Reversing Beeching – schemes within Devon

12th May 2020

Contents

Background

1. Michael Byng on 19th March 2020 asked JRC to provide a 'heads up' on the timetabling and hence track and signalling requirements, for four 'Reversing Beeching' schemes within Devon. The scope was subsequently expanded to include improvements to Tarka Line services (Exeter-Barnstaple) and the potential for rail to be re-opened in some format beyond Barnstaple.

2. Another four schemes are within Cornwall and will be reported on separately.

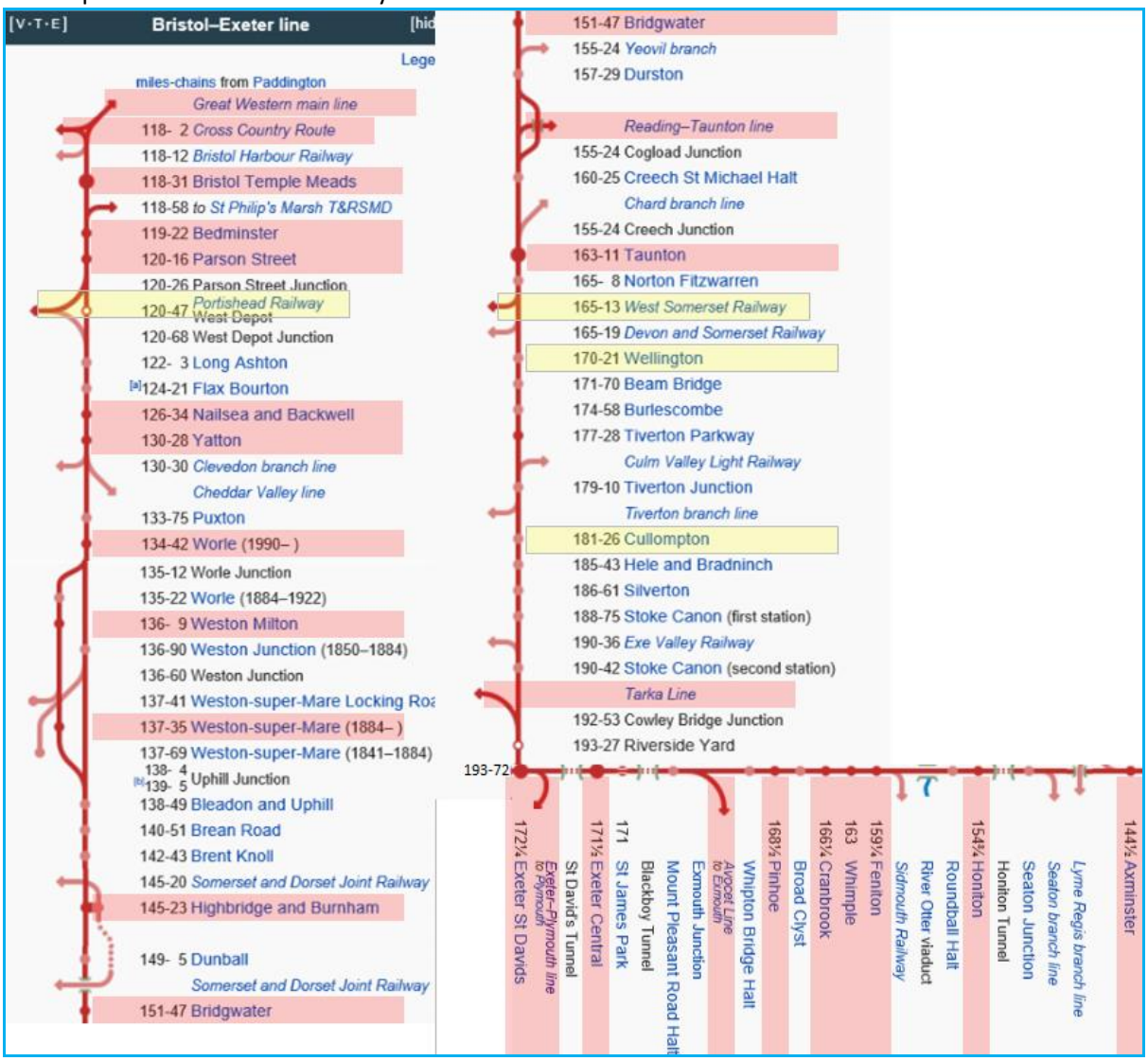
3. The four Devon schemes are:
   - A new station to serve Cullompton, on the Great Western main line between Tiverton Parkway and Exeter St. David's.
   - Three sections to achieve complete reopening of the former Southern Railway route between Exeter and Plymouth via Okehampton (locationally, to the north and west of Dartmoor)

4. The three Southern Railway sections are, in sequence of likely reopening:
   - Exeter to Okehampton (this would branch off the current North Devon Line, for which several analyses have also been requested and have been considered as a logical follow-on).
   - Plymouth to Tavistock (which has led to consideration of more extensive rail access to Plymouth city centre in an Annex).
   - Okehampton to Tavistock, possibly in two parts – to a Sourton A30 Parkway as a first element.

5. This is the sequence adopted for discussion purposes, with Cullompton considered first.

A: New station at Cullompton – and implications for Exeter-Taunton sector

6. The former location of Cullompton is shown on the accompanying track map. Current stations and routes open are shown in red/pink. Intended openings which may be relevant for a new Cullompton station are shown in yellow.



7. There was previously a station at Cullompton, open until 1964. By then Cullompton had only 4-6 trains on weekdays, and 3-4 on Sundays. Wikipedia has this to say on the proposed reopening:

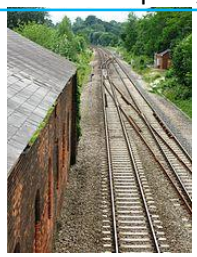
A station was opened at Cullompton when the railway opened on 1 May 1844. In 1931 the platforms were moved back, the lines were widened to provide two passing loops and a new goods shed and waiting room were constructed.[14] The station closed to passengers on 5 October 1964, but goods traffic continued until 8 May. The site is now occupied by Cullompton Services for the adjacent M5 motorway. There is land allocated for re-opening a station at Cullompton but forecast demand is relatively low and so the proposal is for the longer term.[15] In July 2016 Mid Devon District Council announced that it would spend £40k on engineering design work to test the viability of their concept for a new station. This matched a previous commitment by Taunton Deane Borough Council of £40k and £10k contributions from the town councils of Cullompton and Wellington.[16] As part of the "Devon Metro" plans by Devon County Council there would be a station near the location of the old station and could form part of the route. The station is a 'possible' long term proposal.[17]

8. Highlighted is the clear joint commitment by the adjoining local authority, Taunton Deane BC, for station reopening at Wellington. Consequently there is a joint dependency, that progress on both stations should be undertaken, even if one station opened before the other.

Cullompton station as it was in 1984, looking north from Station Road bridge – showing the space created in the 1930s for platform loops off the main line. The photograph may distort matters, but it appears that the main line has been slewed partly into the formation of a loop line.

9. The timetabling implication is evident, that any timetable which incorporated a Cullompton station, should also be able to accommodate a station at Wellington (in Somerset, so a separate authority for project approval), even if there were no other stations in addition.

10. Like Cullompton, Wellington had only a basic service at the end in 1964. As with Cullompton, a station at Wellington could be on reinstated loop lines, or with platforms simply on the main lines. A Wellington stop would, as shown in the photo adjoining, possibly be more effective on loops – but not for timetabling purposes, merely to remain closer to the main part of the town rather than be further west if the platforms were to be kept on the main line, as they might nowadays have to avoid the track crossover area because of the large overhang arising with longer modern carriages.



Goods shed and station site at Wellington

11. The present passenger railway service through Cullompton almost entirely comprises Intercity-style trains, with Great Western IEP expresses to London and CrossCountry expresses to Birmingham etc, many of whom call at the nearby Intercity railhead at Tiverton Parkway. This does imply that an additional layer of regional trains will be required, starting either at Taunton or Bristol (there is currently no regional service on the Taunton-Westbury section of railway).

12. Only the following trains (on an Monday-Friday pre-virus basis) are effectively regional trains, and (except where stated) also call at Tiverton Parkway:

Timings southbound from Taunton:	Timings northbound from Exeter St. David's:
06:21 Bristol TM-Penzance	06:33 Exeter St. David's-Cardiff Central
07:39 Bristol TM-Penzance	09:53 Penzance-Cardiff Ctl.(not Tiv.Pkwy)
09:54 Cardiff Central-Penzance	19:39 Exeter St. David's-Bristol TM
14:54 Cardiff Central-Penzance	19:48 Penzance-Cardiff Ctl.(not Tiv.Pkwy)
20:00 Cardiff Central-Penzance	21:14 Exeter St. David's-Bristol TM
23:08 Cardiff Central-Exeter St. David's	21:50 Exeter St. David's-Bristol TM
00:08 Bristol TM-Exeter St. David's	

Requirement for a regional service layer

13. Consequently there must be a new regional service layer introduced, which for practical passenger requirements ought to run via Exeter Central (which is in the centre of the city), and not rely on variable connections at Exeter St. David's. Otherwise people will stick to using their cars, as it is only (in the offpeak) 21 minutes by car for the 14 miles from Cullompton to central Exeter, and even peak car times are unlikely to be worse than 30-40 minutes, whereas a change of train would easily add 10-15 penalty minutes – and perceived as longer – on its own account at all times of the day.

14. With that proviso, there are generally only 3-4 Intercity type trains in each direction per hour (4-5 in peaks), with most normally calling at Tiverton Parkway as a North Devon railhead, so that the typical express running time between Exeter and Taunton is 26-27 minutes between Exeter and Taunton. It is possible that one freight or departmental path per hour in each direction will also require protection. However this is not seen as an obstacle.

15. Consequently there should be no fundamental capacity problem in accommodating at least one regional train per hour between Taunton and Exeter St. David's (with half-hourly being desirable but maybe not yet achievable unless there were a full timetable recast, or some four-tracking possibly by expanding the present Tiverton Junction loops as part of a Willand station project).

Capacity considerations for the Exeter Central- St. David's-Cowley Bridge Jcn section

16. It will be important to ensure that there is adequate capacity across Cowley Bridge Junction (see Okehampton schemes below) and through St. David's station and at Exeter Central, and wherever trains might need to reverse along the West of England line east of Exeter Central. As there are works required at Cowley Bridge Junction and Exeter St. David's to accommodate the increased services proposed by the reopening of the Southern Railway route to Plymouth and the improved service on an upgraded line to Barnstaple, these matters will be addressed in the proposals to reinstate the northern route between Exeter and Plymouth and an improved frequency between Exeter and Barnstaple.

Timetabling for regional services

17. On the main line, Intercity running times are 22-23 minutes between departing Taunton and arriving at Exeter St. David's, if it were a non-stop train over the 30¾ miles, and typically 26-27 minutes if calling at Tiverton Parkway. Slower regional trains are timed at up to 29 minutes. Addition of two further stops, with a 1 minute dwell time at each station plus braking and acceleration, could add a further 6 minutes, so that a 35 minute regional schedule is assumed, with trains timed to leave Taunton soon after the passage of a fast GW service, for example at xx:55 minutes past the hour. This would allow arrival at Exeter St. David's at x1:30, which on most

occasions would be adequately ahead of the next fast arrival from the east or north. There would be specific occasions when timings needed adjustment. Another stop, at Willand, might be problematic for Taunton trains because of limited time before the next express path.

