1.0 m, no optimism bias will be applied to the costs for Carno station estimated above from the Llanharan cost. A Carno station cost ranging from £0.5 m to £1.7 m will therefore be considered in the Economic Impacts section.

4.2 Option 2: Reopen Carno railway station at new site at East end of village

The village of Carno is a linear settlement about one mile long, with the old station at West end, the pub and the church at the East end and the shops midway between. The school and community centre and the main housing estates are nearer the East end. In view of this, an alternative site at the East end deserves consideration as well as the existing site.

The most suitable site for a station at the East end of the village would be immediately SE of the railway bridge over the Afon Garno – ie at Grid Reference 965965. Here a minor road from Carno roughly parallels the railway on the South side for 200 metres, and a car park could be constructed in part of the narrow field between road and railway. The railway runs beside the field on a 1.5 metre high embankment, so extended platform supports would be required. The station would be about 200 metres from the A470 along the minor road, and would require an access path across the field over the last 50 metres from the minor road.

4.2.1 <u>Technical and operational considerations</u>

The East site is near the point where the gradient in the Westbound direction stiffens from 1 in 171 to 1 in 128, so a station at this site would not have the benefit of level track as at the original station site. However, a station may be acceptable here nonetheless, as the second part of para 23(b) of the RSPG Part 2 Section B "Guidance on stations" states: "Minor stations, at which trains do not terminate or reverse, may be built on steeper gradients where suitable arrangements can be made to ensure safety, subject to the agreement of the Inspectorate."

The line radius of curvature at the East site is approximately 1500 m, so the curvature is less severe than at the original site. Nevertheless, it is clear that a new station would require a derogation from para 23(b) of the RSPG Part 2 Section B "Guidance on stations", which states that platforms should be straight. However, the minimum 1000 metre radius criterion of paragraph 5.32 of the DfT/SRA document "New Stations: A guide for promoters" (2004) would be met.

4.2.2 Station cost

The specification of the station itself at the East site would be the same as at the original site. The main additional costs at the East site would be those for land acquisition and construction for the access required from the minor road to the station. Set against these additional costs, there would be a small saving compared to a station at the original site, because no adjustment to level crossing control settings would be required. As the costs of providing station access are likely to be small relative to station construction costs, any difference in costs between stations at the two sites will be ignored at this stage.

4.3 Option 3: Provide dedicated minibus service to connect with trains at Caersws

This option envisages a minibus shuttling between Llanbrynmair, Carno and Caersws station every 2 hours to connect with the trains to and from the East. Unfortunately, the timing of Eastbound and Westbound trains at Caersws at 13 minutes and 33 minutes respectively past the even hours makes tight connections with trains in both directions impossible, and, as noted above, it is unlikely in any case that many people would want to travel to the West via Caersws. Thus the plan would be that the minibus arrived at Caersws in time for the XX33 departures in the first half of the day, and would depart from Caersws after the XX13 arrivals in the second half of the day.

The big advantages of a dedicated service such as this over the existing bus service – even if retimed to connect with the trains - is that the minibus would have sufficient slack in its timetable to wait for late train arrivals in the afternoon and evening and would actually go to the station to meet the trains.

It is suggested that the hours of operation of such a service would be from about 8 am to 8.45 pm, so no connections would be available into the first Eastbound train or out of the last Westbound train.

4.3.1 Minibus lay-by and turn-round at Caersws station

A minibus stance would need to be provided close to the station where the minibus could await train arrivals. This should be possible on the S side of the road just E of the level crossing, although acquisition of a small portion of the adjacent builder's yard might be necessary. It is envisaged that the minibus would cross over the level crossing and return to Carno via the B4569 and Wig Lane, so there would be no need to turn round.

4.3.2 Cost of operation

The cost of operation this service using an 8 seater minibus has been estimated at £430/day by Celtic Travel of Llanidloes. However, it is likely that a 20% saving could be obtained if the service was operated from Llanbrynmair, so the daily cost will be taken as £350.

4.4 Option 4: Modify X85 bus service to connect with trains at Caersws

Option 4 seeks to mitigate the main objection to Option 3, which is the high cost of providing an additional, dedicated bus service to and from Caersws station. As with option 3, the objective would be to provide connections every two hours into the XX33 train departures in the first half of the day, and out of the XX13 train arrivals in the second half of the day. The existing X85 bus service is approximately two hourly, so no additional vehicles would be required to provide the proposed connections, although an additional evening service would be desirable to connect with the 20:13 train arrival.

In order to make the service reasonably attractive, it would be necessary for the bus to turn in to station road and call at a stop outside the station.

One X85 service each way is well-filled with students attending Coleg Powys in Newtown, and these currently provide less than ideal connections with trains at Caersws, with nominal waits of over 25 minutes. Consultations would be required to establish the extent to which the timings of these services could be adjusted for the benefit of rail travellers. Care would need to be taken in timetabling in general to allow a realistic leeway for bus and train lateness. This is more difficult in relation to arriving trains, as these can easily be 10 or 20 minutes late. Westbound buses could not be expected to wait more than, say five minutes for trains, but if the bus were timed to leave, say, 15 minutes after the scheduled arrival time of the train, rail passengers arriving on a punctual train would suffer an unnecessarily extended journey.

4.4.1 Bus turning circle at Caersws station

As with the minibus, a space would need to be provided close to the station, where the bus could wait a few minutes for late trains. In addition, a turning circle would need to be provided to allow buses to return to the main road. (The route suggested for the minibus via Wig Lane, which avoids the need for turning, would be unsuitable for buses, as egress of buses from Wig Lane onto the A470 would be difficult and dangerous.)

The turning circle would ideally be provided on the S side of the road just E of the level crossing, on part of the land now used as a builder's yard. Buses could stop on the turning circle to let passengers on and off, removing the need for a separate bus lay-by.

4.4.2 Costs

The cost of a new bus turning circle outside a college at Eastleigh, Hampshire was estimated at £110,000 in 2006. Allowing for some inflation, a figure of £120,000 might therefore be appropriate for a turning circle at Caersws built in 2010.

The provision of a bus service to connect with the 20:13 arrival at Caersws would extend the hours of operation on the X85 route by about two hours. Based on a cost estimate of £550 per day provided by Celtic Travel for the provision of the Llanbrynmair-Caersws shuttle (Option 3) with a 29 seater bus, it is estimated that the two hours extra bus operation would cost about £70 per day.

*< APPRAISAL OF OPTIONS 1 & 2: CARNO STATION RE-OPENING AT EXISTING
SITE OR AT NEW EASTERN SITE >*

5. ECONOMIC IMPACTS

5.1 Demand forecast

5.1.1 <u>Introduction</u>

Forecasting the passenger useage of a new railway station from scratch is a major exercise. In the case of Carno station, considerable effort can be avoided by basing the forecast on the existing useage of Caersws station, on the assumption that the patterns of use of the two stations would be very similar. This assumption is justified because

- both stations would be in their villages and accessible on foot by the bulk of the population
- both stations would serve a much larger hinterland
- road access from the larger hinterland is by relatively uncongested roads in each case
- there is no reason to suppose that the socio-economic population mix varies significantly across the Caersws and Carno catchments

The passenger usage of the new station has therefore been estimated from the existing usage of Caersws (6 miles to the East) by means of a **comparison of the catchment populations weighted by distance** – and hence access time - from each station.

This forecasting method makes the fundamental assumption that the propensity of the population in each settlement to travel by rail is determined only by the proximity of the settlement to the nearest railway station and the frequency of the railway service. It is also clearly necessary to assume that the train service provided at the re-opened Carno station would be the same as that currently provided at Caersws – ie **every two hours.** The impact of an hourly service – at least at commuting times – is considered separately at the end of this section.

5.1.2 <u>Distance/access time population weighting</u>

The propensity of people to make train journeys from a station clearly decreases with increasing distance of their homes from the station. Work at the **Institute of Transport Studies** ("Modelling passenger demand for parkway rail stations", W.F.Lythgoe & M.Wardman, Transportation **31**: pages 125-151, 2004) indicates that the "access time elasticity" is about -0.6 for out-of-town stations, so that a 10% increase in access time results in a 6% reduction in the number of rail journeys made per head of population. Assuming the propensity to use the station is constant for access times of less than 5 minutes, then an "access time weighting factor" can be defined as the number of journeys made per head of population for an access time in excess of 5 minutes divided by the number of journeys made per head of population where the access time is less than 5 minutes.

If passengers living more than five minutes walk away from the station drive to the station at a mean speed of 40 mph and take 3 minutes to park their cars, then the resulting variation of access time weighting factor with distance from the station is as shown in the graph.

Distance population weighting factors
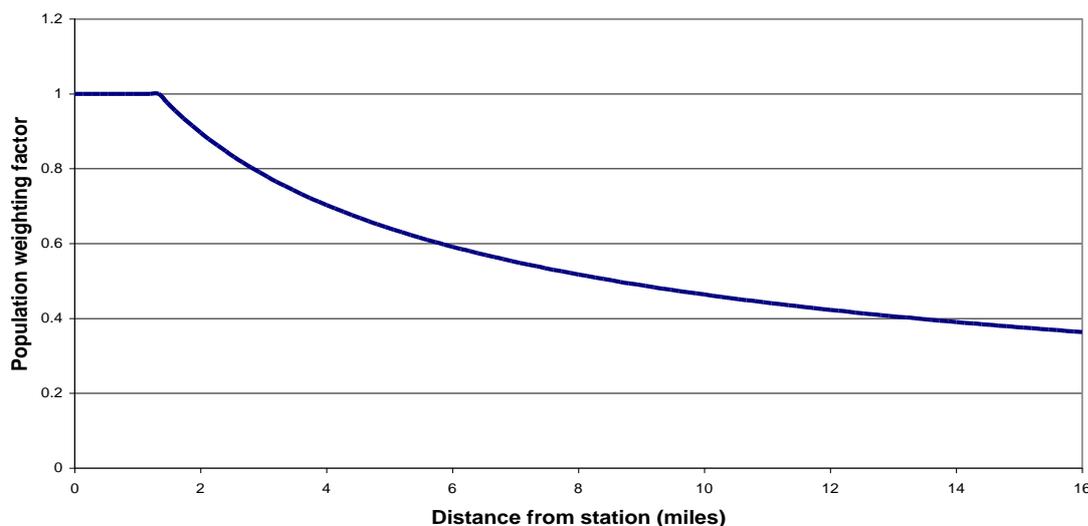
5.1.3 Station selection according to direction of travel

Given that passengers display a marked reluctance to travel to a station in the opposite direction to that of their final destination, it is assumed that people living at Carno, Llanbrynmair and Glantwymyn do not travel to Caersws station for journeys to the West. Estimates of the proportion of journeys to population centres to the East from Carno, Llanbrynmair and Glantwymyn have been made on the coarse assumption that travel flows between two settlements vary in proportion to the settlement populations and inversely as the distance between them raised to the power of 2.5. Destinations within a distance of about 50 miles, such as Welshpool, Shrewsbury, Telford and Aberystwyth have been considered separately, but destinations further afield have been lumped together and considered on a regional basis. The estimated proportion of journeys to the East comes to 0.956, 0.929 and 0.888 for Carno, Llanbrynmair and Glantwymyn respectively.

5.1.4 Weighted Catchment populations

Access time weighting factors as described above have been applied to the populations of the villages surrounding Caersws for which Caersws is currently the nearest station, or the station of choice for journeys to the East (the predominant direction of outward journeys), in order to estimate the **"weighted Caersws catchment population".** This is defined as the notional population living at Caersws *itself* that would generate the same number of journeys as the actual population spread over the whole catchment area. The contributions from Carno, Llanbrynmair and Glantwymyn have been adjusted by multiplying them by the Eastbound direction of travel proportions described in the preceding paragraph.

Based on the 2001 ward population figures for Caersws, Llanidloes, Llanidloes without, Llangurig, Trefeglwys, Carno, Llanbrynmair and Glantwymyn, the weighted Caersws catchment population comes to **6077** – 59% of the actual catchment population and much larger than the population of Caersws itself (1526).

Note that in the case of Carno itself, the estimated 2007 ward population of 766 is used instead of the 2001 figure of 646 because at least 52 new houses have been built since 2001 (household size taken as 2.32 – the Powys average).

After the opening of Carno station, it is assumed that the populations of Llanbrynmair and Glantwymyn to the West of Carno and Cefn Coch to the North would fall into the Carno catchment. Applying new population weighting factors to the populations of these villages and a unity factor to the population of Carno results in a weighted Carno catchment population of **1828**.

With the removal of the populations of Carno, Llanbrynmair and Glantwymyn from the Caersws catchment, its weighted catchment population reduces to **4903**. Hence the new total weighted catchment population for Caersws and Carno is (4903 + 1828) = 6731 – ie 654 greater than the current Caersws figure of 6077.

The calculations are carried out on an Excel spreadsheet which is reproduced as Appendix A5.1.

5.1.5 <u>Carno station passenger forecast</u>

The annual usage of Caersws station for 2005-6 in terms of the number of single journeys made, was 28257 passengers (Source: Station Usage 2005-6, Office of Rail Regulation). The passenger growth rate at Caersws, Newtown and Machynlleth over the last 3 years has been 6.2%, 4.0% and 4.2%. If passenger growth continues at the conservative value of 4.0%, and Carno station did not open, the annual usage at Caersws in 2010/11 would be **34378 passengers**.

If, however, Carno station were to open at the start of 2010/11, the predicted annual usage of the new station is obtained by multiplying the latter figure by the ratio of weighted catchment populations giving 34378(1828/6077) = **10341 passengers**.

5.1.6 <u>Breakdown between new journeys and journeys abstracted from Caersws</u>

After the opening of Carno, the Caersws weighted catchment population drops to 4903, so the Caersws annual usage drops to 34378(4903/6077) = 27737 - a reduction of 6641 passengers. Hence 10341 – 6641 = **3700 new single journeys** are generated and **6641 single journeys are abstracted from Caersws.**

5.1.7 <u>Impact of hourly service</u>

The planned introduction of an hourly service on the Cambrian line would transform its usefulness, not least because it is generally accepted that this frequency is the minimum required to make a service attractive to commuters.

Although it is anticipated that the basic train service at Carno station would remain two hourly, the introduction of the hourly service would enable the service in the early morning and late afternoon to be tailored more closely to the needs of commuters, by either the rearrangement of the stopping pattern or by stopping one or two additional trains at Carno. This would allow Carno station to attract commuters to the service as well as the existing mix of travellers. The resulting additional demand beyond that predicted above for the strictly two-hourly service is conservatively estimated at 30%.

5.2 Transport Economic Efficiency

5.2.1 <u>Introduction</u>

Transport Economic Efficiency (TEE) is a measure of the economic impacts traditionally evaluated by Cost Benefit Analysis. The TEE Table compares user benefits under the headings of travel time savings, vehicle operating cost savings, reliability improvements with user charges and compares the revenue received by the service provider with the operating and investment costs incurred. These benefits and costs, which accrue over the lifetime of the project, are expressed in "Present Value" terms using conventional discounting over time.

The WelTAG guidance recommends that the appraisal period chosen should be the asset life of the longest lived asset in the scheme (#5.2.11). The new station comes under the heading of "infrastructure – earthworks and structures", for which the guidance gives an asset life of 100 years. Accordingly, annual benefits and costs are calculated over a 100 year period beginning in 2010, the assumed year of station opening, and discounted back to the base year of 2010. Note that the default base year of 2002 recommended in WelTAG has not been used, as it unnecessarily complicates the calculations without any clear benefit.

The TEE Table separates users into consumers and businesses. It is assumed that most journeys on the Cambrian line are made by non-business travellers, so, in the absence of any information as to the proportion of business travellers, all travellers are treated as non-business in this appraisal. This will slightly underestimate the value of travel time savings.