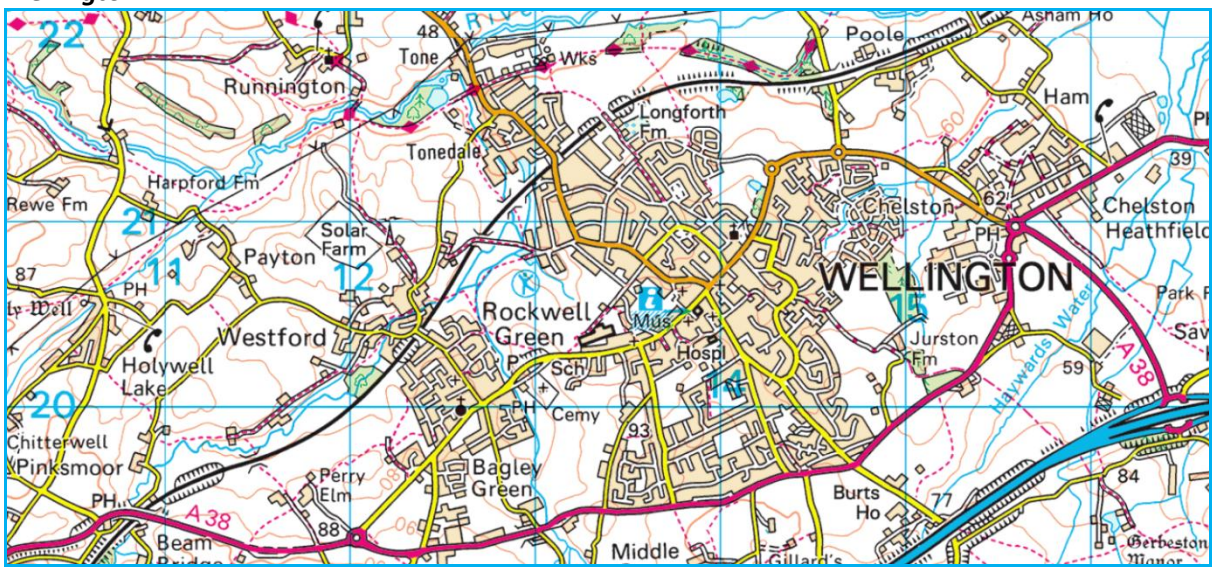
18. In the northbound direction, the slot for an hourly regional service is more constrained because of the timing sequence for the expresses. On most hours, a departure from St. David's around xx:00 would be satisfactory, arriving Taunton around xx:35, and with adequate reversal and recovery time for the next southbound departure. However a slightly later departure would be required during several hours to accommodate other expresses.

19. It is not realistic to plan a half-hourly regional service to Taunton without a full timetable recast. Half-hourly might however be possible to Cullompton, while a reversing siding at Willand (the former Tiverton Junction which still has loops) could be valid in its own right, and independently as a first phase of a project to reopen into Tiverton itself.

20. Plans to increase 'Devon Metro' service levels on the Exeter-Axminster section of the West of England line might assist, by creating paths which are simultaneously used by a Devon Metro train and by (the same train in actuality) a Taunton-Exeter regional service. In effect, Cullompton and Wellington could be part and parcel of a new Metro corridor to the growing hub of central Exeter, and – subject to detailed assessment of viable long term timetable slots with additional stopping margins – possibly several other additional stations or railheads to accommodate local travel to central Exeter. Mapping below suggests the following priorities in that respect (a kilometre = one map square):-

Options for intermediate stations and services

Wellington



21. Wellington is a first priority station. It is 7 miles SW of Taunton, between Taunton and Tiverton Parkway. The preferred location for a station is near Tonedale, as this maximises walkable origins from the community. It is a sizeable community as is evident, parish population approx 15,700 (2011 was 14,549). The urban area covers approx 5-6 sq.kms, similar to Dorchester at 6 kms, with

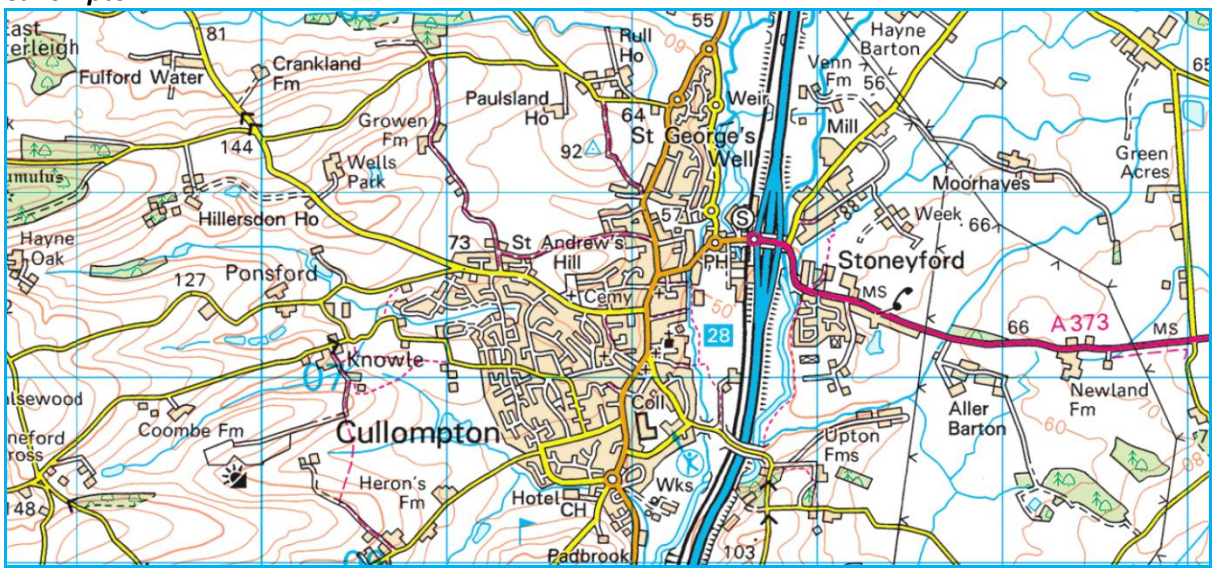
a population of ~12,800. However, if car parking were relevant from the 1-2 km distant catchment within Wellington and further in the parish, then a detailed review would be required about the location and scale of such a car park.

22. At a 5% rail usage and geared to an average of 600 journeys per year per inhabitant (a cautious estimate for *post-virus*, a more normal modelling volume would be 700), the rail volume for locally generally passenger entries and exits would be 470,000. This would put Wellington in a demand catchment also populated by (and let's just look locally in the SW) Dorchester South on the Waterloo main line at 421,000 in 2018-19 (plus Dorchester West at 151,000 (=572,000 in total), Barnstaple 432,000, St Austell 460,000, Yatton 468,000, Tiverton Parkway at 480,000 and Torquay at 483,000.

23. In other words, Wellington station should be open NOW, if a regional service were available. Even if you cut back any demand estimate by half, because only an hourly regional service looks initially feasible at Wellington, equivalent South West region stations open now (~235,000 entry and exit) are: Dawlish Warren 190,000, Penmere 191,000, Par 195,000, Frome 201,000, Highbridge & Burnham 205,000, Yeovil Jcn and Sherborne both 210,000, Falmouth Town 214,000, Castle Cary and Tisbury 222,000, Carbis Bay 228,000, Bodmin Parkway 234,000, Topsham (Devon Metro) 239,000, Exeter St. Thomas (Devon Metro) 243,000, Camborne 266,000, St. Erth 271,000.

24. The failure to provide a station at Wellington is unjustified and should be addressed. However it is clear that the station would require a specified regional service. This would be a Devon Metro station not served by Intercity trains, unless there were a business case for a few Intercities to call towards London/Birmingham in the morning and also to Plymouth, with evening return services.

Cullompton



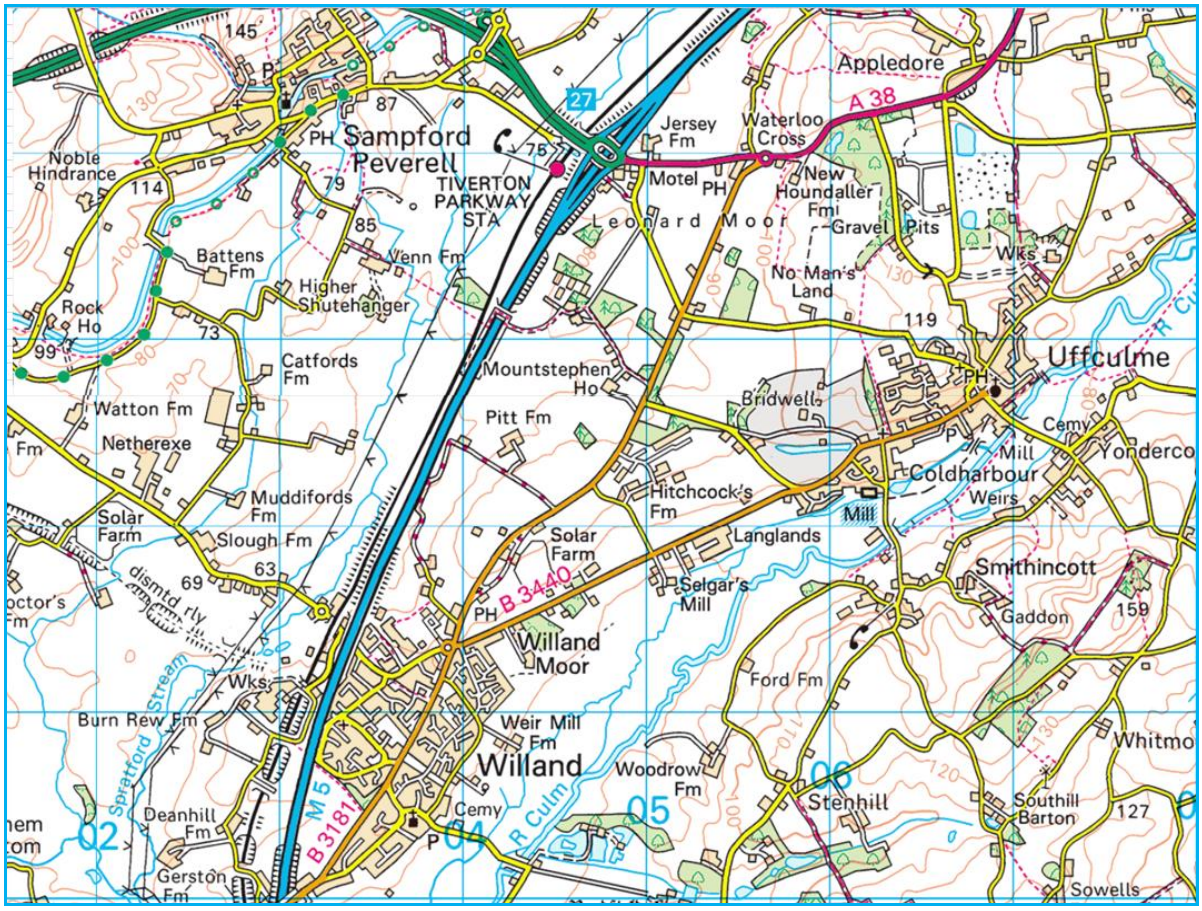
25. Cullompton station is also a first priority. It is south of Tiverton Parkway, 12½ miles from St. David's, 13¼ from central Exeter). The preferred location adjoins the M5 junction, so can also offer a railhead into central Exeter. However road access could then be overloaded, not least with Culm Garden Village travel volumes, so thought may need to be given to a different location

accessible from the town and the Garden Village. It would be a Devon Metro station not served by Intercity trains. Substantial car parking is likely to be required.

26. The parish population was nearly 10,000 in 2018. There are plans for an additional 5,000 homes at Culm Garden Village, to the east, which at say 2½ persons per home would increase the population to 22,500, so considerably more than Wellington, and (if 2 tph) with indicatively over 650,000 passengers entry/exit per annum. Most residents commute to the city of Exeter or other towns, so that there is a good baseline for rail demand nowadays.

27. A minimum half-hourly rail service would be most desirable, however as discussed above a second hourly slot will not be easy to find towards Taunton. The alternative is to run two trains per hour to Cullompton, and turn the 2nd train there or at Willand. Regional trains should be capable of 90 or 100 mph on the main line, to minimise pathing constraints.

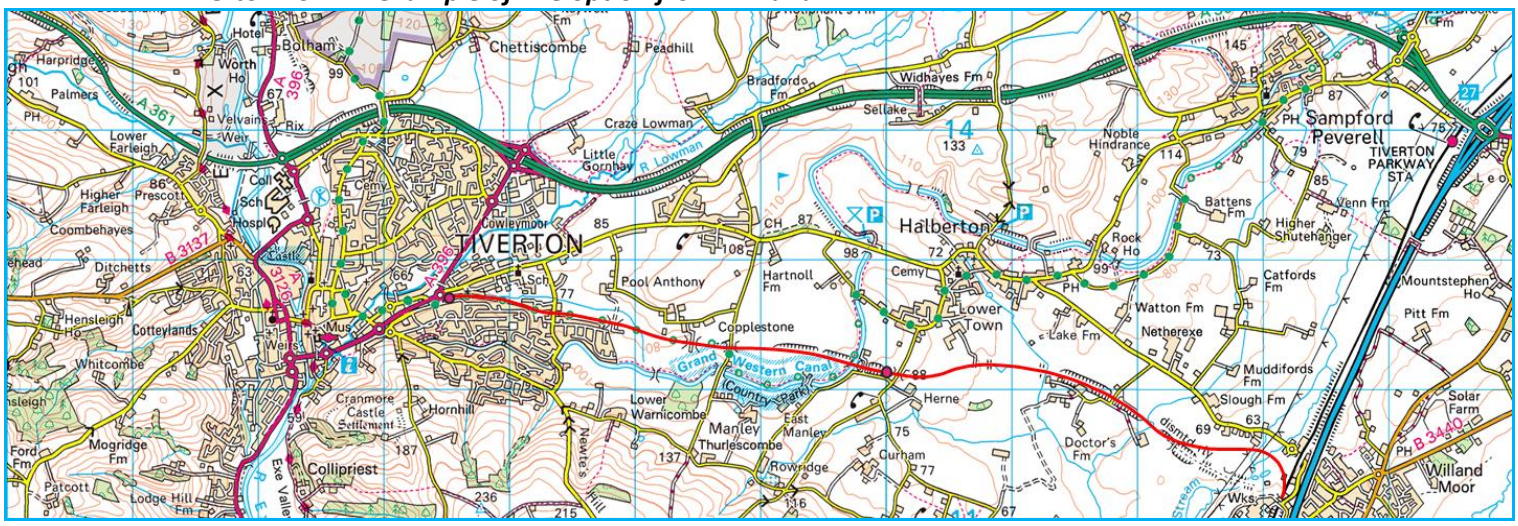
Willand



28. **Willand** is a second priority station, at the former Tiverton Junction station, where there are still passing loops. This also would be a Devon Metro station not served by Intercity trains. The Lower Culm ward population was 5,800 in 2011, and numbers are growing. On the same basis as Wellington for passenger estimates, annual rail usage could be around 90,000, although some might already use Tiverton Parkway station. It could be a terminus for Devon Metro trains to Cullompton which are unable to reach Taunton because of slot constraints on the main line, and so could offer an hourly local service to Exeter.

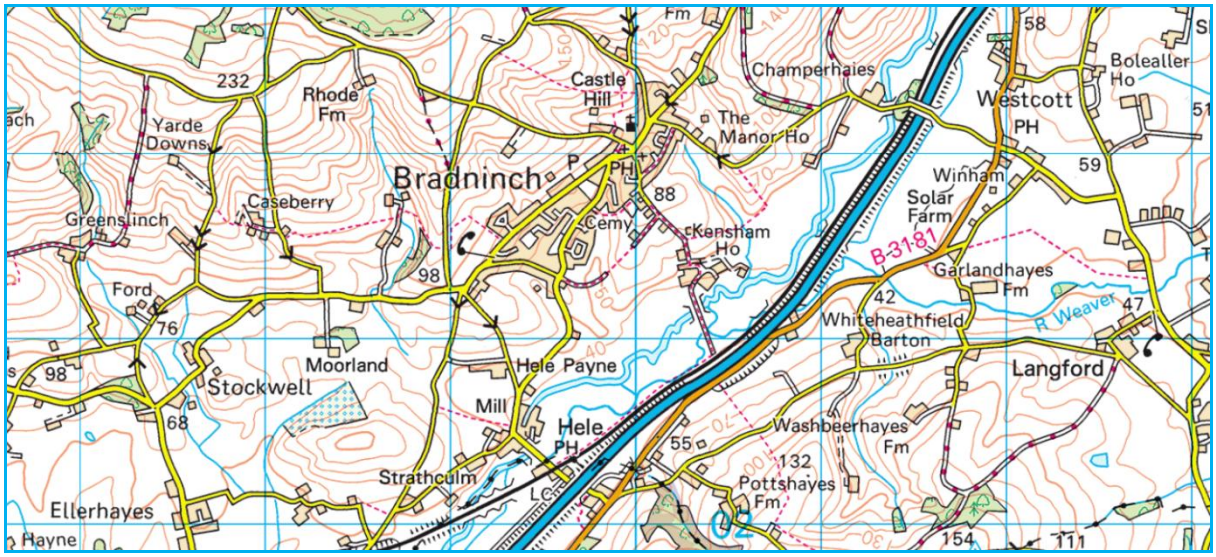
29. A third priority (maybe for the longer term) is a direct railway back to **Tiverton Town from Willand** (not via the former Exe Valley route as that is unavailable), possibly with an intermediate stop at **Halberton** if housing were enabled there. Tiverton has a 20,400 urban population. For Willand to allow a continuation to Tiverton, a station might need a different location south of the former platforms, or a larger chord could be required starting north of the former station site. Proceeding past Willand to reverse at a new bay platform at **Tiverton Parkway** is a further service option, although it occupies more time on the main line.

Tiverton Town – example of line option from Willand



30. Reopening to **Tiverton Town** is an extempore idea, but could provide a clear northern destination for a Devon Metro service, with explicit car removal from Exeter city centre, and enabling a better service at Cullompton, eg hourly to Tiverton, half-hourly from Cullompton.

Hele & Bradninch



31. **Hele & Bradninch**, south of Cullompton, local pop. 2,200, is a last option for an intermediate regional station. Any stop here would depend on the train running time from Willand or Taunton (depending on service options). It must be designed not to impede the timing of following Intercity express trains between the West Country, London and Birmingham. Because of this constraint, it is not thought that a station could currently be justified here, however it is noted in case any general timetable recast permitted further review.

Train operations

32. Specifically in relation to **Cullompton**, most of the potential demand for travel can be expected to be generated locally, because of the proximity of the already open Tiverton Parkway (and also depending on its parking price regime). Local/regional passengers would be deterred by costly short period pricing if they wished to travel to Exeter for work or shopping – so no station parking price paid should be higher than that paid at central Exeter car parks.

33. Two trains would be required for an Exeter-Taunton hourly regional service, irrespective of whether trains continued on an integrated basis along the West of England line which would be another resource requirement. Such integration could however assist pathing through Exeter St. David's and Exeter Central. Otherwise some reversing capability at Exeter Central might be required, where there is room for additional platforms. Currently some regional trains proceed to St. James' Park and reverse at Exmouth Junction, but this is not an efficient operation.

34. If a 2 tph frequency were targeted for Cullompton, with the additional service reversing there or close by near Willand, then the running time would be about 20 minutes from Exeter St. David's and 25 from Exeter Central, so might be feasible with just one additional train, but this would require detailed timetable modelling. More integration with other Devon Metro and/or West of England services might assist efficient scheduling.

Signalling implications

35. In summary, the service options are:
    - Hourly regional service, Taunton-Wellington-Tiverton Parkway-Cullompton-Exeter St. David's-Exeter Central (maybe further)
    - Hourly additional service, from Tiverton Town or Parkway or Willand (3 starting options)-Cullompton-Exeter St. David's-Exeter Central (maybe further).

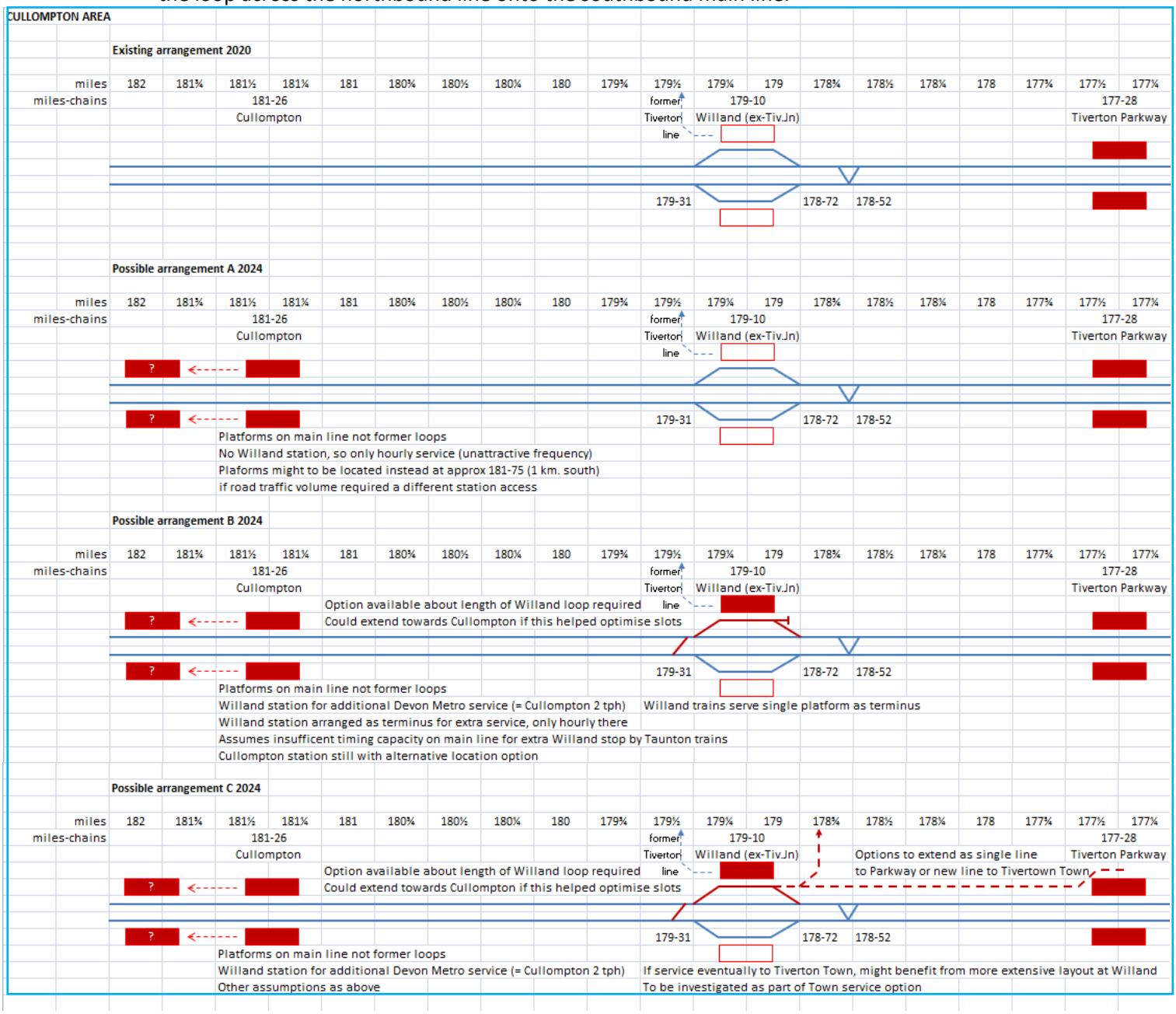
36. For signalling, adequate reversing capacity is assumed to exist now at Taunton with availability of the central platforms. The requirement represents one train per hour, with an approx 20 (and up to 30) minute layover foreseen during most hours of the day. Minimum turnround allowances at Taunton for DMUs or the 'Castle-Class' short HST equivalents are 5-10 minutes.

37. At Wellington, signalling is already provided for two-way crossovers, in addition to the normal line frequency which allows a minimum interval of 4 minutes between trains. This is the basic Rule of the Plan throughout between Fordgate (east of Taunton) and Newton Abbot. Additional time would be required for pathing a train due to stop and resume from platforms, although a reduced headway is permitted if a train starts from a platform to follow a non-stop train which has just passed through. The primary question at Wellington is whether current signal locations could be re-utilised for a pair of platforms, or whether additional signalling would be required. This would

require a detailed survey. At present it is assumed (worst case) that new up and down home and starter signals would be required, so 4 in total.

38. Cullompton's signalling options depend on the preferred regional service level. It is assumed that a second hourly regional train from Exeter could not reach at Taunton because of Intercity timetabling. The main options are shown diagrammatically below. It is assumed that only a core service at Cullompton or Cullompton / Willand (shown as options A or B) could be achieved by 2024, and that other regional service developments would be later.

39. Signalling requirements would follow the extent of necessary track works, including possibly new up and down home and starter signals at Cullompton, and signals to protect Willand terminating and reversing train movements in and out of the proposed single passenger platform, and from the loop across the northbound line onto the southbound main line.