The various benefits are estimated on the assumption that a two hourly service is provided to the new station, with projected station usage estimated from the existing Caersws station usage with a two hourly service as detailed in #5.1.

It is assumed that all journeys made from Carno station after re-opening are presently made by other means – ie by car, taxi or bus, at least between Carno and the nearest railhead. User benefits will differ, depending on the mode replaced. In Sections 5.2.2 and 5.2.3 below, time savings and vehicle operating cost savings are estimated on the basis that *all* journeys are presently made by car (Scenario A). However, the user benefits for passengers now accessing the train at Caersws by bus are much greater than for those using the car for this purpose, because of the considerable time savings, as is shown in Section 5.2.4. Accordingly, Transport Economic Efficiency will also be investigated under scenario B, in which 10% of journeys to and from Carno station are presently made by bus rather than by car. Observation suggests that the overwhelming majority of Carno residents using Carno station reach it by car or taxi, so the percentage reaching it by bus is considered unlikely to be much higher than 10%.

Many of the parameters used in this section have been taken from Transport Analysis Guidance provided by the Department of Transport on its website (referred to as WebTAG). All benefits and costs are expressed in 2002 prices, as the parameter values are expressed in these terms in WebTAG.

5.2.2 07_User benefits:_ Time savings

Time savings are estimated under two headings – new rail journeys to/from Carno and rail journeys abstracted from Caersws.

New rail journeys

New rail journeys are assumed to result from modal shift from road to rail. As at least 50% of journeys to/from the East are thought to be to/from Shrewsbury and beyond, and as most Caersws station users travel to/from the East, the average time saving as a result of the re-opening of Carno station is taken as the reduction in journey time between Carno and Shrewsbury.

The existing journey time from Carno to Shrewsbury by road is based on an assumed average speed of a private car outside the Newtown built up area of 40 mph. Over the 2 miles through Newtown a reduced speed of 20 mph is taken. The additional time loss as a result of traffic congestion in Shrewsbury is not counted, as car journeys beyond Shrewsbury are assumed to be via the bypass. The resulting journey time by road under these assumptions for the 44 mile journey is 69 minutes.

The Carno – Shrewsbury rail journey time is likely to be 54 minutes, based on the existing timetable. However, to this must be added a realistic waiting time – say 5 minutes – which then has to be multiplied by a "waiting time value factor" to reflect the fact that time waiting at a station is less comfortable than time sitting on a train. A "waiting time value factor" of 1.5 has been adopted rather than the value of 2.5 recommended in #5.2.45 of WelTAG, because the ambience of a country station is considered to be much pleasanter than that of the more typical bus stop on an urban main road. Accordingly the total rail journey time comes to 61.5 minutes, yielding a journey time saving of 7.5 minutes after allowance for waiting time.

Rail journeys abstracted from Caersws

It is anticipated that nearly all the existing passengers who start using Carno station in preference to Caersws will be travelling East, as it is counter-intuitive to travel a long distance to a station in the

"wrong" direction. Travellers who switch from Caersws station to Carno station will gain a small amount of time because of the higher average speed of the train. The existing scheduled time for the 8 miles between Caersws and Talerddig is 10 minutes, giving an average speed of 48 mph. There is thus a 1.5 minute saving compared with the car over the 6 miles between Carno and Caersws.

Annual time saving

The total annual time saving is obtained by multiplying the time saving per journey by the number of journeys in a year for new and existing journeys and adding the results. In 2010, the number of new journeys to/from Carno Station is estimated at 3700 and the number abstracted from Caersws at 6641 (see #5.1.6), resulting in an annual time saving of 628 hours.

Value of non-work time in 2010 and beyond

Table 2 of WebTAG Unit 3.5.6, "Value of Time and Operating Costs", gives the value of non-working time per person in 2002 as £5.04 per hour for commuting and £4.46 per hour otherwise. Given that the numbers of journeys are estimated for a two-hourly service, it follows that the value of non-work time should be taken as £4.46, as a two hourly service is too infrequent to be attractive to commuters.

Table 3 of WebTAG Unit 3.5.6 gives the annual percentage increase in the real value of non-work time in the years following 2002, from which it can be calculated that the value of non-work, non-commuting time to be used in 2010 is £5.20 per hour at 2002 prices. Hence the value of the time saved in 2010 is £3270. Table 3 also gives growth rates for succeeding years (typically about 1.6%).

Growth in demand post 2010

Usage of Carno station is assumed to grow initially in line with current trends at about 4% per annum. However, in view of the inherent dangers of forecasting far into the future, no growth is assumed to occur after 2026, as stipulated (for the central case) by #3.3 of WebTAG Unit 3.13.1 "Guidance on rail appraisal."

Discounted benefit

The 2010 Present Value of annual time savings over the 100 year period is reduced by the discount rates of 3%/3.5%, but increased by the initial passenger growth and the slow increase in the value of non-work time. As a result, the 2010 Present Value is equivalent to about 82 years worth of the 2010 time savings – ie to £267 k at 2002 prices. The detailed calculations may be found on spreadsheet "Carno Station Present Value v2".

Time penalties for existing rail passengers with existing service frequency

If the service frequency remains unchanged at one train every two hours, all existing trains would call at Carno station, resulting in a two to three minute time penalty. Set against this, the current upgrading of Cambrian line passing loops will enable trains in one direction to run through the upgraded Talerddig loop without stopping and will yield additional time savings at other passing loops, as the installation of electrically operated points to replace the existing spring-operated ones will permit faster running speeds.

Further time savings on the Aberystwyth-Shrewsbury trunk route could be obtained by eliminating the Dyfi Junction stops on Aberystwyth Services. The stopping of approximately 40 trains a day at Dyfi Junction is not justified by the 1000 passenger journeys per year generated, and Coast line trains alone would provide a very adequate two-hourly service for the traffic on offer.

It is concluded that there would be a negligible increase in overall journey times for passengers to and from the Coast compared with those today, because the time lost stopping at Carno would be largely offset by the time savings resulting from the passing loop upgrades. Journey times to and from

Aberystwyth would actually reduce if the opportunity were taken to eliminate the unnecessary Dyfi Junction stop when Carno station opened.

Time penalties for existing rail passengers with hourly service frequency

The passenger demand forecast for Carno presented in #5.1 is based on the provision of a two-hourly service. On the assumption that the extra trains introduced for the hourly service would be the ones stopping at Carno, there would be no time penalties for existing passengers, as the existing trains would not stop there.

5.2.3 <u>User benefits: Vehicle operating cost savings</u>

Vehicle operating costs are split into fuel and non-fuel costs, each of which is proportional to vehicle mileage.

Car mileage savings

As noted in #5.2.2, new rail journeys are assumed to result from modal shift from road to rail and journeys abstracted from Caersws save a six mile road journey. Taking the average length of new rail journeys as 44 miles (the distance to Shrewsbury), the total number of car occupant miles saved in 2010 is 3700(44)+6641(6) = 162,800 + 39846 = 202,646 miles – ie 326,112 km.

The car mileage saving depends on car occupancy. Table 4 of WebTAG Unit 3.5.6, "Value of Time and Operating Costs", gives a figure of 1.68 for the all week average occupancy of an "average car" in 2000. However, occupancies are on a declining trend, so the <u>passenger</u> occupancy rate must be adjusted downwards by 0.56% per annum (Table 6), giving a car occupancy of 1.6429 in 2010. Hence the car mileage saving arising from the opening from Carno station is estimated at 198,502 km per annum in that year.

Fuel consumption

The fuel consumption of an average car in 2002 has been calculated as 0.068227 litre/km (ie 41.4 mpg) according to the formula in WebTAG Unit 3.5.6 #1.3.5 and Table 10 "Fuel VOC Formulae Parameter Values". Based on the annual improvements in fuel efficiency of about 1.25% per annum given in Table 13 "Assumed Vehicle Fuel Efficiency Improvements", a reduced fuel consumption of 0.061733 litre/km (ie 45.76 mpg) is estimated for the year 2010.

Fuel Market Price

The forecast growth in the resource cost of fuel in Table 14 of WebTAG Unit 3.5.6 combined with the 2005 value of resource cost (24.1 pence/litre for an average car) and the 2006 value of fuel duty (42.3 pence/litre) result in a 2010 market price of fuel of 72.5 pence per litre at 2002 prices. After allowance for the growth of RPI from 176.2 to 206.6 from 2002 to 2007, this translates to 85.0 pence per litre at current prices, which is well below the prevailing rate of over £1.00 per litre since the end of 2007. **Accordingly it has been decided not to adopt the WebTAG trajectory of fuel market prices, but to take a 2010 price of £1.00 litre instead, which translates to £0.853 at 2002 prices. In succeeding years, the real price of fuel is assumed to rise annually by 1% in order to reflect the fact that the world is now entering a period of increasing fuel scarcity.**

Discounted fuel cost saving

The fuel cost saved in 2010 is calculated at 198,502 x 0.061733 x £0.853 = £10,453.

The 2010 Present Value of vehicle fuel cost savings over the 100 year period is reduced by the discount rates of 3%/3.5%, but increased by the initial passenger growth, the very slow reduction in car occupancies and the assumed 1% annual increase in the market price of fuel. As a result, the 2010 Present

Value is equivalent to about 61 years worth of the 2010 vehicle fuel cost savings – ie to £635 k. The detailed calculations may be found on spreadsheet "Carno Station Present Value v2".

Vehicle non-fuel cost savings

Non-fuel vehicle operating costs are given in #1.3.16 and Table 15 "Non-fuel VOC Formulae Parameters" of WebTAG Unit 3.5.6. The perceived cost per vehicle kilometre for and average car is 3.765 pence at 2002 prices, but this is assumed not to change over time. Accordingly the non-fuel vehicle operating cost saving is 198502 x £0.03675 = £7474 per annum in 2010.

The 2010 Present Value of vehicle non-fuel cost savings over the 100 year period is reduced by the discount rates of 3%/3.5%, but increased by the initial passenger growth and the very slow reduction in car occupancies. As a result, the 2010 Present Value is equivalent to about 51 years worth of the 2010 vehicle non-fuel cost savings – ie to £380 k. The detailed calculations may be found on spreadsheet "Carno Station Present Value v2".

Present Value of total vehicle operating cost savings

Addition of the fuel and non-fuel components results in a total figure of £1015 k.

5.2.4 <u>User benefits: Non car-owners</u>

It is assumed that future journeys made by non-car owners from the re-opened Carno station are currently made by bus throughout, or are made by travelling to Caersws station by bus or taxi and catching the train there. Given the expense of a taxi to Caersws (about £8), it is clear that former taxi users would gain significantly from the opening of Carno station, but, in the absence of information about taxi usage, benefits to former bus-users only are considered.

The chief benefit accruing to former bus users is the significant saving in journey time. This is considered separately for new journeys by rail and for journeys abstracted from Caersws station in the following paragraphs

Time savings for new rail journeys

As in #5.2.2, the reduction in journey time between Carno and Shrewsbury is considered to be representative of all new rail journeys. The current bus time table permits four journeys to be made between Carno and Shrewsbury in each direction, with a change of buses required at Newtown in every case, and the average overall journey time in both directions is 139.4 minutes.

With Carno station open, the journey time to Shrewsbury by rail would be 54 minutes, giving a time saving of 85.4 minutes. At a 2010 value of non-work time of £5.20/hour at 2002 prices, this time saving is valued at £7.40.

Time savings for rail journeys abstracted from Caersws

Reference to the current bus and train timetables indicates waiting times at Caersws of 27 minutes and 62 minutes to catch the 08:33 and 10:33 Eastbound trains respectively. On the return journey, connections are better, with waiting times of 16 minutes and 29 minutes after the 14:13 and 16:13 train arrivals. Taking an average waiting time at Caersws of 33.5 minutes, a "waiting time value factor" of 1.5 as before and a 10 minute bus journey time between Carno and Caersws, the mean weighted journey time to catch the train at Caersws or to return after alighting from one comes to 60.25 minutes. However, with Carno station open, the train running time between Carno and Caersws would be 7.5 minutes, yielding a time saving of 52.75 minutes. At a 2010 value of non-work time of £5.20/hour at 2002 prices, this time saving is valued at £4.57.

Comparison with user benefits for those reaching Caersws station by car

The 1.5 minute time saving accruing to passengers who now reach Caersws station by car is valued at £5.20(1.5/60) = £0.13. The fuel VOC saving for the six mile journey is £0.061733 x £0.853 x 6(1.609/1.6429) = £0.05266 x 9.654/1.6429 = £0.05266 x 5.876 = £0.309, after allowing for a vehicle occupancy of 1.6429 and the non-fuel VOC saving is £0.03765 x 5.876 = £0.221. Hence the total user benefit per journey is £0.66 in 2002 prices. This is likely to be less than the Carno-Caersws rail fare.

It is seen that the user benefit of Carno station for a former bus-user is an order of magnitude higher than that for a former car-user. The TEE impact of 10% of the users of Carno station being former bus-users will be investigated in Scenario B.

Value of annual time saving accruing to former bus passengers under Scenario B

The total annual time saving is obtained by multiplying the time saving per journey by the number of journeys in a year for new and existing journeys and adding the results. In 2010, the number of new journeys to/from Carno Station is estimated at 3700 and the number abstracted from Caersws at 6641 (see #5.1.6). Under Scenario B, 10% of these journeys are assumed to have been made by bus – ie 370 new and 664 abstracted. Multiplying these numbers by the values of time saving per journey of £7.40 and £4.57 respectively yields an annual time saving value of £5776.

Discounted benefit

The 2010 Present Value of annual time savings over the 100 year period is reduced by the discount rates of 3%/3.5%, but increased by the initial passenger growth and the slow increase in the value of non-work time. As a result, the 2010 Present Value of the annual time saving accruing to former bus passengers under Scenario B is equivalent to about 82 years worth of the 2010 time savings – ie to £472 k at 2002 prices. The detailed calculations may be found on spreadsheet "Carno Station Present Value v2".

5.2.5 <u>Reliability improvements</u>

As discussed under the heading of *Time penalties for existing rail passengers* in #5.2.2 above, the 2 to 3 minute delay to trains as a result of the stop at Carno is likely to be cancelled out by the time savings resulting from the upgrade of passing loops.

However, with the introduction of the hourly service, there is the additional requirement that the inclusion of the Carno stop does not impair the ability of trains to travel between passing loops. Indeed the Carno Station Action Group made representations to the WAG last year that the Talerddig passing loop should be relocated to Carno as part of the passing loop upgrade works to reduce the running time to the Welshpool loop.

Fortunately the extension of the Welshpool loop Westwards by 4 km, together with increased running speeds into and out of passing loops, makes it likely that there would be time for the Carno stop to be incorporated. Furthermore, the Welsh Assembly Government has indicated that the selection of Talerddig rather than Carno as the site of the enhanced passing loop does not "prejudice the potential opening of a station at Carno". It is therefore concluded that the stopping of trains at Carno station would not impair reliability.

5.2.6 <u>User charges/Operator revenues</u>

The user charges paid by passengers as fares provide the revenue for the service provider.

The additional revenue from the new journeys may be estimated by multiplying the number of single journeys by the UK mean revenue per single journey of £4.26 in 2006/7. On the basis of an estimated 3700 new journeys, the predicted annual revenue from new single journeys is £4.26 x 3700 = £15,762.

As already noted, it is anticipated that nearly all the existing passengers who start using Carno station in preference to Caersws will be travelling East so it is assumed that an additional revenue of 90 pence (6 miles x typical single fare rate of 15 pence/mile) accrues to all passenger journeys abstracted from Caersws. The additional annual revenue from this source is £0.90 x 6641 = £5977. Hence the total additional annual revenue (allowing for abstraction from Caersws) is £21,739, or £19,335 at 2002 prices. On the assumption that fares will not rise in real terms, this figure can be applied to 2010 and subsequent years.