B: North Dartmoor route – Exeter-Okehampton section

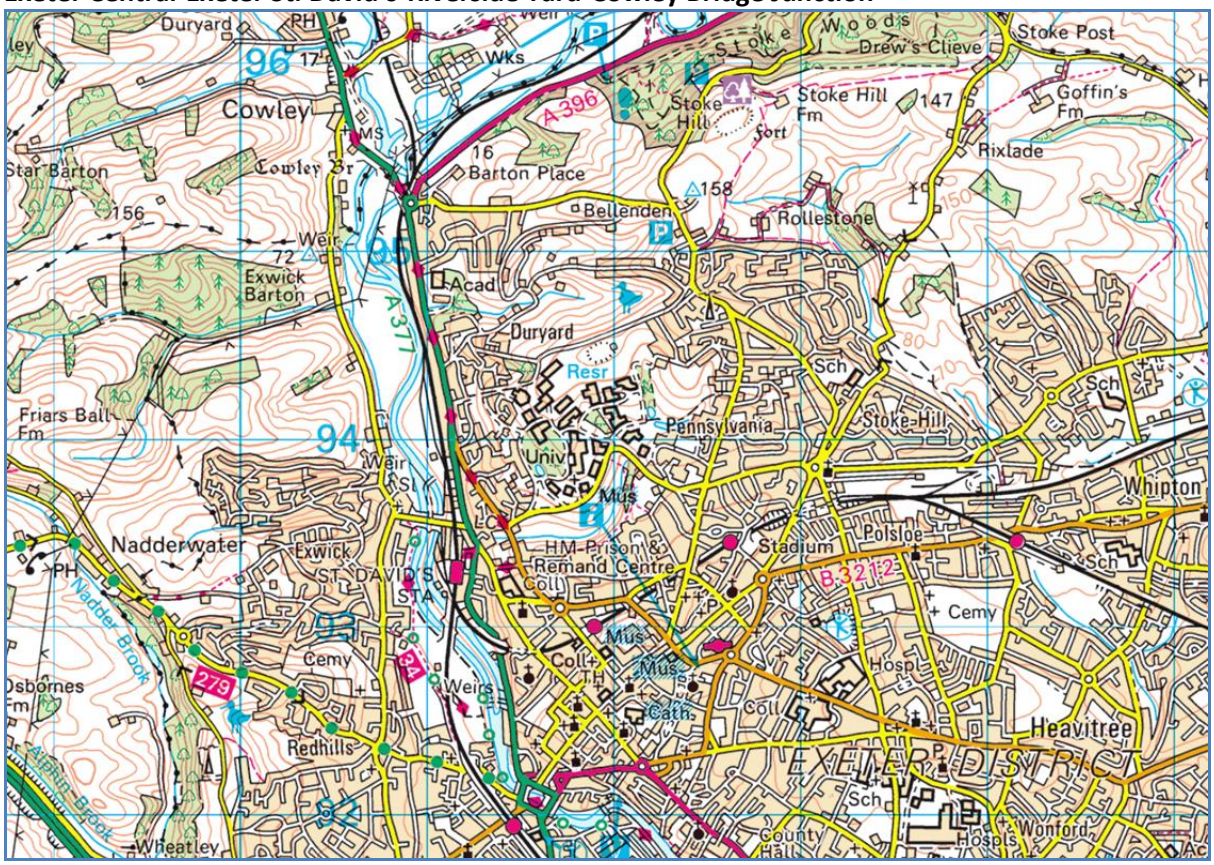
40. This section of the former Southern main line between Exeter and Plymouth still exists and has passenger trains scheduled over it during Summer Sundays for Dartmoor tourism purposes (though possibly not in 2020 because of the virus outbreak). All year passenger services now operate only on the North Devon Line to Barnstaple (known at the 'Tarka Line'), which uses the former Plymouth main line as far as the former Coleford Junction.

41. The route was previously double-track throughout and mostly capable of 85 mph as a steam railway, but is now singled and speed restricted to 40 mph on the section owned by a private railway operator, the Dartmoor Railway, west of Yeoford (ownership starts close by milepost 184 from Waterloo). The Dartmoor Railway CIC is now in administration, and this represents an opportunity to respecify the infrastructure for future purposes. Parts of the North Devon Line are also speed restricted, and it is mostly single track.

42. There are four main purposes for reopening this railway between Exeter and Plymouth:
    - To create a non-seawall-risk railway west of Exeter, to reach Plymouth and Cornwall which are vulnerable to flooding, cliff subsidence and sea wall closures via the South Devon route.
        - The risks grow with climate change, even if Network Rail is able to provide a more resilient seawall defence costing £80m, during the next few years.
        - The economic loss for Devon and Cornwall of the major 2014 line closure was ~ £1.2 bn.
        - The question of further temporary closures is essentially about *when*, not *if*. Short term closures are needed in any event, for essential line maintenance and safety management of the various cliff and tunnel sections in South Devon.
        - While the railway is committed to keeping the South Devon route as the main Intercity and regional corridor, an inland route can be reopened via Okehampton as virtually all of the former railway is protected and safeguarded. This would allow through trains to continue running while the coastal section is maintained and repaired, and after damage.
        - The section of railway between Exeter and Crediton on the North Dartmoor line also would benefit from additional flood resilience, to be tackled during project investment.
    - To reopen rail access for North West and West Devon economic growth, and for North Cornwall, which will benefit from access to the fast-growing Exeter and East Devon economy, and provide attractive journey times for commuting and business. It will be important to define infrastructure, journey times and train services, in a way which is competitive with the main car alternative, which is the dual carriageway A30.
    - To open up access from North West and West Devon to Plymouth as a regional centre, and for basic public transport accessibility to Cornwall via Plymouth. Plymouth's effectiveness as a regional centre has been hindered by the lack of good rail access from this catchment, and contrasts with the popularity of the rail service between Plymouth and Cornish catchments.
    - To provide a less steeply graded route for rail freight from Plymouth and Cornwall. Hauling capacity is severely restricted via the South Devon route which has major inclines in the 1 in 36/1 in 50 range between Newton Abbot and Plymouth, in contrast with the Southern route with major inclines in the 1 in 70/1 in 80 range.

43. There are four sections of railway to consider as far as Okehampton:-
    - Exeter-Cowley Bridge Junction
    - Cowley Bridge Junction-Crediton-Yeoford-Coleford
    - Coleford-North Tawton
    - North Tawton-Okehampton.

Exeter Central-Exeter St. David's-Riverside Yard-Cowley Bridge Junction



44. It will require consideration of timetable needs as a whole, to ensure that adequate train service volume can be sustained for an expanded Devon Metro and West of England operation. The section of railway west of Axminster is mapped at the start of the discussion on Cullompton station. Signalling capacity and track changes are likely to be necessary, with capacity to be determined for the next couple of decades so that further interim changes are not needed. Such works will require specification and installation by 2024.

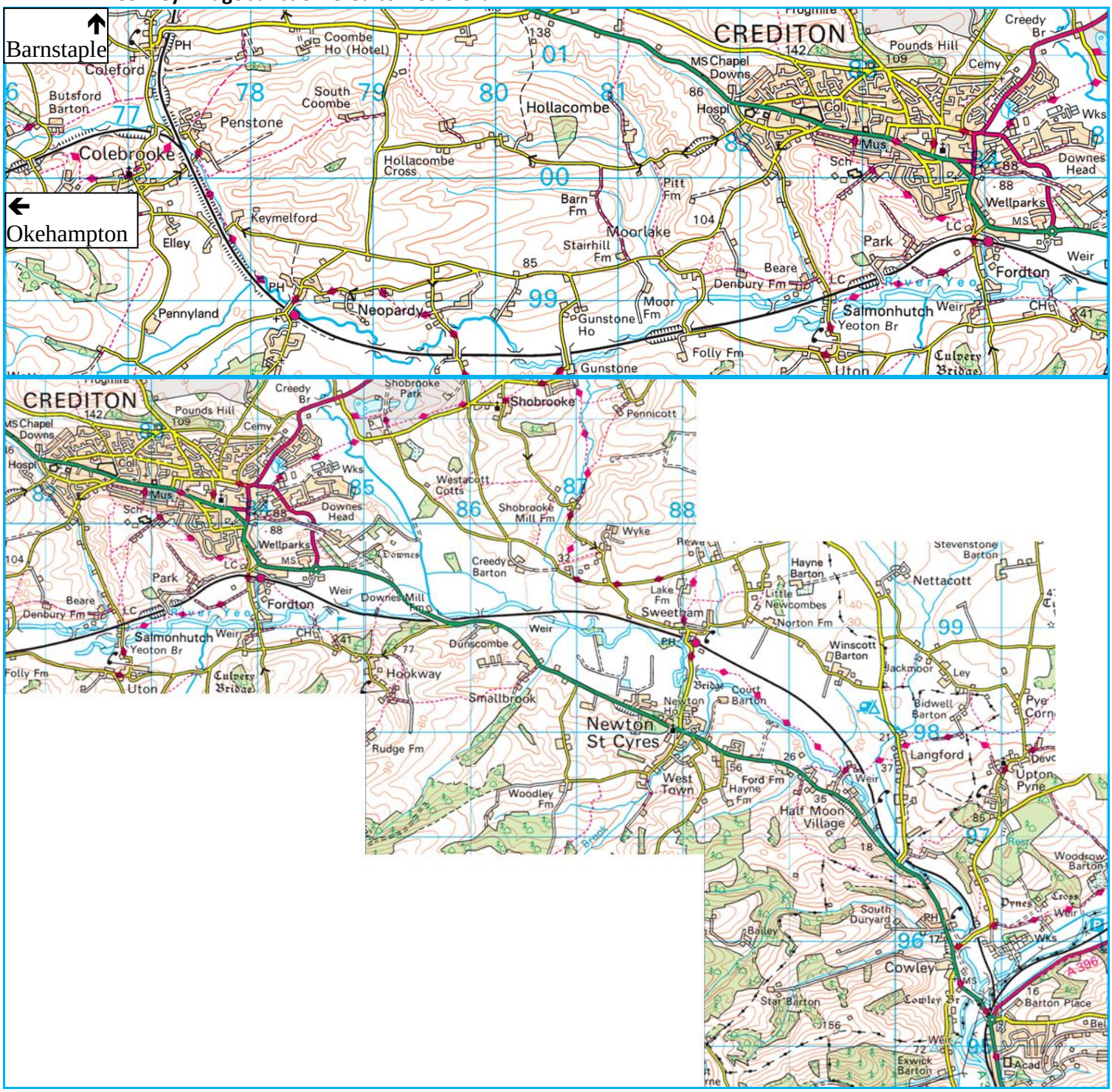
45. At Cowley Bridge Junction, train volume could rise considerably, as a combination of Tarka Line and North Dartmoor Line services could each need capacity for 2 tph (so 4 tph in each direction, 8 tph in total), if Exeter eventually required this frequency of service from these catchments in peak periods. Adding in the proposed regional services to Cullompton and Wellington would require a further 2 tph capacity (4 tph in total) in addition to Intercity frequencies.

46. Since much of the driving force behind the proposed new services is the continuing and long term growth of the City of Exeter as a major business, commercial and educational hub in the South West, the railway infrastructure should be designed to support that and not act as a brake on growth because it caused undue pressure on local railway capacity.

47. There are therefore at least two stages to be considered for development of services via Okehampton:

- Up to 2024, when an initial service level might be authorised (eg at 2 trains per hour from Okehampton and only 1 tph as now from Barnstaple – a lower cost option would be 1 tph also from Okehampton, but it would not compete well with the A30).
- A late 2020s service level when at least 2 tph would be desired also from Barnstaple (and maybe by then 1 of those starting beyond Barnstaple, if further reopenings were sought).

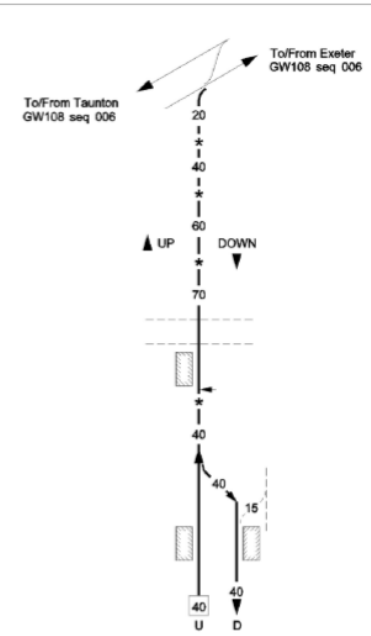
Cowley Bridge Junction-Crediton-Coleford



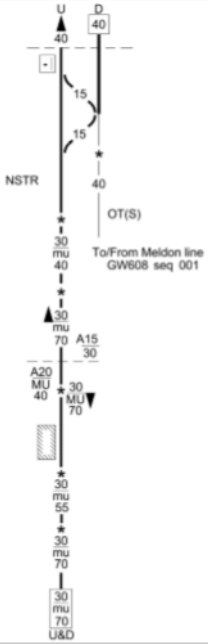
48. The tightest timing constraint as far as the former Junction at Coleford, is the single lead junction at Cowley Bridge. This becomes a single bi-directional track to Crediton (passing loop), which splits into two single lines alongside each other to Yeoford and Coleford, where tracks diverge to Okehampton and Barnstaple. There is also a regular passing loop on the Tarka line at Eggesford, which is the mainstay for Barnstaple trains to cross once they have left the North Dartmoor route.