The 2010 Present Value of fare revenue over the 100 year period is reduced by the discount rates of 3%/3.5%, but increased by the initial passenger growth. As a result, the 2010 Present Value is equivalent to about 49 years worth of the 2010fare revenue – ie to £944 k.

Note that the fare revenues detailed above are the additional revenues received by the train operating company. Under Scenario B, which assumes that 10% of station users formerly travelled by bus, these will be offset by a reduction in the fares received by the bus company.

5.2.7 <u>Investment and operating costs</u>

Investment cost

As set out in #4.1.3, the station investment cost is estimated at between £0.5 m and £1.7 m with a central estimate of £1.0 m. No correction for optimism bias is made as these estimates are based on actual costs of a recently opened station.

Operating cost

The operating costs would be those associated with the station itself, as no additional trains would be run. Some indication of the likely station operating costs can be gained from the Llanharan Station Business Case (April 2004). This forecast an annual cost of £39 k, including rental (payable by the operator to Network Rail), maintenance, lighting and cleaning.

Llanharan station has two 4-car platforms, a footbridge and a 54-bay car park. Given that the usage levels of Carno are likely to be an order of magnitude less at Carno than at Llanharan, an annual operating cost of £10 k would seem realistic.

The 2010 Present Value of operating costs over the 100 year period is reduced by the discount rates of 3%/3.5%. As a result, the 2010 Present Value is equivalent to about 30 years worth of the 2010 operating costs – ie to £297 k.

5.2.8 <u>Grant/subsidy</u>

It is not anticipated that any grant or subsidy would be paid to the Train Operator for stopping trains at Carno, as the projected revenue considerably exceeds the station operating costs.

5.2.9 <u>PV of TEE benefits – Scenario A</u>

As outlined in #5.2.1, the Transport Economic Efficiency benefits will be investigated under two scenarios as follows:
> Scenario A: All users of Carno station are assumed to have formerly travelled by car
> Scenario B: 90% of users are assumed to have formerly travelled by car and 10% by bus

There is uncertainty about the proportion of Carno station users who would previously have travelled by bus, so consideration of two alternative scenarios is necessary in order to capture the likely range of TEE benefits.

This section considers the TEE benefits under Scenario A.

The net present value of the Transport Economic Efficiency Benefits over the 100 year appraisal period is calculated at £0.985 m in 2002 prices. This excludes the station investment cost, which it is assumed will be borne by WAG through TraCC. The Transport Economic Efficiency table is reproduced below (Table 5.1A):

TEE for Scenario A, which assumes all station users formerly travelled by car

	Net Present Value (£ million)				
IMPACT GROUP	Total All Modes	Car/LGV	Bus & Coach	Rail Passenger	Walking/ Cycling
Consumers - User benefits					
Travel Time	0.267			0.267	
Vehicle Operating Costs	1.015	1.015			
User Charges	-0.943			-0.943	
Reliability					
During construction/maint					
[1] *Net Consumer benefits*	0.339	1.015	0	-0.676	0
Businesses - User benefits					
Travel Time					
Vehicle Operating Costs					
User Charges					
Reliability					
During construction/maint					
[2] *Net Business benefits*	0				
Private Sector Provider Impacts					
Revenue (= - User charges)	0.943			0.943	
Operating Costs	-0.297			-0.297	
Investment Costs					
Grant/subsidy					
[3] *Subtotal*	0.646			0.646	
Other Business Impacts					
[4] Developer contributions					

[5] *Net Business Impact*	0.646	= [2]+[3]+[4]

Present Value of TEE Benefits for Scenario A	0.985	= [1]+[5]

TABLE 5.1A: TRANSPORT ECONOMIC EFFICIENCY FOR SCENARIO A

5.2.10 <u>PV of TEE benefits – Scenario B</u>

This section considers the TEE benefits under Scenario B in which 90% of station users are assumed to have formerly travelled by car and 10% by bus.

The net present value of the Transport Economic Efficiency Benefits over the 100 year appraisal period is calculated at £1.328 m in 2002 prices. This is significantly more than the £0.985 m for Scenario A, even though the proportion of former bus passengers has only increased from 0% to 10%. This reflects the large time savings gained by former bus passengers. [As before, the figure excludes the station investment cost, which it is assumed will be borne by WAG through TraCC.] The Transport Economic Efficiency table is reproduced below (Table 5.1B):

TEE for Scenario B, which assumes 90% of station users formerly travelled by car and 10% by bus

IMPACT GROUP	Net Present Value (£ million)				
	Total All Modes	Car/LGV	Bus & Coach	Rail Passenger	Walking/ Cycling
Consumers - User benefits					
Travel Time	0.712			0.712	
Vehicle Operating Costs	0.913	0.913			
User Charges	-0.849			-0.849	
Reliability					
During construction/maint					
[1] *Net Consumer benefits*	0.776	0.913	0	-0.137	0
Businesses - User benefits					
[2] *Net Business benefits*	0				
Private Sector Provider Impacts					
Revenue (= - User charges)	0.849			0.849	
Operating Costs	-0.297			-0.297	
Investment Costs					
Grant/subsidy					
[3] *Subtotal*	0.552			0.552	
Other Business Impacts					
[4] Developer contributions					
[5] *Net Business Impact*	0.552 = [2]+[3]+[4]				
Present Value of TEE Benefits for Scenario B	1.328 = [1]+[5]				

TABLE 5.1B: TRANSPORT ECONOMIC EFFICIENCY FOR SCENARIO B

The figures in the table above are calculated as follows:-
Travel time savings = Former car users savings + former bus user savings
    Former car user savings = 90% of figure in Table 5.1A = 0.9 x £0.267 = £0.240 m;
    Former bus user savings = £0.472 m (#5.2.4);
    Total travel time savings = £0.240 m + £0.472 m = £0.712 m.
Vehicle Operating Costs = 90% of figure in Table 5.1A = 0.9 x £1.015 m = £0.913 m
User charges: It is assumed that bus fares and rail fares are equal, so user charges are unchanged for former bus users. The user charges paid by former car users are 90% of the figure in Table 5.1A – ie 0.9 x £0.944 m = £0.849 m

5.2.11 Public accounts

It is assumed at present that WAG will fund the station investment cost in full through the TraCC regional transport budget. The central cost estimate of £1.0 million has therefore been entered in the Welsh Assembly Government Funding section of the Public Accounts table (see below). Note, however, that the full range of cost estimates is from £0.5 m to £1.7 m (#4.1.3).

The WAG contribution would be reduced if EU funding were to be available, but eligibility for EU funding has yet to be determined.

Net Present Value (£ million)

IMPACT GROUP	Total All Modes		Car/LGV	Bus & Coach	Rail Passenger	Walking/ Cycling
Local Government Funding						
Revenue						
Operating Costs						
Investment Costs						
Developer & other contributions						
Grant/subsidy from Wales						
Grant/subsidy from UK/EU						
[7] *Net Impact*	0					
Welsh Assembly Government Funding						
Revenue						
Operating Costs						
Investment Costs	1					
Developer & other contributions						
Grant/subsidy from Wales???						
Grant/subsidy from UK/EU						
[8] *Net Impact*	1					

Present Value of Costs (PVC)   1   [9] = [7] + [8]

TABLE 5.2: PUBLIC ACCOUNTS

5.2.12 <u>Analysis of monetised costs and benefits</u>

The analysis of monetised costs and benefits for Scenario A (which assumes all station users formerly travelled by car) is presented in Table 5.3A below – using values for the benefits of greenhouse gas emission savings and reduction in road accidents developed in #6.3 and #7.2 respectively. The estimated benefit cost ratio is about 1.6, but this would rise if account were taken of the additional travel time savings gained by non car-owners, and of the additional value of business travellers' time savings.

Impact for Scenario A	**Present Value (£ millions)**
Noise	
Greenhouse Gas emissions	0.057
Accidents	0.583
Present Value of TEE benefits	0.985
Present Value of benefits (PVB)	1.625
Present Value of Costs (PVC)	1
Net Present Value	0.625

Benefit Cost Ratio	**1.625**

TABLE 5.3A: ANALYSIS OF MONETISED COSTS AND BENEFITS FOR SCENARIO A

The impact of the additional time savings gained by non car-owners is examined under Scenario B, which assumes that 10% of station users formerly travelled by bus and the rest by car. The analysis of monetised costs and benefits for Scenario B is presented in Table 5.3B below – using 90% of the values for the benefits of greenhouse gas emission savings and reduction in road accidents given in Table 5.3A.

Impact for Scenario B	**Present Value (£ millions)**
Noise	
Greenhouse Gas emissions	0.052
Accidents	0.524
Present Value of TEE benefits	1.328
Present Value of benefits (PVB)	1.904
Present Value of Costs (PVC)	1
Net Present Value	0.904

Benefit Cost Ratio	**1.904**

TABLE 5.3B: ANALYSIS OF MONETISED COSTS AND BENEFITS FOR SCENARIO B

It is seen that there is a significant increase in the Benefit Cost Ratio – from about 1.6 to 1.9 - when the benefits to former bus users are taken into account.

Clearly the BCR figures should be treated very cautiously in view of the large uncertainty regarding the station cost.

Commuter traffic

It was noted in #5.1.7 that an increase in passenger numbers of about 30% could reasonably be expected if train times were better tailored to the needs of commuters following the introduction of the hourly service. The effect of this would be to increase the Benefit Cost Ratio to about 2.2 under Scenario A (with the retention of the central station capital cost estimate of £1 million).

5.3 Economic Activity and Locational Impacts

The principal economic benefits flowing from station re-opening would be
1. Expansion of the job opportunities available to Carno residents
2. Expansion of the labour pool available to enterprises in the Severn valley corridor, Machynlleth and Aberystwyth
3. Enhancement of the regeneration potential of the former Laura Ashley site for new housing
4. Development of new and existing tourist enterprises
5. Attraction of new knowledge-based businesses and consultancies to the area
6. Growth in the use of Carno Community Centre for All-Wales conferences.

These are considered in more detail below.

5.3.1 <u>Expansion of job opportunities for Carno residents</u>

Following the loss of some 200 local jobs with the closure of the Laura Ashley factory in 2005, there is a continuing need to expand the range of jobs accessible to Carno residents, particularly for those without access to a car. The opportunity provided by the station for people to travel farther afield to work would materially assist the regeneration of the village following the factory closure and would therefore constitute a "distributional welfare gain" (see #D8.5). It is not expected that this would be to the detriment of other regeneration areas, as nowhere else in the area has seen such a large percentage loss of local jobs.

It should be pointed out that the introduction of a strictly 2 hourly service would be unlikely to make commuting by rail convenient for all people with fixed hours of work, but this drawback could be overcome if the 2 hour service gaps were filled at commuting times.

Location of impact: This economic benefit would clearly accrue to the Carno area itself - not to the region or Wales as a whole.

5.3.2 <u>Expansion of the regional labour pool</u>

Enterprises located on the Cambrian railway corridor which are constrained by skill shortages would benefit from the additional source of labour available to be tapped as result of Carno station re-opening. Research would be necessary to establish the level of skill shortages that currently exist.

Location of impact: This economic benefit would clearly accrue to the Mid Wales region and the two main centres in Shropshire - not to Wales as a whole.

5.3.3 <u>Regeneration of former Laura Ashley factory site</u>

The moribund Laura Ashley factory will become an increasing blight on the village-scape as the building deteriorates over time. Freight transport logistics appear to militate against the sale of the buildings for alternative industrial use, so, unless there is interest in converting them into a call-centre, it is likely that they will have to be demolished. The obvious alternative use for the site is for new housing, for which there has been a strong demand, and Laura Ashley have already applied for planning permission for over 50 new houses. As noted in #5.3.1 above, re-opening of Carno station would considerably improve access to jobs, which would increase the attractiveness of Carno as a place to live. Station re-opening would therefore encourage the regeneration of the Laura Ashley site for housing, which would both enhance the appearance of the village and buttress the economic viability of the community as a whole.

Location of impact: The factory site regeneration benefit would clearly accrue to the Carno area itself - not to the region or Wales as a whole.

5.3.4 <u>Development of tourist enterprises</u>

With the growing recognition of the climate damage resulting from long-distance travel, particularly by air, there is an increasing trend towards the deliberate choice of green holidays, which Carno, with its attractive natural environment, is well-placed to exploit. An example of a newly established enterprise in this sphere is Cledan Valley Tipis, which makes use of an attractive, secluded site only a mile from the former railway station. The proprietors regularly collect customers from Caersws station, but clearly they would attract more business if visitors could simply walk to the site from a station in Carno.

It would clearly increase the scope for other tourist ventures to start up in Carno, ranging from conventional B&B's to cycle hire businesses, if the village could be reached by train direct from the West Midlands and visitors in turn could make day trips by train to the coast.

Location of impact: Although the "displacement" principle (#D1.4-6) holds that extra tourist visits attracted to one area are likely to be at the expense of tourist visits to another, it should be noted that Carno is better-placed for weekend and short breaks than the traditional coastal resorts of Cardigan Bay, being one or two hours closer to the West Midlands conurbation, and may therefore be able to attract additional visits to Wales.

5.3.5 Attraction of new knowledge-based businesses

Rural areas are attractive locations for IT and other knowledge-based businesses for which the physical transportation of goods forms only a small proportion of costs. However, marketing activity usually requires regular meetings with potential and existing clients, so good transport links are a key factor determining where such businesses are established. Similar considerations apply to small, specialist consultancies. The re-opening of Carno station would make business travel to and from Carno much easier and hence attract businesses and consultancies seeking a rural base to Carno rather than elsewhere.

Location of impact: The attraction of new businesses to Carno would clearly produce local rather than regional or national benefit.

5.3.6 Development of Carno Community Centre as a conference centre

Carno is probably the only village in Mid Wales on a key transport corridor with a large, modern community centre capable of accommodating conferences, and the community has exploited its situation by promoting the centre as a venue for All-Wales conferences for several years. However, the lack of a railway station acts as a considerable disincentive to delegates travelling by rail, with the result that the private car is overwhelmingly the transport mode of choice. Re-opening of the railway station would significantly increase the attractiveness of the conference venue and allow a high proportion of delegates to reach it by train.

Location of impact: The attraction of additional conferences to Carno would clearly produce local rather than regional or national benefit.

6. ENVIRONMENTAL IMPACT

6.1 Noise

The noise impacts resulting from the re-opening of Carno station will be a slight reduction in road traffic noise and a change in the nature of noise from trains.

Railway noise

The sound power level emitted by a train travelling at uniform speed increases as the square of its speed, so trains which slow down and stop at Carno will produce less noise approaching the station than trains that run through without stopping (at speeds of over 60 mph). On departure, however the train engines

will work harder to accelerate stopping trains, but it is doubtful whether the increased engine noise would exceed the rolling noise of non-stopping trains.

Road traffic noise

The average daily traffic flow on the trunk road network of Powys is about 5,000 vehicles per day. By comparison, the predicted removal of about 30 car journeys a day from the A470 will have only a tiny effect on road traffic noise. In view of this, detailed appraisal of changes in noise levels is not considered to be worthwhile (see WelTAG # 6.4.3).

6.2 Local air quality

As outlined in #5.2.2, the re-opening of Carno station is expected to result in a modal switch from road to rail, and thus a reduction of car mileage. This section describes the estimation of the consequent savings in emissions of nitrogen dioxide and particulate matter (PM_{10}) in kg per year.

Vehicle kilometres removed

The starting point is the number of vehicle kilometres per annum removed from the road system as a result of the station opening. Under Scenario A, it is assumed that 100% of journeys made from Carno station would previously have been made by car., Accordingly, the 2010 modal shift from car to rail is estimated at 3700(44)+6641(6) = 202,646 passenger miles – ie 326,100 km. Taking the 2010 car occupancy as 1.6429 as before (#5.2.3), the number of vehicle kilometres removed from the road system per annum in 2010 comes to 198,500 km.