Network Rail Western Sectional Appendix

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW606	001	Cowley Bridge Jn to Barnstaple	DAC	Western	02/02/2013

Location	Mileage M Ch	Running lines & speed restrictions	Signalling & Remarks
			GSM-R TCB Crediton SB (CN) RA6
Cowley Bridge Jn	173 50		Cowley Bridge Jn controlled by Exeter (E) signal box
	173 54 ★		
	173 74 ★		
	175 07 ★		
Norton Farm 1 LC (UWC)	175 64	T	
Norton Farm 2 LC (UWC)	176 21	T	
NEWTON ST. CYRES	176 51		Platform - 120m, 131yds
Newton St. Cyres HABD	176 60 178 69 ★		
Single line Jn	178 70		
CREDITON	179 20		Down platform - 135m, 148yds Up platform - 155m, 170yds

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW606	002	Cowley Bridge Jn to Barnstaple	DAC NDN	Western	02/11/2019

Location	Mileage M Ch	Running lines & speed restrictions	Signalling & Remarks
			GSM-R NSTR/OT(S) Crediton SB (CN) RA5
Crediton LC (MCB)	179 26		ELR : DAC
Crediton (CN) SB (change of ELR)	179 26		ELR : NDN
	179 32 ★		
	179 36 ★		
	179 60 ★		
Salmon Pool LC (ABCL)	180 09		See Local instructions
	180 12 ★		★ Down Trains only
	182 70	T	
YEOFORD	182 72		Platform - 136m (149 yards)
	184 00 ★		
	184 40 ★		

49. It is currently an 11-12 minute basic timing between Exeter St. David's and Credition, 13 if calling briefly at Newton St. Cyres which is a halt. There is also a passing time allowance required at Crediton. It would be unwise to give much slack on the St. David's-Cowley Bridge section, as this is the section used by multiple services including GWML and CrossCountry. With grade separation at Cowley Bridge Junction, faster timings will be possible.

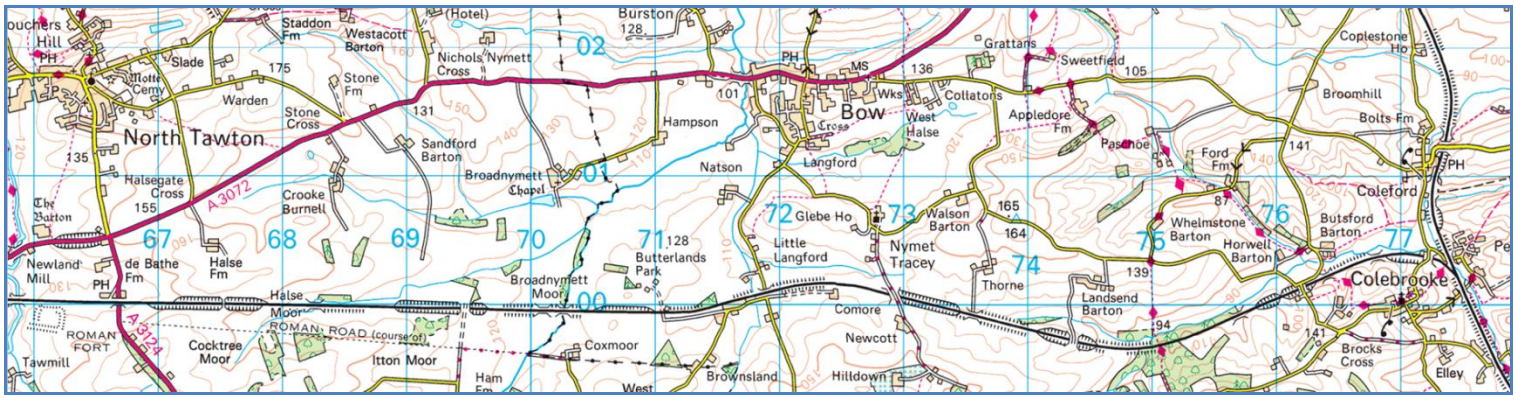
50. There are several strategies available to manage line capacity:
    - (1) To limit services to 4 tph, generally two each way, with an hourly service on each single track branch. Trains could cross at Crediton, as indeed they do already with the Barnstaple service. However that limits the Okehampton service to hourly so is not preferred.
    - (2) To flight trains to enable 6 tph, so that two must follow each other closely in the same direction, eg at 4-5 minute intervals; this would require more intensive signalling and nevertheless still require track doubling west of Crediton, probably best to west of Yeoford, with a new junction instituted there. This would effectively create a dynamic loop between Crediton and the divergence of the two single lines. This is because the hourly occasion when there were two successive trains, would also need to be replicated in the other direction.
    - (3) To double track across Cowley Bridge Junction all the way to Crediton (5¼ miles), and beyond at least to Yeoford (another 3½ miles) – Coleford at 4½ miles is unsuitable as curvatures are tight there so a junction at that location would severely constrain safe train speeds. The actual location of a junction could be west of Yeoford in the 183 MP-183½ MP area. It might still be desirable to allow some intermediate signals, as the precise timing slots permitted at Cowley Bridge might have to flex to avoid retiming of Intercity services, and for train flighting. The flood-risk section near Newton St. Cyres could be tackled by civil engineers at the same time as doubling.
    - (2, 3) Cowley Bridge-Crediton doubling would allow 6 tph, while continuing further to west of Yeoford would allow 8 tph, which is the most envisaged until much longer term. This latter makes full provision for an eventual 2 tph with Barnstaple trains, as well as 2 tph from the start for Okehampton trains. Line improvements should aim for a top speed of 80-85 mph on the Cowley Bridge-Coleford section, so far as possible, to minimise Okehampton journey times and speed those to/from Barnstaple. (Speeds will be slower through Crediton.) This will be easier to achieve west from Half Moon Village, as the line is curvier closer to Exeter.
    - A higher line speed could be permissible between Crediton and Yeoford, but it is not worth aiming for if the journey time to Coleford doesn't achieve a ½ minute gain, or if all trains called at Crediton. There is an option for 1 non-stop tph from Okehampton area to/from Exeter to compete better with the A30, and 1 tph calling at Crediton for passengers to interchange there with a Barnstaple train. The best average modelled outcome on this section is 80 mph.

51. A further opportunity for slot minimisation is for a train <u>to</u> the Southern route via Cowley Bridge to cross outside St. David's with a train <u>from</u> the Southern route. This could reduce slot hindrances for InterCity trains. It does however rely on accurate on-time presentation of trains on all routes.

52. Based on strategies (2) and (3), a regular half-hourly service to and from the Okehampton line should be feasible. The Okehampton line curve at Colebrooke NW of Yeoford (the former Coleford Junction) will limit speed, however it is not intended that Okehampton trains should call at Colebrooke or Yeoford. The Okehampton line is simply the former second track there. The relevant permanent speed restrictions which existed in Southern days are listed in the SR Western Section appendix for 1st October 1960. The overall line speed limit was 85 mph, although it would have been impossible for trains to achieve this speed on some sections where the starting speed was low. The 1960 permanent speed restrictions were:

(1) 25 mph both ways through Cowley Bridge Junction (it is now 20 mph); (2) 45 mph through Crediton station (now 40 mph, but 15 mph if onto the Barnstaple single line); (3) 40 mph at Coleford Junction (the same, but 70 mph allowed towards Barnstaple where it was previously 55 mph); (4) 45 mph for three miles through Okehampton station.

Coleford-North Tawton



53. West of Coleford was the fastest section of the former Southern route, suitable for the previous 85 mph maximum permitted speed. It is currently a single track line limited to 40 mph. So the strategy is re-engineer for 85-90 mph, even if it mostly remains as single track initially, and do not have any intermediate stations. This is the vital section to compete effectively with the A30 dual-carriageway.

54. In 1970, diesel trains limited to 75 mph took 6-7 minutes to serve Yeoford from Crediton, and then a further 29 minutes to reach Okehampton calling at Bow, North Tawton and Sampford Courtenay. Overall times between Exeter St. David's and Okehampton were 45-49 minutes (the uphill direction). Eastwards from Okehampton (the downhill direction) took 40-43 minutes, with 21-24 minutes to Yeoford and a further 6-7 to Crediton. The only non-stop train of the day between Crediton and Okehampton (uphill) was allowed 26 minutes.

55. The journey time savings to be achieved by fast running west of Crediton (except for the curve at Colebrooke) are self-evident. The key questions are therefore:
    - Where should passing loops or (preferably) dynamic loops be located, to enable a half-hourly service with mostly single-track operation? Alternatively, double-track throughout?
    - Where should any stations be located, to maximise the potential NW Devon catchment accessible to Exeter in an attractive fast time?

Optimising track, Crediton-Okehampton

56. Optimising dynamic loops will depend on the timing of trains through the single-track sections. The answer for 6 tph through a Cowley-Crediton-Yeoford double track assumes that the first train in every hourly sequence will be an Okehampton service, followed shortly by an Exeter-Barnstaple train, and then another Okehampton train 30 minutes after the first. For 8 tph, a second Barnstaple train follows the second Okehampton train. This fixes the approximate first train times as rotating around Crediton-Yeoford station westbound and Crediton-Newton St. Cyres eastbound.

57. Timetable planning would be based on multiples of 15 minutes with an additional timing margin in each direction. Loops would be at intervals of approximately 10-11 minutes (then a 5-4 minute double track), then a further 10-11 minutes to another double track, etc. This how the present

West of England main line operates in principle between Wilton (west of Salisbury) and Templecombe, although it has more variable loop and timing distances which force a train in one direction or the other to stop and wait for one in the opposite direction. Which is why dynamic loops are much preferred, if costs are to be less than double-track railway, and timings quicker!

58. This would tentatively point to the first dynamic loop west of the Yeoford ladder junction being west of North Tawton. The longer the dynamic loop, the higher the permitted speed of trains, as each train would need to be able to stop safely from its authorised maximum if the train in the other direction were running behind schedule and not yet in the loop section. A full double track is the ultimate dynamic loop, but that is not thought essential on this section of railway, providing that there is a clear priority about which train should have the non-stop run if the other has to stop briefly. Generally this is likely to be the train towards Exeter, since its timings are more critical for operation of the main Devon and SW network.

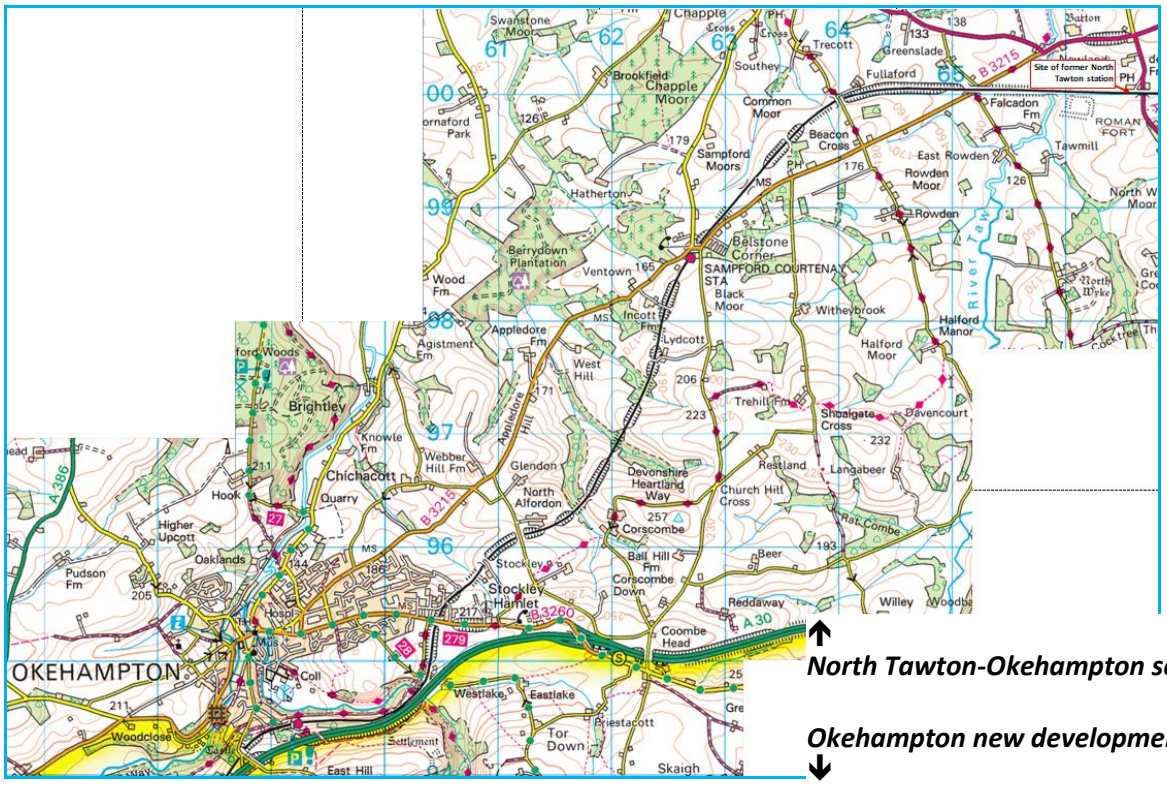
59. Based on an average 65 mph from MP 180 (between Crediton and Yeoford), this would bring a westbound train to about MP 190¾ (just west of the former North Tawton station). Higher average running speeds would enable at 70 mph MP 191½, and 75 mph MP 192½. It is likely that a double track would then be needed from a Sampford Courtenay station as far as Okehampton station (197-25), as line speeds are slower on this section because of curvature, as in SR days between MP 195¼ and MP 198¼. An actual estimate has now been developed, which puts an average timing at 74 mph between MP 180 and the proposed Sampford Courtenay station location (discussed below).