Emission rates

Emission rates as a function of average vehicle speed are given for petrol and diesel cars for different engine sizes and emission legislation classes in the Dept of Transport Design Manual for Roads and Bridges, Volume 11 "Environmental Assessment", Section 3 "Environmental Assessment Techniques", Part 1 "Air Quality". ***However, these can only be used in conjunction with information on the local car traffic mix, which is not readily available. Ideally, a source of UK average emission rates for petrol and diesel cars as functions of average vehicle speed is required. [This section incomplete]***

6.3 Greenhouse Gas Emissions

This section describes the estimation of carbon dioxide emission reductions as a result of car mileage savings under Scenario A, which assumes that all journeys from Carno station were previously made by car. Train mileage would not be increased as result of the station re-opening, but there would be some increase in carbon dioxide emissions as trains accelerated after the Carno station stop.

Vehicle kilometres removed

Under Scenario A, the number of vehicle kilometres removed from the road system per annum in 2010 is estimated at 190,500 km – see #6.2 above. This figure is assumed to grow at 4% per annum until 2026 and then remain steady, in line with the passenger demand forecast.

Fuel Consumption savings

The fuel consumption of petrol and diesel cars in 2002 have been calculated as 0.071032 litre/km and 0.057579 litre/km respectively, according to the formulae in WebTAG Unit 3.5.6 #1.3.5 and Table 10 "Fuel VOC Formulae Parameter Values". However, fuel consumption is reducing over time, both because of increased engine efficiencies and the increase in the proportion of the diesel cars. Accordingly, the petrol and diesel car mileages saved in each year following station re-opening have been calculated from the number of vehicle kilometres saved, combined with data in WebTAG Unit 3.5.6 Table 12 "Proportion of the Car Fleet Using Petrol or Diesel". The total petrol and diesel consumption savings in litres for a

particular year are then obtained by multiplying these mileages by the fuel consumption rates for that year, based on the 2002 figures modified according to WebTAG Unit 3.5.6 Table 13 "Assumed Vehicle Fuel Efficiency Improvements". The 2010 figures of fuel saved are 9114 litres of petrol and 3214 litres of diesel. See spreadsheet "Carno Station GHG benefits PV Scenario A v1".

Carbon emission savings

The Carbon Dioxide emissions per litre of petrol or diesel are changing over time, because of the addition of bioethanol and biodiesel respectively. Table 1 "Carbon Emissions per litre of fuel burnt" in WebTAG Unit 3.3.5 "The Greenhouse Gases Sub-Objective" gives annual data in grams of Carbon per litre. The 2010 figures for petrol/bioethanol and diesel/biodiesel are 609.27 gramsC/litre and 696.23 gramsC/litre respectively, resulting in an emissions saving of 5.553 + 2.238 tonnes of Carbon, ie 7.791 x 3.667 = 28.57 tonnes of Carbon dioxide.

Increased rail Carbon Dioxide emissions

WelTAG (#6.6.10) recommends the use of the SRA Rail Emission Model Final Report (2001) as a source for train emission factors. This provides estimates of CO_2 emissions per kilometre for various types of train, assuming a particular station spacing, but provides no information on the additional CO_2 emissions that would result from an additional station stop. As a result the additional CO_2 emissions resulting from trains stopping at Carno station has had to be neglected.

Value of Carbon Dioxide emission savings

Defra issued updated guidance on the valuation of Carbon Dioxide emissions in December 2007, which is assumed to supersede the recommendations in #6.6.11 of WelTAG. The Defra guidance defines the shadow price of carbon (SPC) as reflecting "the damage costs of climate change caused by each additional ton of greenhouse gas emitted", and sets it at £19 per tonne of Carbon Dioxide in the year 2000 in 2000 prices. Thereafter the SPC rises at 2% per annum in real terms.

For the projected Carno station year of opening, the SPC comes to £19 x (90.105/85.329) x 1.02^{10} = £24.457 per tonne of CO_2, using the Treasury GDP deflator of (90.105/85.329) to convert from 2000 prices to 2002 prices as required by WelTAG (#5.2.6). Thus the value of the 28.57 tonnes of Carbon Dioxide emissions savings in 2010 is £698.7 in 2002 prices.

Discounted value of CO_2 emissions savings over project life

The 2010 Present Value of CO_2 emissions savings over the 100 years project life is reduced by the discount rates of 3.5%/3% and by increasing fuel efficiency but is increased by the growth of the SPC over time, initial passenger growth, and the very slow reduction in car occupancies. As a result, the 2010 Present Value of CO_2 emissions savings over the 100 years project life is equivalent to about 83 years worth of the 2010savings – ie to £58k. As noted above, this result is for Scenario A, which assumes that all journeys from Carno station were previously made by car. In the case of Scenario B, under which 10% of the journeys from Carno station would previously have been made by bus, the CO_2 emissions saving is reduced by 10%.

6.4 Landscape and townscape

The two sites under consideration lie on the edge of the existing village.

The existing station site is already developed, lying alongside a disused factory, with the old station buildings still in place. There is a road crossing the railway but no other significant vantage points. Although a new platform and passenger shelter would be required, no significant impacts are identified as existing development screens the site from most of the few nearby houses. The factory site is likely to be redeveloped at some point in the future.

The site at the south-east end of the village does not immediately adjoin the settlement but is fairly close and is also near the village sewage treatment works. A minor road is nearby and a public footpath crosses a field, and the railway, at the edge of the site. The site is highly visible from these minor routes and from a small number of houses in and around the village, two houses being quite close. The passenger shelter would be lower than the road bridge and sloping field forming the background in views as one approaches the site. There would be some loss of agricultural land to access and car parking. The impact identified here is slight.

The sites do not lie in, or near, any National Park or Area of Outstanding Natural Beauty and do not affect any Conservation Area. A full appraisal, involving Landmap, may be required at stage 2 but the Landmap information available on the Countryside Council for Wales website identifies no particular issues and classifies the landscape as moderate.

With respect to the impact that has been identified at the south-eastern site, the landscape here contains the linear features of the road, the railway (on a slight embankment then cutting as it approaches the road bridge) and the river. It is visually contained to the south-east by a road bridge. Another linear feature, the station platform would not significantly detract from the current landscape features and the passenger shelter would not rise to the level of the nearby road bridge. No remedial measures are envisaged. The access and car parking would be at a low level, between the embankment and the road but behind an existing hedge. Access from the A470 already exists in the form of a fairly new road which forms the south-east boundary of the built up area at this point.

Overall, following more detailed appraisal at stage 2, the outcome would be likely to be - no effect or neutral effect (or slight adverse effect in respect of the south-eastern site).

6.5 Biodiversity

The two sites under consideration lie on the edge of the existing village. The site at the existing village consists of the land within the railway boundary fences, to the south-east of the level crossing, and is partly bounded by the original station platform and buildings. A small area outside the boundary fences might be required for car parking. The site to the south-east of the village consists of land within the railway boundary fences and adjoining semi-improved agricultural land.

This document has been prepared during the winter and this is not an appropriate time for a detailed survey of the land, nor for classifying it within the National Vegetation Classification (NVC). If required, such work should be carried out at stage 2.

At both sites, the land is extensively man-modified, consisting of embankment, cutting (at the south-eastern site), ballast and scrub. At the south-eastern site the adjoining land has been agriculturally improved, now consisting mainly of semi-improved grassland which is reverting with some *Juncus* infestation. Both sites are near to, but not adjoining, the Afon Garno, a typical mid-Wales soft water river. The existing station site is also close to the Afon Cledan, which runs into the Afon Garno.

No land at, adjoining or near to the sites has been designated as Special Protection Area under the terms of the European Birds Directive or as Special Area of Conservation under the terms of the Natural Habitat Regulations (Wales), in implementation of the European Habitats Directive. Neither has any such land been notified under the terms of the Wildlife and Countryside Act 1981 (as amended) as being of Special Scientific Interest. The nearest Site of Special Scientific Interestis at Llyn Mawr, some two and a half miles away and at a much higher altitude. No National or Local Nature Reserve would be affected by the proposals. No other designations concern the sites. Without detailed survey, it is believed that no species covered by particular legislation, or of conservation concern, occur at the sites on a regular basis other than badgers, which are common in the area, and some species of bats, which would be unlikely to be affected by the proposed development.

The only impacts identified are scrub clearance and rainwater run-off into nearby watercourses. Scrub clearance would affect a relatively small proportion of the embankment scrub along the railway line and would have an insignificant effect. This impact would be even further reduced if any clearance took place at a time of year when nesting birds would not be present. Run-off from the station and the small area of car park would not be significantly different from that at the sites currently. At the existing station site the run-off would be almost identical as a station platform, buildings and a road border the site. At the south-eastern site, a road runs between the site and the river and run-off would be of a similar quality. The outfall from Carno Sewage Treatment Works is at the downstream end of this stretch of river.

Overall, following more detailed appraisal at stage 2, the outcome would be likely to be - no effect or neutral effect and the only mitigation required is likely to be that suggested above regarding scrub clearance.

6.6 Soil

Transport schemes can have an impact on the soil of an area, which in turn can strongly influence the vegetation and general habitats the area can support. However, as discussed in #6.5 above, the main impact on the latter would be the loss of vegetation over the area of the car park (grass) and beneath the platform (embankment scrub) if the station were constructed at the south eastern site. Excavation of platform foundations would inevitably cause temporary soil disturbance at both sites, but this is not a significant concern, as the soil is not expected to be contaminated in either case.

6.7 Heritage

Re-opening the original Carno station would provide significant heritage benefits to the village. The preservation of the old station, a Grade 2 listed building, and its return to use as a functional part of the Cambrian railway would re-establish a very real link to the village's past: here local heritage would not merely be looked at passively, but would be used daily by Carno people and visitors alike.

Locating the re-opened station in the original building offers other heritage opportunities too. Laura Ashley may justly be considered Carno's greatest benefactor of the last century, and there is strong local feeling that the history of the company she began here should be recounted by a small museum in the village. The old station waiting room would provide an excellent location. That the building is owned by the Laura Ashley company itself only adds to the potential synergy; (an office for Carno Community Council upstairs would enable overheads to be shared).

An overall score for Heritage of +3 on the 7-point scale would seem appropriate.

The Eastern station site lies between the road bridge over the Afon Carno and the road bridge over the railway, on the minor road to the north of the river between Carno and Clatter. Approximately 250 metres from the parish church and just north of the village sewage farm, it is a location with no features of heritage value near enough to be affected. No listed buildings or conservation areas lie within the area affected by the station.

Depending upon its exact position, the station's structure might be visible from some parts of the church cemetery, although many trees stand in the way of the sightlines.

Overall it is felt that the heritage impact of a new station here would be a neutral '0' on the seven-point scale.

6.8 Water Environment

For stage 1, no detailed appraisal of water quality has been carried out. The background to the issue of the water environment is largely as set out in the section on biodiversity above and concerns potential run-off into the Afon Garno and Afon Cledan.

Run-off is not identified as a significant impact. At the existing station site any such run-off would be minor in relation to adjoining land and a station platform, with shelter, would not involve significant harmful substances. During construction care would be needed with fuel and lubricants of construction vehicles. At the south-eastern site, the road between the site and the Afon Garno drains into the river, both directly and through a short culvert. A further culvert carries water from land above and beyond the railway. Run off from these sources, plus any surface water from the railway, would not be significantly increased by a railway platform and shelter. Again, during construction care would be needed with fuel and lubricants of construction vehicles.

Overall, following more detailed appraisal at stage 2, the outcome would be likely to be - no effect or neutral effect.

7. SOCIAL IMPACTS

7.1 Overview

Section 7.1.2 of WelTAG states that social objectives, such as improving quality of life, health and welfare, are central to policy in Wales, as in other places. This is apparent from the Welsh Assembly Government's main policy document "Wales: A Better Country":
"We will continue to promote social inclusion by focusing all of our policies – economic, health, education, transport, housing, the Welsh language and culture and the environment – on building stronger and more sustainable communities across Wales".

WelTAG recommends that the appraisal of social impacts should focus on five topics as follows:
- Transport safety;
- Personal security;
- Permeability;
- Physical fitness; and
- Social inclusion.

As set out below, the re-opening of Carno station would yield significant benefits in reducing road accidents, improving physical fitness and promoting social inclusion. On the other hand, the impacts on personal security and permeability would be slight or non-existent.

7.2 Transport Safety

The removal of traffic from the road network following the re-opening of Carno station would produce a clear benefit through the reduction of road accidents. This benefit has been estimated using the methodology set out in the Dept of Transport Design Manual for Roads and Bridges, Volume 13 "Economic Assessment of Road Schemes", Section 1 "The COBA Manual", Part2 "The Valuation of Costs and Benefits" (referred to as DMRB below).

Vehicle kilometres removed

The starting point is the number of vehicle kilometres per annum removed from the road system as a result of the station opening. Initially these are based on Scenario A, which assumes that 100% of journeys made from Carno station would previously have been made by car. Accordingly, the 2010 modal shift from car to rail is estimated at 3700(44)+6641(6) = 202,646 passenger miles – ie 326,100 km. Taking the 2010 car occupancy as 1.6429 as before (#5.2.3), the number of vehicle kilometres removed from the road system per annum comes to 198,500 km.

DMRB accident costs for 2000

The DMRB provides statistics on
a) the number of personal injury accidents (pia) per million vehicle km for different road types in 2000

b) the proportion of fatal, serious and slight accidents for different road types in 2000
c) the number of casualties per pia for different road types in 2000
d) the death/injury costs per casualty in 2002 prices
e) the cost per accident of damage to property, police time and insurance administration in 2002 prices for different kinds of roads

In the case of car journeys removed by the re-opening of Carno station, the vast majority of the car journeys removed from the road system would formerly have been on older single carriage way rural A roads without speed restriction – in particular the route East to Shrewsbury. Accordingly the applicable values for the parameters listed above are:
a) Personal injury accidents (pia) per million vehicle km: 0.381
b) Accident proportions: 0.038 fatal, 0.207 serious and 0.755 slight
c) Number of casualties per pia: 0.0436 fatal, 0.2855 serious and 1.286 slight
d) Death/injury costs per casualty: £1,249,890 fatal, £140,450 serious and £10,830 slight
e) Cost per accident of damage to property, police time etc: £11,753 fatal, £5,104 serious, £3,194 slight and £2,064 damage only. (The number of damage only accidents is given as 7.8 times the number of personal injury accidents.)

These figures allow the cost of an accident to be calculated at £128,535 at 2002 prices, giving an accident cost in the year 2000 per million vehicle kilometres of £128,535 x 0.381, or £48,972, for older single carriage way rural A roads without speed restriction (in 2002 prices). See spreadsheet "Carno Stn Accident Benefits PV Scenario A v1.xls". The 198,500vehicle km saved by Carno station re-opening would therefore have equated to an accident cost saving of £9721 in 2000 at 2002 prices.

Extrapolation of accident costs to 2010

Fortunately, both accident rates and the proportions of fatal and serious casualties in accidents are slowly reducing over time. The DMRB therefore specifies a 2.7% reduction in accident rates each year from 2000 to 2010, 1.35% each year from 2011 to 2020 and 0.676% each year from 2021 to 2030, with no reductions beyond 2030. Similar annual change rates are specified for parameters b) and c) above. These enable the accident cost per million vehicle kilometres to be calculated for each year after 2000 at 2002 prices for each type of accident quoted above. The resulting total accident cost in the year 2010 per million vehicle kilometres is £33,007 for older single carriage way rural A roads without speed restriction (in 2002 prices) – much lower than the 2000 figure of £48,972 because of reducing accident rate and severity. See spreadsheet "Carno Stn Accident Benefits PV Scenario A v1.xls".

The DMRB notes that accident costs themselves do not stay constant, and recommends that they are assumed to rise with GDP/head. Figures for actual or forecast annual rises in GDP/head are given for each year, which indicate that GDP/head will be 1.2116 times the 2002 level in 2010. Hence the 2010 cost of accidents per million vehicle kilometre become £39,990 at 2002 prices. The 198,500 vehicle km saved by Carno station re-opening would therefore equate to an accident cost saving of £7938 under Scenario A. See spreadsheet "Carno Stn Accident Benefits PV Scenario A v1.xls".

Discounted accident cost savings

The 2010 Present Value of accident cost savings over the 100 years period is reduced by the discount rates of 3.5%/3% and by declining accident rates but is increased by the growth of accident costs in-line with GDP/head, initial passenger growth, and the very slow reduction in car occupancies. As a result, the 2010 Present Value under Scenario A is equivalent to about 73 years worth of the 2010 accident cost savings – ie to £583k. In the case of Scenario B, under which 10% of the journeys from Carno station would previously have been made by bus, the accident cost saving is reduced by 10%.

7.3 Personal Security

Personal security is taken to mean not only relative freedom from risk of attack or robbery but freedom from the fear of such an incident. When appraising any new transport facility it is necessary to assess the

both actual risk of crime and the perception of such risk and to compare these with a "do nothing" scenario and alternatives if any.

7.3.1 Overall Risk of Crime

Table 7.3 below compares the number of incidents recorded by British Transport Police with the station footfall for the Cambrian network.

TABLE 7.3: PERSONAL SECURITY
CAMBRIAN LINE FOOTFALL 2005-2006 & RECORDED CRIME FIGURES 2007–2008

Stations	Medium Sized Stations	Entries	Exits	Total Pass	Incidents	Incidents per 100k passengers
Shrewsbury		661334	655518	1316852	84	6.4
Abeystwyth		123791	117560	241351	8	3.3
Newtown		45786	46098	91884	6	6.5
Machynlleth		44253	45284	89537	14	15.6
Welshpool		21806	21186	42992	8	18.6
Borth		18901	20625	39526	3	7.6
Caersws	X	12389	12512	24901	4	16.1
Dovey Jn		475	618	1093	1	91.7
Total (Main Line)				531284	44	8.3
Barmouth		82416	79804	162220	13	8.0
Harlech		56327	56324	112651	10	8.9
Tywyn		52486	52596	105082	7	6.7
Pwllheli		29096	28789	57885	6	10.4
Penrhyndeudrath		24288	24155	48443	0	0.0
Porthmadog		22659	21970	44629	10	22.4
Fairbourne		18729	19181	37910	14	36.9
Llyngwril		15470	15909	31379	6	19.2
Aberdyfi	X	11438	11862	23300	0	0.0
Talybont	X	8083	9198	17281	1	5.8
Llanaber	X	8116	8082	16198	0	0.0
Dyffryn Ardudwy	X	6889	7531	14420	2	13.8
Criccieth	X	6439	6610	13049	3	23.1
Llanbedr	X	5208	5509	10717	6	56.1
Minffordd	X	5138	4901	10039	1	9.9
Penhelig	X	4367	4427	8794	1	11.4
Morfa Mawddach	X	3032	3429	6461	0	0.0
Talsarnau		1934	2337	4271	0	0.0
Llandanwg		1660	1746	3406	0	0.0
Penychain		1456	1540	2996	0	0.0
Tonfanau		1129	1067	2196	0	0.0
Pensarn		845	913	1758	0	0.0
Tygwyn		744	855	1599	0	0.0
Llandecwyn		544	604	1148	0	0.0
Abererch		470	568	1038	0	0.0
Total (Coast Line)				738870	80	10.8
Grand total				2587006	208	8.0
Total (Medium Sta)	X			145160	18	12.4
Moving Offences					40	
Total Offences					248	
Serious Offences	At Stations	Passengers			40	
Serious Offences	On trains	Passengers			20	

Ignoring the inevitable statistical fluctuations affecting the smaller stations, it will be seen that the incident rate expressed in terms of number per 100,000 passengers per year varies from 6 at Shrewsbury to 8 at the main line stations and 11 at those on the coast line. There is a tendency for the crime rate to be higher at the smaller stations, possibly through a lower level of surveillance. The figure for medium use stations (6,000 to 30,000 footfall) at settlements similar to Carno is 12, although these stations are mostly

on the coast line where the incidence of crime is higher. It should be noted that the latest available figures for station footfall are for 2005/6 while those for recorded crime are for 2007/8; since there has been about an 8% rise in passenger numbers over that period, the crime rate figures will be high by the same percentage. Taking all these factors into account, it is estimated that the figures for reported criminal incidents at a station at Carno either at the western or the eastern site would be of the order of 10 incidents per 100,000 passengers per year. This equates to one incident per year for an annual usage of 10,300 (#5.1.5).

7.3.2 Comparison of Risk

The table below is a comparison between the present risk of crime at the point of departure in Carno with the potential risk at a station. The passenger figures are taken from #5.1.5/6 although the allocation of the 3700 additional rail passengers currently travelling by bus and car between those modes of transport is somewhat speculative. The risk to existing passengers travelling from Caersws station is presumed to be unchanged while that for car travellers form home will be effectively zero. No data is available for the risk to a traveller waiting at a typical village bus-stop such as at Carno; it is assumed to be about half that at a rural station on account of the greater level of informal surveillance.

	Passengers/Annum	Crime/100k Pass
Car from home	1700	0
Bus	2000	5
Car to Caersws Sta	6600	10
Total	10300	7
Train from Carno	10300	10

Although some of the data are uncertain, the analysis does indicate an increase in recorded crime per 100,000 passengers per year from 7 incidents under the "do nothing" option to 10 if a station is built at either site at Carno, an increase of 50%. The alternative road based options have not been considered since there will be little difference in risk to personal security between these options and "do nothing".

While risks are only compared at the point of departure or arrival in Carno, it is probable that the postulated 3700 passengers switching from car to train could lead to a higher overall risk to personal security while in transit but it should be substantially less than the 50% figure above. In any event the actual risk would be small since, as Table 7.3 shows, over 80% of recorded crime on the Cambrian network occurs at stations.

7.3.3 Perception of Crime

The crime figures discussed above are for all recorded crime, the number of incidents leading to actual injury or loss to passengers being 20% of the total (Table 7.3). However, since all incidents will tend to heighten the fear of crime and so lead to an erosion of personal security, it is realistic to take all recorded crime into account when assessing personal security. Direct measurement of the public perception of crime is difficult, particularly when comparing specific localities. It is doubtful if the exercise would yield worthwhile data in this instance.

7.3.4 Conclusion
The overall risk of crime at a station at Carno is predicted at about 10 incidents per year per 100,000 passengers; this represents an increase 50% in average risk over that currently experienced by potential users of Carno station. At the estimated usage, this equates to an average of one incident per year, with a serious crime causing injury or loss to a passenger at the station once every five years.

It is concluded that the actual risk of crime at Carno station will be small but by no means negligible. If ignored, it will magnify into an exaggerated fear of crime and inhibit the use of the station. It is important that consideration be given in any design process to security indicators such as those set out in table 1 of the Security Sub-Objective at section 3.4.2 in the WebTag scheme. This identifies the main design issues

as treatment of perimeters and entrances, surveillance (formal and informal), landscaping, lighting and emergency call facilities. While the size of the station may not justify the provision of facilities such as continually monitored CCTV, careful planning is essential to create an environment which not only is safe but creates an assurance of safety.

7.3.5 <u>References</u>

British Transport Police (Wales and Western Area Headquarters)
Recorded Crime Figures - Overview for Period 10/04/2007 - 31/03/2008

Network Rail
Station Footfall Figures 2005/06

Department for Transport
Transport Analysis Guidance Website
WebTag Security Sub-Objective TAG Unit 3.4.2

7.4 Permeability

Station opening will not involve the blockage of any rights of way, nor open up any new through footpaths, so there will be no impact on permeability.

7.5 Physical Fitness

Walking and cycling would both be boosted by the re-opening of the station, and driving would be reduced with the availability of the rail travel option. Many Carno residents using the railway would walk or cycle to and from the station.

Incoming green tourism to Carno – there are several existing and forthcoming ventures based in and near the village – would include walking and cycling elements, with people being able to bring bicycles by train, adding extra possibilities to their holiday.

It is believed that the Physical Fitness impact of a new station in Carno here would be moderately positive, '++' on the seven-point scale.

7.6 Social Inclusion

For the purposes of a WelTag appraisal social inclusion may be taken as synonymous with accessibility (7.6.1) i.e. access by public transport.

7.6.1 <u>Social Inclusion Report</u>

Six criteria are set out to determine the necessity for a Social Inclusion Report (7.6.3-12).

	Score
1. Nature of planning exercise	2
2. Cost	0
3. Area affected	0
4. Purpose	1
5. Significant results from standard SI appraisal	3
6. Inconclusive results from standard SI appraisal	1

The results of the above analysis are not totally conclusive and, although a full SIR is probably not required in the light of the relatively small scale of the projects under consideration, it may be necessary to seek advice (7.6.5).

7.6.2 <u>Standard Social Inclusion Appraisal (Stage 1)</u>

Eight indicators are set out at 7.6.18. comprising the proportion of households in the target area able to reach four given destinations by public transport within 90 and 60 minutes respectively at specified times of day.

Approximately two thirds of the inhabitants of Carno live in the village and are within 15 minutes walk of any potential bus stop or station, while the remainder are sparsely distributed over a substantial area and would normally only be able to access the village by car. The Social Inclusion Appraisal may only therefore be applied to the 500 or so people living in the village.

Table 7.6 below gives the estimated travelling times (assuming a waiting time at Carno of 5 minutes) and indicates whether or not the 90 and 60 minute criteria are fulfilled. An estimate of the percentage of the population that meet these criteria has not been attempted, since this will normally be either very near 67% or zero. The final two columns show when there is an improvement in meeting the standard criteria; it is to be noted that this is particularly marked in the cases of travel to Shrewsbury and travel in the evening.

	Present Position			Carno Station			Saving		Improve	
	Time	90 m	60 m	Time	90 m	60 m	Time	90m	60 m
Royal Shrewsbury Hospital	2h 43m	n	n	1h 25m	y	n	1h 18m	y	
Bronglais Hospital, Aberystwyth	1h 31m	n	n	1h 18m	n	n	0h 13m	y	

1. Time to District General Hospital, departing 10.00 - 12.00, Tuesday

2. Time to "Learning Provider", departing 7.00 - 9.00, Tuesday.

	Time	90 m	60 m	Time	90 m	60 m	Time	90m	60 m
Colleg Powys, Newtown	0h 23m	y	y	0h 23m	y	y	0h 0m		
Newtown High School	0h 40m	y	y	0h 35m	y	y	0h 5m		
Bro Dyfi, Machynlleth	x	n	n	0h 41m	y	y		y	y
Llanidloes High School	1h 37m	n	n	1h 7m	y	n	0h 30m	y	

3. Time to "Key Centres", departing 10.00 - 12.00, Tuesday

	Time	90 m	60 m	Time	90 m	60 m	Time	90m	60 m
Shrewsbury	2h 19m	n	n	1h 1m	y	y	1h 18m	y	y
Aberystwyth	1h 35m	n	n	1h 6m	y	n	0h 29m	y	
Newtown	0h 29m	y	y	0h 20m	y	y	0h 9m		

4. Time to "Key Centres", departing 20.00 - 22.00, Saturday

	Time	90 m	60 m	Time	90 m	60 m	Time	90m	60 m
Shrewsbury	x	n	n	1h 1m	y	n		y	
Aberystwyth	x	n	n	1h 6m	y	n		y	
Newtown	x	n	n	0h 20m	y	y		y	y

y = yes   n = no   x = not accessible by public transport

It is assumed that the travelling time by train between Carno and Caersws would be 8 minutes and that the current timetables for both bus and train are followed apart from a train stop at Carno. School buses are ignored

TABLE 7.6: SAVINGS IN TRAVELLING TIME BY PUBLIC TRANSPORT FOLLOWING REOPENING OF CARNO STATION

7.6.3 Conclusion

While it may be necessary to seek advice on the necessity for a full Social Inclusion Report and while a stage 2 standard appraisal will probably be required, the preliminary conclusion is that the provision of a station at Carno will be moderately beneficial in terms of improving social inclusion.

< APPRAISAL OF OPTION 3: DEDICATED RAIL LINK BUS TO CAERSWS STATION >

8. ECONOMIC IMPACTS

8.1 Demand forecast

There are two possible approaches to forecasting the likely demand for a dedicated minibus service connecting with trains at Caersws station. The first is to base it on the actual demand for a similar existing service elsewhere, making adjustments for different populations served, journey frequency and journey length, whilst the second is to take the passenger demand already predicted for Carno station and adjust it downwards to reflect the greater inconvenience of the minibus journey to Caersws.

Although examples of bus services connecting with trains at a suitable railhead are not uncommon, they typically serve town centres rather than rural villages, so the adjustment needed for population size is unlikely to be simply pro-rata, as this would not reflect the greater relative convenience of a minibus serving villages.

Accordingly it has been decided to adopt the second approach outlined above.

New rail journeys

There is no reason to suppose that car-owners not already using the train service from Caersws would start doing so following the introduction of the connecting minibus service. On the other hand, non-car owners would be likely to switch to the rail service at Caersws if they could use a connecting minibus. It is therefore optimistically assumed that the number of new rail journeys from Caersws made with the aid of the minibus would be equal to the number of new rail journeys predicted for Carno station (3700 per annum) multiplied by the proportion of non car-owners in the Powys population (17.5%) – ie 648.

Existing rail journeys from Caersws diverted to minibus

Clearly the minibus service would be attractive to those currently using bus or taxi to reach Caersws to the extent that nearly all existing Carno/Llanbrymair bus and taxi users would be likely to switch to the more convenient minibus. In addition, it is anticipated that about half of existing car drivers would switch to the minibus service to avoid tying up cars at Caersws station unnecessarily. Accordingly, on the basis that 90% of existing Carno/Llanbrynmair users of Caersws station reach it by car and 10% by bus or taxi, it is predicted that the proportion of existing Caersws rail users switching to the minibus would be (10 + 0.5x90) = 55% . Thus the number of existing rail journeys to and from Caersws diverted to the minibus service per annum is predicted to be 0.55 x 6641 = 3653.

8.2 Transport Economic Efficiency

8.2.1 <u>Introduction</u>

Transport Economic Efficiency (TEE) is a measure of the economic impacts traditionally evaluated by Cost Benefit Analysis. The TEE Table compares user benefits under the headings of travel time savings, vehicle operating cost savings, reliability improvements with user charges and compares the revenue received by the service provider with the operating and investment costs incurred. These benefits and costs, which accrue over the lifetime of the project, are expressed in "Present Value" terms using conventional discounting over time.

The WelTAG guidance recommends that the appraisal period chosen should be the asset life of the longest lived asset in the scheme (#5.2.11). However, as the annual cost of the minibus service includes vehicle depreciation, the appraisal period used should not have a significant impact on the Transport Economic Efficiency, so it has been decided to adopt the same 100 year appraisal period as for the station in order to simplify the calculations.

The derivation of the Present Values of time savings, vehicle operating cost savings, user charges etc are described in the following sections.

8.2.2 <u>User benefits: Time savings</u>

These are considered under three headings as follows:
    a) New rail journeys from Caersws by non-car owners
    b) Existing rail journeys from Caersws diverted to minibus – former bus users
    c) Existing rail journeys from Caersws diverted to minibus – former car users

New rail journeys from Caersws by non-car owners

As in #5.2.2, the reduction in journey time between Carno and Shrewsbury is considered to be representative of all new rail journeys. The current bus time table permits four journeys to be made between Carno and Shrewsbury in each direction, with a change of buses required at Newtown in every case, and the average overall journey time in both directions is 139.4 minutes.