60. There should be a comparative assessment of the cost and relative infrastructure savings of either a double track all the way to Okehampton from Yeoford, or a single track to west of North Tawton followed by double track to Okehampton, together with associated signalling. A regular interval half-hourly service could be accommodated with single-track, as a train arriving in the final double track section would be neatly matched by the preceding train needing to head east towards Exeter from the Okehampton area. Adding on an hourly direct service between Plymouth, Okehampton and Barnstaple, on a flighted basis, might require an extended dynamic loop or full double track.

Station locations in the Okehampton area

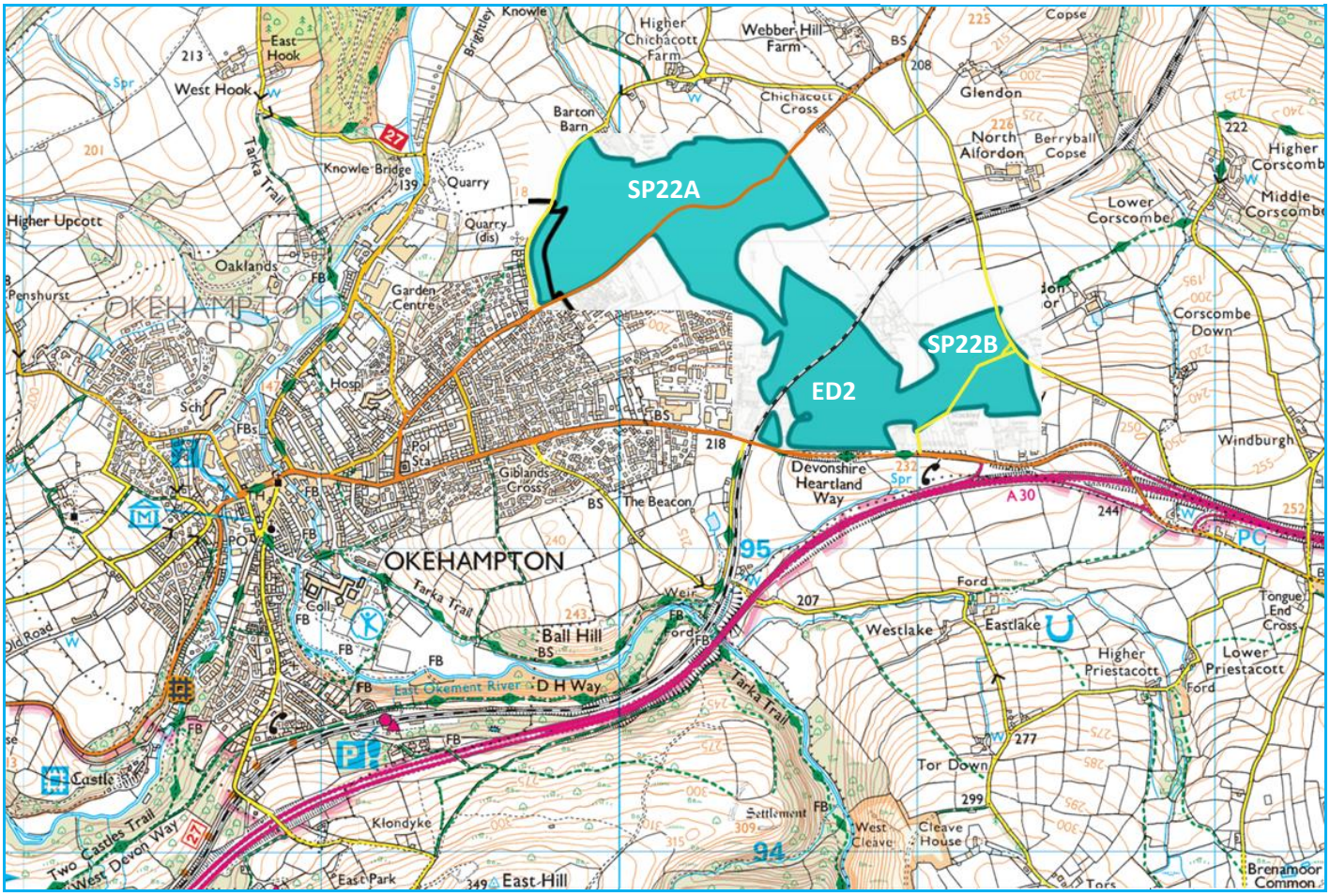
61. The other leading question is about location of stations in the Okehampton area, for local access and as railheads for the wider catchments, and even from North Cornwall via the A30. Mapping overleaf shows the line from **North Tawton to Okehampton**, and the Okehampton urban area. In this assessment we are concerned immediately with trains terminating at Okehampton, not continuing further towards Plymouth or Cornwall, although we should allow for the latter. Locally, Okehampton station is located inconveniently high above the town and to the SW of the town, so also in the wrong 'natural' direction for Exeter.

62. Local housing development, stimulated by the A30, points to the scope for a second, principal station at **Okehampton East**, to be a Town station better located for travel needs to Exeter, and to serve the new developments (which could expand further in another decade), and also be an interim Parkway station from the SW via the A30 dual carriageway (whose road junction is slightly further to the east – it has no interchange adjoining the existing Okehampton heritage station).



North Tawton-Okehampton section

Okehampton new development zones



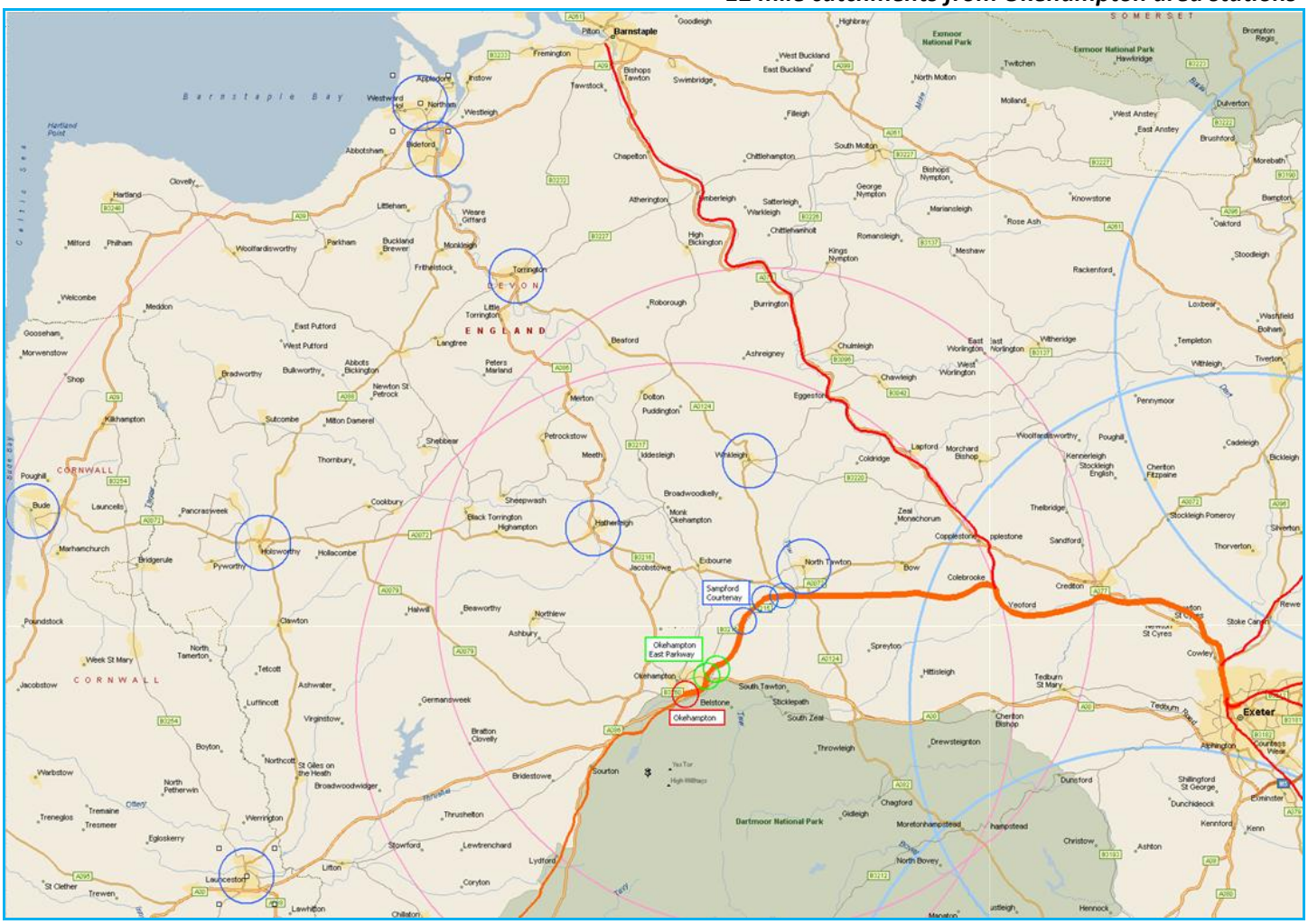
63. The development area and A30 interchange are shown above, overlaid on OS mapping for Okehampton town. The development area straddles the railway, the upper zone (SP22A) would be housing for 900 units, with the lower areas (ED2 and SP22B) for 10 ha. of business parks with a mix of B1, B2 and B8 capacity. An additional station has been proposed at ED2 by West Devon District Council (see link here: https://www.westdevon.gov.uk/media/2431/East-of-Okehampton-Masterplan-Adopted-Version/pdf/East_of_Okehampton_Masterplan_-_Adopted_version_FINAL.pdf).

Wider NW and West Devon catchment assessment

64. There is also the NW Devon catchment to be taken into account for station locations in the Okehampton area. Its effective catchment is shown below in small scale mapping with a 12 mile radius (in pink) from possible stations near to Okehampton, and, for the Bude area, a doubling of that distance for 24 miles.

65. Without dual carriageways, 12 miles represents a simple approximation of about 25-30 minutes access time by car to a station (parking time should also be considered). So an average 30-35 mph nominal and 40 mph actual are possible. With dual carriageway average speeds, for example towards Launceston, this distance would expand, depending on the proportional extent of travel on local roads compared to trunk roads.

12 mile catchments from Okehampton area stations



66. It is axiomatic that reopening between Exeter and Okehampton must embrace the North West Devon catchment and desirably some of North Cornwall, as shown in the mapping above. Economic benefits should grow in proportion to the ability to access Exeter and other major locations easily by rail.

67. It is assumed that towns such as Bideford, previously on a direct Southern railway, will continue to use the closer railhead at Barnstaple, not least as the driving time to Exeter via the A30 is over an hour even in the offpeak, while reaching an Okehampton Line railhead would be about 40 minutes. Central Bideford is modelled at 16 minutes to Barnstaple station.