The journey time to Shrewsbury by minibus and train would be 61.5 minutes, based on a 10 minute journey in the minibus, 5 minute connection time at Caersws and a 46.5 train journey time, and this would give a time saving of 77.9 minutes. At a 2010 value of non-work time of £5.20/hour at 2002 prices, this time saving is valued at £6.75. For the estimated 647 journeys per year in this category, the total annual time saving is 840 hours.

Existing rail journeys from Caersws diverted to minibus – former bus users

Reference to the current bus and train timetables indicates waiting times at Caersws of 27 minutes and 62 minutes to catch the 08:33 and 10:33 Eastbound trains respectively. On the return journey, connections are better, with waiting times of 16 minutes and 29 minutes after the 14:13 and 16:13 train arrivals. Taking an average waiting time at Caersws of 33.5 minutes, a "waiting time value factor" of 1.5 as before and a 10 minute bus journey time between Carno and Caersws, the mean weighted journey time to catch the train at Caersws or to return after alighting from one comes to 60.25 minutes. However, with the minibus service, the waiting time at Caersws would be only 5 minutes, yielding a time saving of 45.25 minutes. At a 2010 value of non-work time of £5.20/hour at 2002 prices, this time saving is valued at £3.92. For the estimated 6641 x 0.10 = 664 journeys per year in this category, the total annual time saving is 501 hours.

Existing rail journeys from Caersws diverted to minibus – former car users

The journey times of former car-users switching to the minibus will be extended by the five minute connection time at Caersws and the one minute slower journey time, making six minutes in all. For the estimated 6641 x 0.45 = 2988 journeys per year in this category, the total annual time loss is 299 hours.

Total net annual time saving

Adding the above time savings together, the total comes to 840 + 501 – 299 = 1042 hours.

Discounted benefit

In the case of Carno Station re-opening, an annual time saving of 628 hours resulted in a 2010 Present Value of annual time savings over 100 years of £267 k at 2002 prices. Accordingly the corresponding figure for the minibus service is £267k x(1042/628) = £443 k.

8.2.3 <u>User benefits: Vehicle operating cost savings</u>

Caersws rail users switching from private car to minibus for the journey to Caersws would save on vehicle operating costs. The average mileage saved per trip by minibus users from Carno, Llanbrynmair and Glantwymyn is estimated at 9.32 miles on the basis of the population split. For 2988 journeys per year and a car occupancy of 1.643, the annual vehicle kilometres saved is 9.32 x (1.609/1.643) x 2988 = 27,264 km.

Discounted benefit

In the case of Carno Station re-opening, an annual vehicle kilometre saving of 198,500 km resulted in a 2010 Present Value of the annual vehicle kilometre saving over 100 years of £1015 k at 2002 prices. Accordingly the corresponding figure for the minibus service is £1015k x(27264/198500) = £139 k.

8.2.4 <u>User charges/operator revenues</u>

The user charges paid by minibus passengers as fares provide the revenue for the service provider. It is assumed that the minibus fare would be the same as the bus fare, so there would be no change in the user charges paid by former bus passengers.

Caersws rail users switching from private car to minibus for the journey to Caersws would pay fares which they had not done before. These would be based on the annual passenger mileage of 9.32 x 2988 = 27,833 miles. Assuming a 15 pence per mile fare at 2006 prices, the total annual increase in user charges would be £4175, equivalent to £3713 at 2002 prices.

Discounted benefit

The 2010 Present Value of fare revenue over the 100 year period is reduced by the discount rates of 3%/3.5%, but increased by the initial passenger growth. As a result, the 2010 Present Value is equivalent to about 49 years worth of the 2010 fare revenue savings – ie to £181 k at 2002 prices.

8.2.5 <u>Investment and operating costs</u>

Investment cost

There will be a small cost associated with the provision of a minibus stance at Caersws station. However, this is likely to be very small in relation to the operating cost, so will be ignored.

Operating cost

The estimated minibus daily operating cost, assuming the vehicle is based at Llanbrynmair, is £350 at 2008 prices (see #4.3.2) or £109,200 per annum. This reduces to an annual cost of £91,711 at 2002 prices. The 2010 Present Value of minibus operating costs over the 100 year period is equivalent to 29.72 years worth after discounting at 3%/3.5% - ie to £2,726 k at 2002 prices.

8.2.6 <u>Grant/subsidy</u>

In view of the limited expected revenue, it would be necessary for most of the operating costs to be provided by direct subsidy. It is assumed that the full difference between operating costs and fare revenue would be met by WAG subsidy. The Present Value of the annual subsidy would be £2,726k - £181k = £2,545k at 2002 prices.

8.2.7 PV of TEE benefits

The net present value of the Transport Economic Efficiency Benefits over the 100 year appraisal period is calculated at £0.401 m in 2002 prices. This is the same figure as that for the user benefits, as operating costs over and above revenue are assumed to be met by a WAG grant. The Transport Economic Efficiency table is reproduced below (Table 8.1):

TEE for Llanbrynmair - Carno - Caersws Station Minibus Link

Net Present Value (£ million)					
IMPACT GROUP	Total All Modes	Car/LGV	Bus & Coach	Rail Passenger	Walking/ Cycling
Consumers - User benefits					
Travel Time	0.443		0.443		
Vehicle Operating Costs	0.139	0.139			
User Charges	-0.181		-0.181		
Reliability	0				
During construction/maint	0				
[1] *Net Consumer benefits*	0.401	0.139	0.262		
Private Sector Provider Impacts					
Revenue (= - User charges)	0.181		0.181		
Operating Costs	-2.726		-2.726		
Investment Costs					
Grant/subsidy	2.545		2.545		
[3] *Subtotal*	0		0		

Present Value of TEE Benefits | 0.401 | = [1]+[3]

TABLE 8.1: TRANSPORT ECONOMIC EFFICIENCY OF MINIBUS LINK

8.2.8 Analysis of monetised costs and benefits

The analysis of monetised costs and benefits for the minibus link is presented in Table 8.2 below – using values for the benefits of greenhouse gas emission savings and reduction in road accidents scaled down from the Carno station values in #6.3 and #7.2 respectively. The estimated benefit cost ratio is only about 0.19, reflecting the high operating cost for the service.

Savings in accident costs (at 2002 prices)

Annual private car vehicle kilometres saved - Minibus scheme	**27264.26**
Annual private car vehicle kilometres saved - Carno station	198502
Present value of accident cost savings over 100 years (£) - Carno station	583276
Hence PV of accident cost savings over 100 years (£) - Minibus scheme	**80113**

Greenhouse gas emission savings (at 2002 prices)

Annual private car vehicle kilometres saved - Minibus scheme	**27264.26**
Annual private car vehicle kilometres saved - Carno station	198502
Present value of GHG emissions savings over 100 years (£) - Carno station	57875
Hence PV of GHG emissions savings over 100 years (£) - Minibus scheme	**7949.1**

Public Accounts

PV of Grant/subsidy from Welsh Assembly Government (at 2002 prices)	(£ millions)	**2.544**

ANALYSIS OF MONETISED COSTS AND BENEFITS

		Present Value (£ millions)
Noise		
Greenhouse Gas Emissions		0.007
Accidents		0.08
Present Value of TEE benefits		0.401
Present Value of benefits (PVB)	[1]	0.488
Present Value of annual grant/subsidy (PVC)	[2]	2.544
Net Present Value		-2.056
Benefit Cost Ratio	[1]/[2]	**0.191**

TABLE 8.2 ANALYSIS OF MONETISED COSTS AND BENEFITS FOR MINIBUS LINK

8.3 Economic Activity and Location Impacts

8.3.1 Access to employment

The principal economic benefits flowing from the minibus link to Caersws station would be
7. Expansion of the job opportunities available to Carno residents
8. Expansion of the labour pool available to enterprises in the Severn valley corridor, Machynlleth and Aberystwyth

The comments under these headings in #5.3.1 and #5.3.2 in regard to the re-opening of Carno station would in general apply to the minibus service, but to a reduced extent because of reduced convenience and increased journey times.

8.3.2 Laura Ashley site redevelopment

The relative inconvenience of the minibus service would also mean that it would not significantly assist the regeneration of the former Laura Ashley site or the development of tourist enterprises.

8.3.3 Access to conferences at Carno Community Centre

As set out in #4.3, the minibus connections at Caersws would be arranged to facilitate out and back journeys on the same day to destinations to the East. Because of the way the train timetable is structured, connections for people visiting Carno for the day from the East would be sub-optimal, with a wait at Caersws of about 20 minutes. Consequently, the minibus service would not be particularly attractive for delegates attending conferences at Carno Community Centre.

9. ENVIRONMENTAL IMPACTS

The impact of the minibus service on noise, local air quality and greenhouse gas emissions would be very small because of the small reduction in car journeys that would result. The impact on greenhouse gas emissions has been quantified and included in the analysis of monetised costs and benefits – see Table 8.2.

The minibus service would have a slight impact on townscape in Caersws because of the provision of a stance adjacent to Caersws station. However, there would be no impact on landscape, biodiversity, soil, heritage or water environment.

10. SOCIAL IMPACTS

10.1 Transport Safety

The small reduction in car journeys resulting from the introduction of the minibus service would have a small benefit in reducing road accidents. This has been quantified and included in the analysis of monetised costs and benefits – see Table 8.2.

10.2 Personal Security

This has not been investigated. However, it is not expected that the incidence of crime on the minibus service would differ from the very low levels on the existing bus service.

10.3 Permeability

The minibus service would have no effect on permeability.

10.4 Physical Fitness

Many former car-users would walk or cycle to the minibus stops, resulting in a slight positive impact on Physical Fitness.

10.5 Social Inclusion

The minibus service would enable non-car owners to make considerable time savings on journeys to centres East of Newtown. In particular the journey times to the "Key Centre" of Shrewsbury, and to the

Royal Shrewsbury Hospital would be reduced by 28 minutes for those formerly using the bus to catch the train at Caersws and 78 minutes for those formerly travelling by bus throughout. (These savings do not include Waiting Time Value Factors). On the other hand, the minibus would not improve journeys to Aberystwyth at all.

The minibus service would permit early evening journeys to be made to Newtown by rail from Caersws, which would be of benefit to young people.

< APPRAISAL OF OPTIONS 4: MODIFY X85 BUS SERVICE TO CONNECT WITH TRAINS AT CAERSWS STATION >

11. ECONOMIC IMPACTS

11.1 Demand forecast

It is envisaged that the modified X85 bus service would provide the same connections into and out of trains at Caersws as the minibus link in Option 3 – ie the bus would connect into the East bound trains in the first half of the day (beginning with the 08:33 departure) and out of the West bound trains in the second half of the day (ending with the 20:13 arrival).

The key difference between the minibus service and the retimed X85 bus would be poorer connections at Caersws. In the Eastbound direction, a connection time of 10 minutes might be necessary to allow for variability in bus times from Machynlleth. In the Westbound direction a longer connection time – say 15 minutes - would be necessary to accommodate poor punctuality of the rail service. Although it would probably be acceptable for the bus to wait a further 5 minutes for a late running train, there would inevitably be occasions when arriving rail passengers would miss their bus connection.

Given that the retimed X85 bus service would connect with the same trains as the minibus, but with less convenient connections, it seems reasonable to estimate the demand for the retimed X85 as a proportion of the minibus demand estimate, as follows:

New rail journeys

It is assumed that the attractiveness of the X85/rail combination is half that of the minibus/rail combination, resulting in an annual number of new rail journeys of 648 x 0.5 = 324.

Existing rail journeys from Caersws diverted to retimed X85

Clearly those currently using bus to reach Caersws station would continue to do so, and would probably be joined many of those currently using a taxi. In addition, it is anticipated that about a quarter of existing car drivers would switch to the retimed X85 service to avoid tying up cars at Caersws station unnecessarily. Accordingly, on the basis that 90% of existing Carno/Llanbrynmair users of Caersws station reach it by car and 10% by bus or taxi, it is predicted that the proportion of existing Caersws rail users switching to the minibus would be (10 + 0.25x90) = 32.5% . Thus the number of existing rail journeys to and from Caersws diverted to the minibus service per annum is predicted to be 0.325 x 6641 = 2158.

11.2 Transport Economic Efficiency

11.2.1 <u>Introduction</u>

Transport Economic Efficiency (TEE) is a measure of the economic impacts traditionally evaluated by Cost Benefit Analysis. The TEE Table compares user benefits under the headings of travel time savings, vehicle operating cost savings, reliability improvements with user charges and compares the revenue received by the service provider with the operating and investment costs incurred. These benefits and costs, which accrue over the lifetime of the project, are expressed in "Present Value" terms using conventional discounting over time.

The WelTAG guidance recommends that the appraisal period chosen should be the asset life of the longest lived asset in the scheme (#5.2.11). For the retimed X85 bus service calling at Caersws station, the longest lived asset is the bus turning circle to be provided there, for which the asset life is 25 years. However, it has been decided to adopt the same 100 year appraisal period as for the station in order to simplify the calculations.

The derivation of the Present Values of time savings, vehicle operating cost savings, user charges etc are described in the following sections.

11.2.2 <u>User benefits: Time savings</u>

These are considered under three headings as follows:
- d) New rail journeys from Caersws by non-car owners
- e) Existing rail journeys from Caersws on retimed X85 bus – former bus users
- f) Existing rail journeys from Caersws diverted to retimed X85 bus – former car users

New rail journeys from Caersws by non-car owners

As in #5.2.2, the reduction in journey time between Carno and Shrewsbury is considered to be representative of all new rail journeys. The current bus time table permits four journeys to be made between Carno and Shrewsbury in each direction, with a change of buses required at Newtown in every case, and the average overall journey time in both directions is 139.4 minutes.

The journey time to Shrewsbury by retimed X85 bus and train would be 69 minutes, based on a 10 minute journey in the bus, 12.5 minute mean connection time at Caersws and a 46.5 train journey time. However, the connection time at Caersws should be multiplied by the "waiting time value factor" of 1.5, giving a weighted journey time of 75.25 minutes and an overall time saving of 64.1 minutes. At a 2010 value of non-work time of £5.20/hour at 2002 prices, this time saving is valued at £5.55. For the estimated 324 journeys per year in this category, the total annual time saving is 346 hours.

Existing rail journeys from Caersws on retimed X85 bus – former bus users

Reference to the current bus and train timetables indicates waiting times at Caersws of 27 minutes and 62 minutes to catch the 08:33 and 10:33 Eastbound trains respectively. On the return journey, connections are better, with waiting times of 16 minutes and 29 minutes after the 14:13 and 16:13 train arrivals. Taking an average waiting time at Caersws of 33.5 minutes, a "waiting time value factor" of 1.5 as before and a 10 minute bus journey time between Carno and Caersws, the mean weighted journey time to catch the train at Caersws or to return after alighting from one comes to 60.25 minutes. However, with the retimed X85 bus service, the waiting time at Caersws would be reduced to 12.5 minutes on average, or 18.75 minutes including the "waiting time value factor" of 1.5, yielding a time saving of 31.5 minutes. At a 2010 value of non-work time of £5.20/hour at 2002 prices, this time saving is valued at £2.73. For the estimated 6641 x 0.10 = 664 journeys per year in this category, the total annual time saving is 349 hours.

Existing rail journeys from Caersws diverted to retimed X85 bus – former car users

The journey times of former car-users switching to the retimed X85 bus would be extended by the 12.5 minute average connection time at Caersws (18.75 minutes including the "waiting time value factor" of 1.5) and the one minute slower journey time, making 19.75 minutes in all. For the estimated 6641 x 0.225 = 1494 journeys per year in this category, the total annual time loss is 492 hours.

Total net annual time saving

Adding the above time savings and subtracting the time loss together, the net time saving comes to 346 + 349 - 492 = 203 hours.