68. An estimate based on Autoroute Express computer modelling, shows Bude to Sampford Courtenay station (at location C, see below) as 47 minutes for 30½ miles, excluding parking, with main travel being on A roads at 39 mph average. From Launceston via A30 dual carriageway to Okehampton East Parkway station (location A, see below), would be 24 minutes for 21 miles [at legal speeds, quicker is possible], at 52½ mph average. From Bude to Okehampton East A station would be 46 minutes and 32 miles, so doubly unattractive because of a longer car journey and a longer rail time, compared to Sampford Courtenay. From Bude to the existing Okehampton station would still be 46 minutes, no better, though 29½ car miles. The total time to Exeter would be longer, though.

69. It is clear from the mapping above that future reliance on railheading, to a station where it has been located historically such as Okehampton (and presume that people would willingly transfer there), is the wrong approach to making the railway and the wider catchment economically strong. There is an obvious geographical case for a Parkway station near Sampford Courtenay – not necessarily where the historic station is sited – while the new development taking place, plus the A30 on an interim basis, make their own case for an Okehampton East station. That station can also serve the east side of Okehampton town.

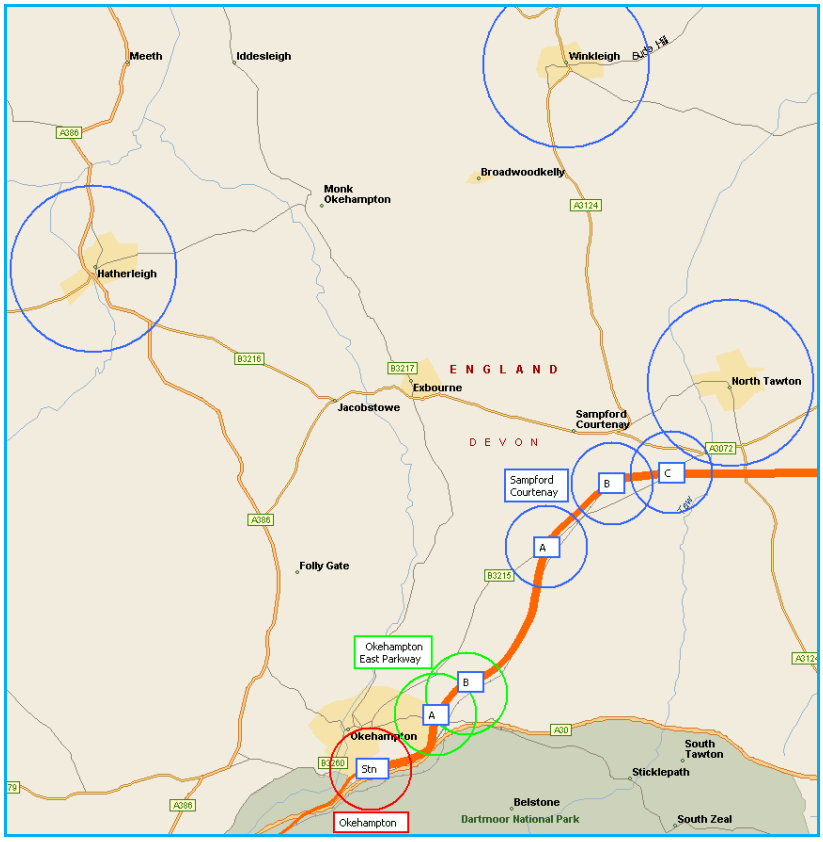
70. The attractiveness of Okehampton East, which adjoins the existing town, raises a logical question – whether it is necessary or useful to project the reopened Okehampton service as far as the existing but inconvenient Okehampton heritage station. That station would still have some use for the town centre and western town catchments, so should be retained if operationally viable for the intended half-hourly service. It is also where the existing train reversing facilities are available, which can be modified suitably for both an Exeter-Okehampton service and for extension to Plymouth. Any Plymouth extension would certainly bring the heritage station into play as being a good railhead for commuters to Tavistock, Devonport and especially Plymouth. So the existing Okehampton station should be allowed for in rail planning for initial services just towards Exeter, although its deferral until a Plymouth extension could be a valid outcome.

71. Double tracking through Okehampton based on a clockface timetable could also be helpful in due course, by enabling low cost extension of trains to an A30 Sourton Parkway railhead for North Cornwall, requiring only a single track and platform there initially, as a ‘one-train-in-steam’ section until a through railway to Plymouth were built. A single-track Meldon Viaduct might either be renovated using the present structure (with a pedestrian / cycle track adjoining), or with a new structure if this were required. The section on reopening Okehampton-Tavistock considers this.

Specific locations for Okehampton area stations

72. The map below shows various options for station locations. As just discussed, it is possible but not certain that the original Okehampton station would be included from the start of services to Exeter. Its main passenger benefit would be (from the medium term) greater accessibility towards Plymouth. Okehampton locally is about 10,335 population including the existing Hamlets parish, not the new development which is worth a further 2,250 people at 2½ persons per home. 10 ha. of business parks could be 4,000-6,500 employees depending on density of building fit out. A wider 12 mile catchment is at least a further 17,700 population excluding places such as Great Torrington, and counting only half the Winkleigh population (which is equidistant in time to Eggesford on the Tarka Line) and also some other locations accessible from the Tarka Line.

73. Cumulatively this is a notional catchment population totalling over 30,000 excluding the business parks. The estimate also excludes the further but significant catchments such as Holsworthy, and Bude in North Cornwall. Of course the propensity to use rail will diminish in distance from railheads, however it also highlights how critical it is to identify best locations for such railheads, which must be easily accessible from normal driving corridors.



Okehampton area station options in detail

74. Choices are set out, for two station options (A or B) for an Okehampton East (including an A30 Parkway), and three options for a Sampford Courtenay Parkway (A, B or C). It is not proposed at this point in the commentary, to favour any one specific site, except to discard the existing station at Sampford Courtenay. Options are discussed further in the section on Okehampton-Tavistock.

75. Optimisation of total estimated passenger throughput will be relevant for Okehampton East station. This must include eastwards access from the town, and access from the development catchment, plus parking from the A30 western catchments at least until a Parkway station further west – such as Sourton – were in place. The latter stipulation might mean that a less optimal station location for the A30 would be acceptable in the short term, if Sourton were to replace that in the medium term.

76. In respect of Sampford Courtenay station, it is clear that the present station (location A) is not useful. It is not as convenient for the NW Devon catchment as locations B or C, and is too far from the eastern developments at Okehampton to be any use to them. Hence we propose either B or C locations for a Parkway station, which should take into account the accessibility from the NW Devon catchment as a whole, and the more local (and hence possibly busier demand) from Hatherleigh, Winkleigh and North Tawton.

77. In general the total NW Devon travel catchment to be assessed should therefore exclude the Bideford coastal area, but should include other locations southwards as far as the A30 dual carriageway within a 12 mile catchment, and as far as Lifton along the A30. Bridestowe ward is the furthest south catchment to be included.

78. Torrington, whose current nearest station is at Umberleigh on the North Devon Line, can reach Sampford Courtenay parkway station in under 30 minutes, which will have a faster and (initially) more frequent service to Exeter, so that this route might be preferred from that originating town. However, to be cautious the Okehampton population count currently excludes Great Torrington (6,000 people) from its catchment, as Tarka Line improvements (discussed separately) may swing the advantage towards that railway.

79. An initial Exeter-Okehampton rail service should include newly located stations for a Sampford Courtenay Parkway, on the proposed double track section of railway, and at Okehampton East. If operational running time permits, trains should continue to the existing heritage Okehampton station to reverse there. With the present service specification, this should not be a problem as trains should pass between Sampford Courtenay and Okehampton East.

80. Operationally the service will require 3 trains in use. The availability of trains at Exeter Central might enable operating gains for other services by amalgamation with those routes. That would be a separate assessment exercise.

C: Exeter – Barnstaple (Tarka Line)

81. This is not a reopening, but there is a desire by the Tarka Rail Association to achieve eventually 2 tph to/from Barnstaple, and also become fully integrated with the Devon Metro.

82. In JRC's assessment of Exeter-Okehampton, it has been demonstrated that the restoration of double-track via Cowley Bridge Junction should not reinstate Coleford Junction at its previous location, because of the speed limits arising there on the Okehampton Line curve. It used to be 55mph towards Barnstaple and 40mph towards Okehampton. Now it is 70mph towards Barnstaple.

83. It would be better to have (looking eastbound at Coleford) a piece of either two single-tracks or, if either or both were double track, a ladder junction around 183 MP -183½ MP. Looking westbound that would permit tighter elevation and higher speed on the left hand corner heading towards Okehampton, while enabling 70-80 mph towards Barnstaple.

Capacity for 2 tph – anticipating needs

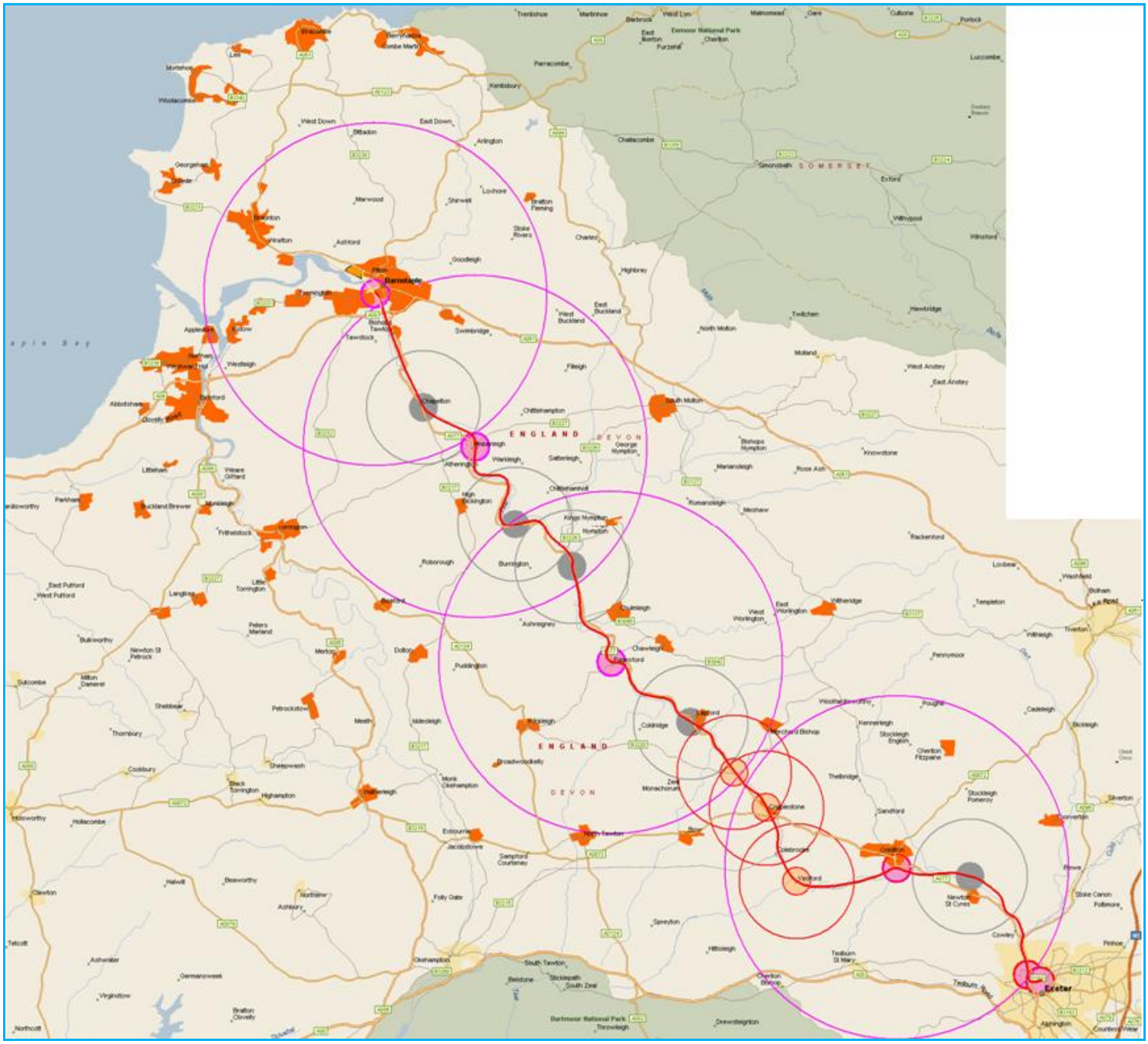
84. The Barnstaple corridor is a combination of single track railway with multiple speed restrictions, several scarcely used stations, and a few which are railheads. Meanwhile the railway passes by but doesn't serve Bishop's Tawton; it has never been served directly, and there doesn't appear to be a case now as Barnstaple station is close by. Looking ahead it might also be wise to allow a notional alignment for long term reopening beyond Barnstaple, and to safeguard suitable corridors, with a railway returning to either or both of Bideford and Ilfracombe, not necessarily wholly along former rail routes, and with improvement works allowing passive provision.