Discounted benefit

In the case of Carno Station re-opening, an annual time saving of 628 hours resulted in a 2010 Present Value of annual time savings over 100 years of £267 k at 2002 prices. Accordingly the corresponding figure for the minibus service is £267k x(203/628) = £86 k.

11.2.3 <u>User benefits: Vehicle operating cost savings</u>

Caersws rail users switching from private car to the retimed X85 bus for the journey to Caersws would save on vehicle operating costs. The average mileage saved per trip by X85 bus users from Carno, Llanbrynmair and Glantwymyn is estimated at 9.32 miles on the basis of the population split. For 1494 journeys per year and a car occupancy of 1.643, the annual vehicle kilometres saved is 9.32 x (1.609/1.643) x 1494 = 13,632 km.

Discounted benefit

In the case of Carno Station re-opening, an annual vehicle kilometre saving of 198,500 km resulted in a 2010 Present Value of the annual vehicle kilometre saving over 100 years of £1015 k at 2002 prices. Accordingly the corresponding figure for the retimed X85 service is £1015k x(13632/198500) = £70 k.

11.2.4 <u>User charges/operator revenues</u>

The user charges paid by X85 bus passengers as fares provide the revenue for the service provider. There would be no change in user charges for existing bus passengers.

Caersws rail users switching from private car to the retimed X85 bus for the journey to Caersws would pay fares which they had not done before. These would be based on the annual passenger mileage of 9.32 x 1494 = 13,917 miles. Assuming a 15 pence per mile fare at 2006 prices, the total annual increase in user charges would be £2087, equivalent to £1856 at 2002 prices.

Discounted benefit

The 2010 Present Value of fare revenue over the 100 year period is reduced by the discount rates of 3%/3.5%, but increased by the initial passenger growth. As a result, the 2010 Present Value is equivalent to about 49 years worth of the 2010 fare revenue savings – ie to £91 k at 2002 prices.

11.2.5 <u>Investment and operating costs</u>

Investment cost

As noted in #4.41, investment would be required in a bus-turning circle at Caersws station. The cost of the turning circle has been assumed to be the same as for one provided at Eastleigh, Hampshire in 2006 – ie £110,000. This equates to £98 k at 2002 prices. It is assumed that this cost would be funded by WAG through the TraCC regional transport budget.

Operating cost

It is assumed that the operation of the X85 service would need to be extended two hours into the evening in order to provide a connection out of the 20:13 train arrival at Caersws. This is considered desirable to allow for day return trips to the West Midlands or Cardiff and for commuting. The estimated additional daily operating cost is £70 at 2008 prices (see #4.4.2) or £21,480 per annum. This reduces to an annual cost of £18,342 at 2002 prices. The 2010 Present Value of the additional annual cost of the 2 hour extension to the hours of operation of the X85 bus service over the 100 year period is equivalent to 29.72 years worth after discounting at 3%/3.5% - ie to £545 k at 2002 prices.

11.2.6 <u>Grant/subsidy</u>

In view of the limited expected revenue, it would be necessary for most of the operating costs to be provided by direct subsidy. It is assumed that the full difference between operating costs and fare revenue would be met by WAG subsidy. The Present Value of the annual subsidy would be £542 k - £91 k = £451 k at 2002 prices.

11.2.7 <u>PV of TEE benefits</u>

The net present value of the Transport Economic Efficiency Benefits over the 100 year appraisal period is calculated at £0.065 m in 2002 prices. This is the same figure as that for the user benefits, as operating costs over and above revenue are assumed to be met by a WAG grant. The Transport Economic Efficiency table is reproduced below (Table 11.1):

TEE for Re-timed X85 Bus Service

	Net Present Value (£ million)				
IMPACT GROUP	Total All Modes	Car/LGV	Bus & Coach	Rail Passenger	Walking/ Cycling
Consumers - User benefits					
Travel Time	0.086		0.086		
Vehicle Operating Costs	0.07	0.07			
User Charges	-0.091		-0.091		
Reliability	0				
During construction/maint	0				
[1] *Net Consumer benefits*	0.065	0.07	-0.005		
Private Sector Provider Impacts					
Revenue (= - User charges)	0.091		0.091		
Operating Costs	-0.545		-0.545		
Investment Costs					
Grant/subsidy	0.454		0.454		
[3] *Subtotal*	0		0		
Present Value of TEE Benefits	0.065	= [1]+[3]			

TABLE 11.1: TRANSPORT ECONOMIC EFFICIENCY OF RE-TIMED X85 BUS SERVICE

11.2.8 Analysis of monetised costs and benefits

The analysis of monetised costs and benefits for the re-timed X85 bus service is presented in Table 11.2 below – using values for the benefits of greenhouse gas emission savings and reduction in road accidents scaled down from the Carno station values in #6.3 and #7.2 respectively. The estimated benefit cost ratio is only about 0.20, reflecting the modest user benefits and the relatively high operating cost for extending service into the early evening.

Savings in accident costs (at 2002 prices)

Annual private car vehicle kilometres saved - retimed X85 scheme	**13632.13**
Annual private car vehicle kilometres saved - Carno station	178651.8
Present value of accident cost savings over 100 years (£) - Carno station	524934
Hence PV of accident cost savings over 100 years (£) - Retimed X85 scheme	**40055.4**

Greenhouse gas emission savings (at 2002 prices)

Annual private car vehicle kilometres saved - retimed X85 scheme	**13632.13**
Annual private car vehicle kilometres saved - Carno station	178651.8
Present value of GHG emissions savings over 100 years (£) - Carno station	52087.08
Hence PV of GHG emissions savings over 100 years (£) - Retimed X85	**3974.535**

Public Accounts

PV of Grant/subsidy from Welsh Assembly Government (£ millions) (at 2002 prices)	**0.552**

ANALYSIS OF MONETISED COSTS AND BENEFITS

		Present Value (£ millions)
Noise		
Greenhouse Gas Emissions		0.004
Accidents		0.04
Present Value of TEE benefits		0.065
Present Value of benefits (PVB)	[1]	0.109
Present Value of annual grant/subsidy (PVC)	[2]	0.552
Net Present Value		-0.443
Benefit Cost Ratio	[1]/[2]	**0.197**

TABLE 11.2 ANALYS1S OF MONETISED COSTS AND BENEFITS FOR RE-TIMED X85 BUS SERVICE

11.3 Economic Activity and Location Impacts

11.3.1 Access to employment

The principal economic benefits flowing from the retimed X85 bus service would be:
9. Expansion of the job opportunities available to Carno residents
10. Expansion of the labour pool available to enterprises in the Severn valley corridor, Machynlleth and Aberystwyth

The comments under these headings in #5.3.1 and #5.3.2 in regard to the re-opening of Carno station would in general apply to the retimed X85 bus service service, but to a considerably reduced extent because of reduced convenience and significantly increased journey times.

11.3.2 Laura Ashley site redevelopment

The relative inconvenience of the retimed X85 bus service would also mean that it would not significantly assist the regeneration of the former Laura Ashley site or the development of tourist enterprises.

11.3.3 Access to conferences at Carno Community Centre

As set out in #4.4, the X85 bus service would be retimed to facilitate out and back journeys on the same day to destinations to the East. Because of the way the train timetable and bus timetable are structured, it is very unlikely that there would be suitable connections at Caersws for people visiting Carno for the day. Consequently, the re-timed X85 bus service would not assist delegates wishing to travel by train to conferences at Carno Community Centre.

12. ENVIRONMENTAL IMPACTS

The impact of the retimed X85 bus service on noise, local air quality and greenhouse gas emissions would be very small because of the small reduction in car journeys that would result. The impact on greenhouse gas emissions has been quantified and included in the analysis of monetised costs and benefits – see Table 11.2.

The retimed X85 bus service would have a small impact on townscape in Caersws because of the provision of a bus turning circle adjacent to Caersws station. However, there would be no impact on landscape, biodiversity, soil, heritage or water environment.

13. SOCIAL IMPACTS

13.1 Transport Safety

The small reduction in car journeys resulting from the retiming of the X85 bus service would have a small benefit in reducing road accidents. This has been quantified and included in the analysis of monetised costs and benefits – see Table 11.2.

13.2 Physical Fitness

Many former car-users would walk or cycle to the bus stops, resulting in a slight positive impact on Physical Fitness.

13.3 Social Inclusion

The retimed X85 bus service would enable non-car owners to make considerable time savings on journeys to centres East of Newtown. In particular the journey times to the "Key Centre" of Shrewsbury, and to the Royal Shrewsbury Hospital would be reduced by 21 minutes for those formerly using the bus to catch the train at Caersws and 71 minutes for those formerly travelling by bus throughout. (These savings do not include Waiting Time Value Factors). On the other hand, the retimed X85 bus would not improve journeys to Aberystwyth at all.

The retimed X85 bus service would permit early evening journeys to be made to Newtown, which would be of benefit to young people.

< APPRAISAL OF OPTIONS 1 – 4 >

14. APPRAISAL SUMMARY

The two options for re-opening Carno station, Options 1 and 2, have generally similar impacts, and so are covered on a single Appraisal Summary Table, Table 14.1/2. The impacts of the minibus link service between Llanbrynmair and Caersws station via Carno, Option 3, and of the re-timed X85 bus service, Option 4, are summarised in Appraisal Summary Tables 14.3 and 14.4 respectively. Finally the four options are compared in Table 14.5. All four tables may be found at the end of this section.

Transport Economic Efficiency

It is immediately apparent from Table 14.5 that the user benefits yielded by the re-opened station (£ 1.0 m) are significantly greater than those arising from the minibus link (£0.4 m) and the re-timed X85 bus service (£0.07 m), both in absolute terms and in relation to cost. The Present Value of the operating cost of the minibus link over the 100 year appraisal period is £2.5 m – much greater than the central estimate of station capital cost of £1.0 m. As for the re-timed X85 bus service, the Present Value of the additional operating cost (as a result of the extra evening journey) over the 100 year appraisal period is much less at £0.5 m, but the predicted user benefits are much less too.

The high operating costs of both the minibus link and the extended hours X85 bus service result in a benefit cost ratio (BCR) of only 0.2, indicating that neither option is anywhere near being economically justifiable, even when the impacts on accident rates and CO_2 emissions are taken into account.

By contrast, the benefit cost ratio of the station is estimated to be in the range 1.6 to 1.9 (depending on the proportion of station users who would previously have travelled by bus rather than by car – see #5.2.12), indicating a healthy return on investment.

Economic Activity and Location Impacts

All four options would improve access to jobs, which is a key objective following the closure of the Laura Ashley factory. However, re-opening the station would be significantly more effective than the other options, because it avoids the inconvenience of an extra journey leg and the connectional delays entailed.

Environmental impacts

None of the options have significant adverse environmental impact. The re-opened station and the retimed X85 bus service would have modest benefits in reducing air pollution and greenhouse gas emissions.

Social impacts

All four options would yield significant benefits in terms of reduced social exclusion, because of much improved access by public transport to Shrewsbury and its Hospital. There would also be significant benefits in road accident reduction and improved physical fitness, but these benefits would be much greater for Options 1 & 2 than for Options 3 & 4. The Present Value of the accident savings over 100 years is £0.5 m for Options 1 & 2, £0.1 m for Option 3 and £0.04 m for Option 4.

Transport Policy Objectives

The re-opening of Carno station would be likely to meet all seven Transport Policy Objectives, but the performance of the minibus and bus options would be inferior in all cases apart from TPO 5 "Enable evening access to nearby towns". The minibus and bus options would not encourage car-owners to access jobs in Welshpool, Aberystwyth, Shrewsbury, Telford and Birmingham by pubic transport (TPO 2) nor would it increase the percentage of local journeys made by public transport to 25%. (TPO 3). The minibus

and bus options would also be less attractive than a re-opened Carno station for Green travel to holidays centred in Carno (TPO 6) or for delegates attending conferences (TPO 7).

Conclusions

- The estimated Benefit Cost Ratio for re-opening Carno Station of 1.6 – 1.9 is an order of magnitude greater than those for the minibus and bus options and indicates that station scheme would constitute a worthwhile investment to meet the transport needs of the community
- Re-opening the station would considerably expand the job opportunities open to Carno residents and encourage modal shift
- No significant adverse environmental impacts are foreseen for any of the options
- All options would reduce social exclusion
- All options would deliver benefits in reducing road accidents and increasing physical fitness, but these would be much greater in the case of station re-opening
- Re-opening the station would substantially meet all the Transport Policy Objectives, whereas the minibus and bus options would meet a subset of the TPO's less effectively.

TABLE 14.1/2: APPRAISAL SUMMARY TABLE – OPTIONS 1 & 2

OPTION 1 & 2: CARNO STATION RE-OPENING: OPTION 1: AT EXISTING SITE ; OPTION 2: AT NEW SITE AT EAST END OF VILLAGE				
Criterion	**Ref**	**Assessment**	**Distribution**	**Significance**
Economy				
Transport Economic Efficiency	#5.2	PV of TEE benefits: £1m – from time savings and savings in vehicle operating costs gained by former drivers Capital Cost: £0.7m - £1.5m (#4.1.3). Central estimate £1m BCR (including accident savings): 1.62 (Scenario A) to 1.90 (Scenario B)	All travellers to and from Carno/Llanbrynmair	Significant beneficial effect
EALI	#5.3	Improves access to jobs; encourages redevelopment of Laura Ashley site; encourages new local tourist enterprises; attracts knowledge based businesses; enhances Carno as conference venue	Largely local	Significant beneficial effect
Environment				
Noise	#6.1	Very small reduction in road traffic noise, local reduction in train noise	Main East West road corridor	Slight benefit
Local Air Quality	#6.2	Very small reduction in road NO_2 and PM_{10} emissions	Main East West road corridor	Slight benefit
Greenhouse gas emissions	#6.3	Very small reduction in road CO_2 emissions	Irrelevant	Slight benefit
Landscape	#6.4	Option 1: Negligible impact Option 2: Station & car park would be new features in the landscape, highly visible from adjacent car park and a few houses		1: Neutral effect 2: Neutral or slight adverse effect
Bio-diversity	#6.5	No designated sites affected by either site. No adverse effects foreseen		Neutral
Soils	#6.6	Option 1: Negligible impact, as construction is at existing station site Option 2: Foundations required on existing embankment		1. Neutral effect 2. Neutral effect
Heritage	#6.7	Option 1: The original stone station building would regain its natural setting beside the platform. Potential for integration of community use with provision of waiting facilities Option 2: Station would stand apart from existing buildings		1. Large benefit 2. Neutral effect
Water environment	#6.8	Increase run-off from platform would have marginal impact		Neutral effect
Social				
Transport Safety	#7.2	Reduced car mileage would result in a reduction in road accidents. PV of accident savings = £0.5m	Main East West road corridor	Moderate benefit
Personal security	#7.3	One crime incident per year predicted, with 20% chance of injury or loss	Carno station	Slight adverse effect
Permeability	#7.4	No effect		Neutral effect
Physical fitness	#7.5	Walking and cycling would be encouraged, as station access by these means would avoid tying up family cars	Carno residents	Moderate benefit

Social inclusion	#7.6	Marked benefits for travel to Shrewsbury and travel in the evening	Carno residents, visitors without cars	Moderate benefit
Transport Planning Objectives				
1. Access to jobs – non car owners		Partially met with 2 hourly train service; Substantially met if 2 hr gaps filled at commuting times		Large benefit
2. Access to jobs – car owners		Partially met with 2 hourly train service; Substantially met if 2 hr gaps filled at commuting times		Moderate benefit
3. Increase % of local journeys made by public transport to 25%		Station has potential to meet this objective		Moderate benefit
4. Increase % of longer journeys made by public transport to 50%		Provision of station has potential to meet this objective		Moderate benefit
5. Enable evening access to nearby towns		Provision of station meets this objective		Moderate benefit
6. Enable travel to Green holidays centred in Carno		Provision of station meets this objective		Moderate benefit
7. Enable access by public transport to all Wales conferences in Carno		Provision of station meets this objective		Moderate benefit
Public acceptability: Strong public support for station re-opening has been demonstrated at public meetings and other events since 2002, by the 120 people who turned out for a crowd photograph in April 2007, by the 800 strong petition submitted to the National Assembly of Wales in June 2007 and by the large public attendance at the NAW Enterprise and Learning Committee Hearing into the petition in September 2007				
Acceptability to other stakeholders: ATW recognise that the re-opened station would have great benefits for the local community, but are concerned that the additional journey time would discourage other passengers (Mike Bagshaw, para [218], 4.9.07 NAW ELC hearing). However, ATW would be ready to stop trains at a new Carno station if asked to do so (*ibid*, para [222])				
Technical and operational feasibility: Option 1:Network Rail have concerns about the track curvature and the adverse gradient W of the level track at the existing station site and, but their predecessor, Railtrack, foresaw "no insurmountable problems". Option 2: Network Rail may have concerns about siting a station on a 1 in 171 gradient				
Financial affordability and deliverability: The mid-range cost estimate of £1m is affordable in relation to the benefits that would flow, with a BCR in excess of 1.6 for a 2 hourly service without peak hour service enhancement. Station construction would be straightforward at the site with unforeseen difficulties unlikely.				
Risks: The chief risk is capital cost over-run. The wide range of cost estimates (£0.5m -£1.7m) reflects uncertainties about both the platform length required and the degree to which projected industry wide cost savings in modular platform construction can be realised. The former uncertainties should be resolved through dialogue with Network Rail and the train operator and the latter through dialogue with modular station suppliers and station construction companies.				

TABLE 14.3: APPRAISAL SUMMARY TABLE: OPTION 3

OPTION 3: MINIBUS LINK TO CAERSWS STATION FROM LLANBRYNMAIR AND CARNO				
Criterion	**Ref**	**Assessment**	**Distribution**	**Significance**
Economy				
Transport Economic Efficiency	#8.2	PV of TEE benefits: £0.4m – from time savings and savings in vehicle operating costs gained by former drivers PV of operating cost: £2.7m BCR = 0.19 (including accident savings)	All travellers to and from Carno/Llanbrynmair	
EALI	#8.3	Improves access to jobs		Slight benefit
Environment				
Noise	#9	Negligible	Main East West road corridor	Neutral effect
Local Air Quality	#9	Reduction in car emissions offset by minibus emissions	Main East West road corridor	Neutral effect
Greenhouse gas emissions	#9	Reduction in car emissions offset by minibus emissions	Irrelevant	Neutral effect
Landscape	#9	None		No effect
Bio-diversity	#9	None		No effect
Soils	#9	None		No effect
Heritage	#9	None		No effect
Water environment	#9	None		No effect
Social				
Transport Safety	#10.1	Reduced car mileage would result in a reduction in road accidents. PV of accident savings = £0.1m	Main East West road corridor	Slight benefit
Personal security	#10.2	Unlikely to change from bus to minibus		No effect
Permeability	#10.3	No effect		No effect
Physical fitness	#10.4	Walking and cycling would be encouraged, as station access by minibus would avoid tying up family cars	Carno residents	Slight benefit
Social inclusion	#10.5	Useful benefits for travel to Shrewsbury and travel in the evening	Carno residents, visitors without cars	Moderate benefit
Transport Planning Objectives				
1. Access to jobs – non car owners		Partially met with 2 hourly train service		Moderate benefit
2. Access to jobs – car owners		No improvement		No effect
3. Increase % of local journeys made by public transport to 25%		Minibus service unlikely to bring about any increase		No effect
4. Increase % of longer journeys made by public transport to 50%		Provision of minibus would increase %, but not to anywhere near the 50% target		Slight benefit
5. Enable evening access to nearby towns		Provision of minibus meets this objective		Moderate benefit
6. Enable travel to Green holidays centred in Carno		Provision of minibus helps meet this objective, but many would find it inconvenient because of poor connections and need for luggage transfer		Slight benefit

7. Enable access by public transport to all Wales conferences in Carno	Provision of minibus helps meet this objective, but many would find it inconvenient because of poor connections	Slight benefit
Public acceptability: There has been no call for such a service, which would be viewed as far inferior to an re-opened station		
Acceptability to other stakeholders: This has not been investigated		
Technical and operational feasibility: No technical obstacles to the provision of the minibus service are anticipated		
Financial affordability and deliverability: The operating cost of the service would far exceed the anticipated benefits		
Risks: Not considered		

TABLE 14.4: APPRAISAL SUMMARY TABLE: OPTION 4

OPTION 4: RE-TIMED X85 BUS SERVICE				
Criterion	**Ref**	**Assessment**	**Distribution**	**Significance**
Economy				
Transport Economic Efficiency	#11.2	PV of TEE benefits: £0.07m – from time savings and savings in vehicle operating costs gained by former drivers PV of operating cost: £0.55m BCR = 0.20 (including accident savings)	All travellers to and from Carno/Llanbrynmair	
EALI	#11.3	Improves access to jobs		Slight benefit
Environment				
Noise	#12	Negligible	Main East West road corridor	Neutral effect
Local Air Quality	#12	Reduction in car emissions	Main East West road corridor	Slight Benefit
Greenhouse gas emissions	#12	Reduction in car emissions	Irrelevant	Slight Benefit
Landscape	#12	None		No effect
Bio-diversity	#12	None		No effect
Soils	#12	None		No effect
Heritage	#12	None		No effect
Water environment	#12	None		No effect
Social				
Transport Safety	#13.1	Reduced car mileage would result in a reduction in road accidents. PV of accident savings = £0.04m	Main East West road corridor	Slight benefit
Personal security		No effect		No effect
Permeability		No effect		No effect
Physical fitness	#13.2	Walking and cycling would be encouraged, as station access by bus would avoid tying up family cars	Carno residents	Slight benefit
Social inclusion	#13.3	Useful benefits for travel to Shrewsbury and travel in the evening	Carno residents, visitors without cars	Moderate benefit
Transport Planning Objectives				
1. Access to jobs – non car owners		Partially met with 2 hourly train service, but connections at Caersws not all that attractive		Slight benefit
2. Access to jobs – car owners		No improvement		No effect
3. Increase % of local journeys made by public transport to 25%		Retimed X85 bus service unlikely to bring about any increase		No effect
4. Increase % of longer journeys made by public transport to 50%		Retiming of X85 bus service would increase %, but not to anywhere near the 50% target		Slight benefit
5. Enable evening access to nearby towns		Extension of hours of operation of X85 bus meets this objective		Moderate benefit
6. Enable travel to Green holidays centred in Carno		Retiming of X85 bus helps meet this objective, but many would find it inconvenient because of poor connections and need for luggage transfer		Slight benefit

7. Enable access by public transport to all Wales conferences in Carno	Retiming of X85 bus would not provide the connections at Caersws needed for this	No benefit
Public acceptability: There is a consensus that the bus service should connect with the trains at Caersws, but this solution would be viewed as far inferior to an re-opened station		
Acceptability to other stakeholders: This has not been investigated		
Technical and operational feasibility: No technical obstacles to the revision of the X85 bus service timings are anticipated, but the needs of Coleg Powys students would need to be taken into account.		
Financial affordability and deliverability: The cost of extending the hours of operation of the X85 bus service into the early evening would significantly exceed the anticipated benefits		
Risks: Not considered		

TABLE 14.5 SUMMARY OF APPRAISAL OF DIFFERENT OPTIONS

Appraisal criteria	Summary of significance/other quantitative finding					
	OPTIONS 1 & 2: CARNO STATION RE-OPENING		OPTION 3: MINIBUS LINK LLANBRYNMAIR-CARNO-CAERSWS		OPTION 4: RE-TIMED X85 BUS SERVICE	
	Assessment	Score	Assessment	Score	Assessment	Score
Economy						
Transport Economic Efficiency	PV of TEE benefits: £1.0 m Cost: £1.0 m central estimate BCR = 1.62 – 1.9	++	PV of TEE benefits = £0.40 m Cost: £2.5 m BCR = 0.19	--	PV of TEE benefits = £0.07 m Cost: £0.5 m BCR = 0.20	--
EALI	Improves access to jobs; Encourages redevelopment of Laura Ashley site & new local tourist enterprises; Attracts knowledge based businesses; Enhances conference venue	++	Improves access to jobs, but less effectively than Options 1 & 2	+	Improves access to jobs but less effectively than Options 1, 2 & 3	+
Environment						
Noise	Very small reduction	+	Negligible	0	Negligible	0
Local Air Quality	Very small emissions reduction	+	Negligible	0	Reduction in car emissions	+
Greenhouse gas emissions	Very small emissions reduction	+	Negligible	0	Reduction in car emissions	+
Landscape	Option 1: Negligible impact Option 2: Station & car park would be new features in the landscape	0 0 or -	None	0	None	0
Bio-diversity	No adverse effects foreseen	0	None	0	None	0
Soils	No adverse effects foreseen	0	None	0	None	0
Heritage	Option 1: The original station building would regain its natural setting beside the platform. Potential for community use Option 2: Station would stand apart from existing buildings	+++ 0	None	0	None	0
Water environment	Increase run-off from platform		None	0	None	0
Social						
Transport Safety	Reduced car mileage would result in a reduction in road accidents. PV of accident savings = £0.5m	++	Reduced car mileage would result in a reduction in road accidents. PV of accident savings = £0.1m	+	Reduced car mileage would result in a reduction in road accidents. PV of accident savings = £0.04m	+

Draft 3

Appraisal criteria	OPTIONS 1 & 2: CARNO STATION RE-OPENING		OPTION 3: MINIBUS LINK LLANBRYNMAIR-CARNO-CAERSWS		OPTION 4: RE-TIMED X85 BUS SERVICE	
Personal security	One crime incident per year predicted, with 20% chance of injury or loss	-	Unlikely to change from bus to minibus	0	No effect	0
Permeability	No effect	0	No effect	0	No effect	0
Physical fitness	Walking and cycling encouraged	++	Walking and cycling encouraged	+	Walking and cycling would be encouraged, as station access by bus would avoid tying up family cars	+
Social inclusion	Marked benefits for travel to Shrewsbury and travel in the evening	++	Useful benefits for travel to Shrewsbury and travel in the evening	++	Useful benefits for travel to Shrewsbury and travel in the evening	++
Transport Policy Objectives						
1. Access to jobs – non car owners	Partially met with 2 hourly train service; Substantially met if 2 hr gaps filled at commuting times	+++	Partially met with 2 hourly train service	++	Partially met with 2 hourly train service, but connections at Caersws not all that attractive	+
2. Access to jobs – car owners	Partially met with 2 hourly train service; Substantially met if 2 hr gaps filled at commuting times	++	No improvement	0	No improvement	0
3. Increase % of local journeys made by public transport to 25%	Station has potential to meet this objective	++	Minibus service unlikely to bring about any increase	0	Retimed X85 bus service unlikely to bring about any increase	0
4. Increase % of longer journeys made by public transport to 50%	Provision of station has potential to meet this objective	++	Provision of minibus would increase %, but not to anywhere near the 50% target	+	Retiming of X85 bus service would increase %, but not to anywhere near the 50% target	+
5. Enable evening access to nearby towns	Provision of station meets this objective	++	Provision of minibus meets this objective	++	Extension of hours of operation of X85 bus meets this objective	++
6. Enable travel to Green holidays centred in Carno	Provision of station meets this objective	++	Provision of minibus helps, but many would find it inconvenient because of poor connections and need for luggage transfer	+	Retiming of X85 bus helps, but many would find it inconvenient because of poor connections and need for luggage transfer	+
7. Enable access by public transport to all Wales conferences in Carno	Provision of station meets this objective	++	Provision of minibus helps, but many would find it inconvenient because of poor connections	+	Retiming of X85 bus would not provide the connections at Caersws needed for this	0

APPENDIX A5.1

CARNO STATION PASSENGER DEMAND FORECAST

A. CALCULATION OF WEIGHTED CATCHMENT POPULATIONS

Carno Population 2001	*646*	No of new houses	*52*
Increase since 2001	*120*	Household size	*2.32*
Carno Population 2007	**766**		

Access time = Drive time + Parking time

Access time elasticity	*-0.6*	Mean driving speed, V	*40*	mph
Maximum access time for unity access time weighting		5	min	
Mean time to drive to station in same village		2	min	Parking time 3 min

1. Caersws Catchment Population Weighted by distance decay factors

Ward	Distance	Population	Drive time	Access time, Ta	Access time weighting	Weighted population	Directional reduction factor	Adjusted Weighted populn
	x		Td	Td + Tp	wrt Caersws			
Caersws	0	1526	2	5	1	1526	1	1526
Llandinam	3	942	4.5	7.5	0.78405268	738	1	738
Trefeglwys	4	868	6	9	0.70280768	610	1	610
Carno	6	766	9	12	0.59138902	453	0.9561892	433
Llanidloes	8	2807	12	15	0.51728186	1452	1	1452
Llanidloes without	8	593	12	15	0.51728186	306	1	306
Llangurig	13	670	19.5	22.5	0.40557623	271	1	271
Llanbrynmair	11.25	958	16.875	19.875	0.43691577	418	0.9293259	388
Glantwymyn	16.25	1106	24.375	27.375	0.36055334	398	0.8876983	353
Sum		10236		Caersws catchment weighted population, P1				**6077**
				Weighted populn/gross populn				0.593689

2. Carno Catchment Population Weighted by distance decay factors

Ward	Distance	Population	Drive time	Access time, Ta	Access time weighting	Weighted population	Directional reduction factor	Adjusted Weighted populn
	x		Td	Td + Tp	wrt Carno			
Carno	0	766	2	5	1	766	1	766
Llanbrynmair	5.25	958	7.875	10.875	0.62737101	601	0.9293259	558
Glantwymyn	10.25	1106	15.375	18.375	0.45797903	506	0.8876983	449
Cefn Coch (part only)	7	100	10.5	13.5	0.55103824	55	1	55
Sum		2930		Carno catchment weighted population, P2				**1828**
				Weighted populn/gross populn				0.623891

3. Caersws Catchment Population after Carno re-opening Weighted by distance decay factors

Ward	Distance	Population	Drive time	Access time, Ta	Access time weighting	Weighted population	Directional reduction factor	Adjusted Weighted populn
	x		Td	Td + Tp	wrt Caersws			
Caersws	0	1526	2	5	1	1526	1	1526
Llandinam	3	942	4.5	7.5	0.78405268	738	1	738
Trefeglwys	4	868	6	9	0.70280768	610	1	610
Llanidloes	8	2807	12	15	0.51728186	1452	1	1452
Llanidloes without	8	593	12	15	0.51728186	306	1	306
Llangurig	13	670	19.5	22.5	0.40557623	271	1	271
Sum		7406		Caersws catchment weighted population, P1'				**4903**
				Weighted populn/gross populn				0.662031

New Caersws + Carno weighted population, P1' + P2   **6731**

Increase in weighted populn catchment after Carno re-opening, $\Delta P = (P1'+P2) - P1$ **654**

B. PASSENGER FORECASTS

1. Caersws

Recorded Caersws annual station useage 2005/6	28257	
Assumed annual growth rate in Caersws station useage (based on 2003/4 - 2005/6)	4	%
Predicted Caersws annual station useage 2010/11 *if Carno station does not open*, U1	**34378**	

2. Carno

Predicted Carno annual station useage 2010/11 = U1(P2/P1)	**10341**
Predicted Carno annual useage by new passengers 2010/11 = U1(ΔP/P1)	**3700**
Predicted Carno annual useage by ex Caersws passengers 2010/11 = U1(P2-ΔP)/P1	**6641**