85. A map plus addition of 800m (½ mile – easy walking distance) and 6 mile catchments (main railheads) and 2 miles (local railheads) from stations, set out overleaf, shows the extent of nominal station catchment overlaps between Crediton and Barnstaple. 6 miles in a rural area and with slow rural roads equates to an approximate 15 minutes, it would be less time on a main road, but of course it may still be necessary to park the car, maybe buy a ticket (or on the train) etc., while you wouldn't want to miss the train.

86. In the mapping:
    - Purple catchments denote a main railhead – although 800m (=a ½ mile) will not attract many local residents (except at Crediton) as most population is distant (see the orange zones).
    - An light orange 800m catchment and 2 mile red circle denotes a local railhead served all day by typically an hourly service. Most stops including the orange ones are request only, just Crediton and Eggesford have a mandatory stop. This in itself speaks volumes about demand.
    - A grey catchment and circle implies only a few trains a day, including peak times on Monday-Friday, and sometimes on other limited occasions.

87. It must be noted that while the Exeter region has the strongest pull, the Barnstaple area is also a significant travel attractor. The Petroc college has thousands of pupils, and the college is within walking distance of Barnstaple station; there is also a second college in North Barnstaple at Pilton. The NW Barnstaple industrial estate (see google photo below) is a major generator of travel, but lacks a railway station for access from the Taw Valley. So this raises some fundamental questions about the type of rail service to be offered *in both directions*.

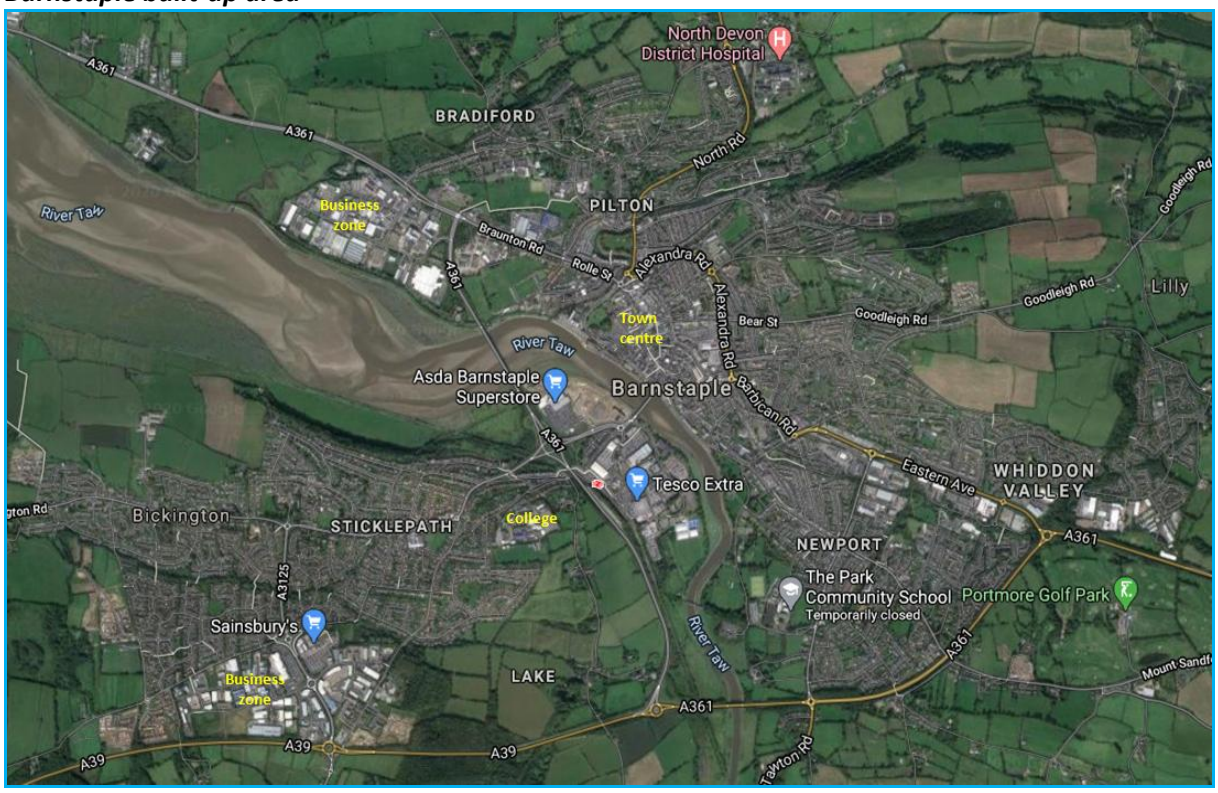
88. Although it isn't a major piece of evidence, the pre-Beeching service included a specific morning peak train towards Barnstaple, which started at King's Nympton. This points to an historic catchment, which now that Barnstaple is a much larger employment zone, should be taken into account.



800m / ½ mile, 2 mile and 6 mile catchments along the Tarka Line

Only at Umberleigh and Barnstaple does the practical catchment extend further to significant population volumes, located at Torrington, South Molton, and at main centres including 'Greater Bideford' and Ilfracombe on the North Devon coast (where the summer-time population is also greater).

Barnstaple built-up area



Faster trains to Exeter as well?

89. Meanwhile the Tarka Rail Association also hopes to accelerate services towards Exeter.

90. The rail infrastructure is restrictive and only just accommodates an hourly service. There is no passing loop north of Eggesford, with 'one train in steam' on this section. There are many user worked crossings, while at Eggesford the train crew must operate the signals. Top line speed is not high, 70 mph with 55 mph on heavily curved sections.

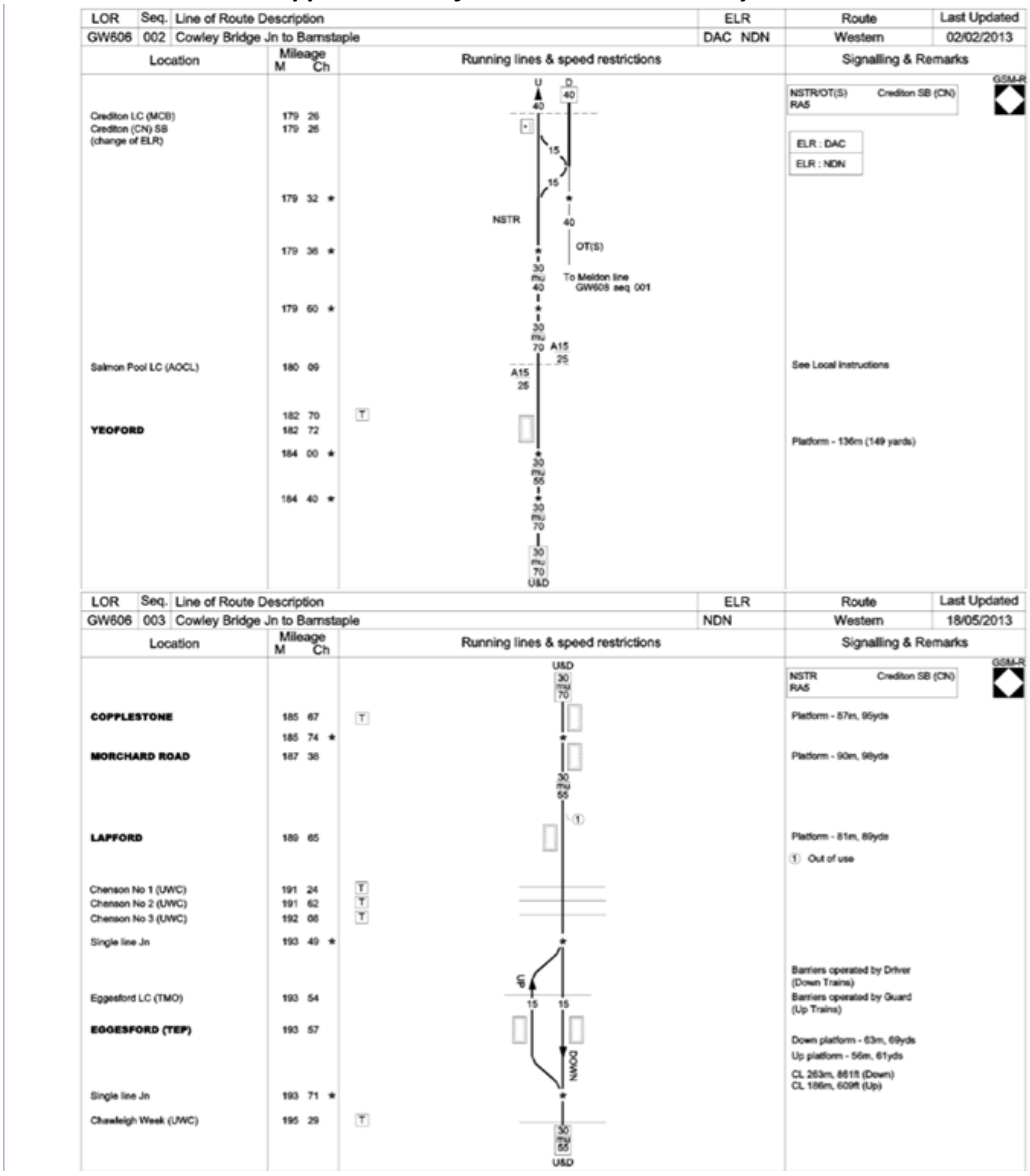
91. So in summary the line would require significant investment to offer more frequent services plus higher speeds, and/or it might be necessary to remove some station stops from peak trains (or close the stations altogether). The present track arrangements north from Crediton are described below in Network Rail's sectional appendix.

92. The scope for additional line capacity and for faster trains is interlinked along the North Devon Line. Faster running on single track sections would reduce journey time, so giving the potential for additional trains per hour if new track and service arrangements could be devised to make the most of the new nominal capacity.

93. The fastest parts of the line could be (looking southwards) Barnstaple to Umberleigh (6¾ rail miles) if non-stopping Chapelton, and Lapford to Crediton (11½ rail miles) but this latter section embraces some season ticket holder usage (JRC estimates about 10 people per station if annual equivalents, at Morchard Road, Copplestone, Yeoford). Others will buy different tickets, so that actual peak usage will be significantly higher. However, this volume is for the current basic hourly service, so that investigation of a service on the other half hour being faster, merits assessment.

94. Because stations are relatively close to each other, speed improvements are also likely to be of limited value unless some intermediate stations are ignored. An ‘express’ service could be defined which called only at:
    - **Barnstaple**, for the North Devon coastal catchment.
    - **Umberleigh**, for South Molton and Torrington.
    - **Eggesford**, for Chawleigh, Chulmleigh and Winkleigh (the latter might prefer to head to Exeter via a Sampford Courtenay station on the Okehampton line).
    - **Crediton**, for the local town and for villages to the north.

Network Rail sectional appendix data for North Devon Line beyond Crediton



LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW606	002	Cowley Bridge Jn to Barnstaple	DAC NDN	Western	02/02/2013

Location	Mileage M Ch	Running lines & speed restrictions	Signalling & Remarks
		U 40 / D 40	NSTR/OT(S) Crediton SB (CN) RAS
Crediton LC (MCB)	179 26		
Crediton (CN) SB (change of ELR)	179 26		ELR : DAC
			ELR : NDN
	179 32 ★	15 15	
		NSTR 40	
	179 36 ★	OT(S)	
		30 mu 40 — To Meldon line GW608 seq 001	
	179 60 ★	30 mu 70 A15 25	
Salmon Pool LC (AOCL)	180 09	A15 25	See Local Instructions
	182 70 T		
YEOFORD	182 72		Platform - 136m (149 yards)
	184 00 ★	30 mu 55	
	184 40 ★	30 mu 70	
		30 mu 70 U&D	

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW606	003	Cowley Bridge Jn to Barnstaple	NDN	Western	18/05/2013

Location	Mileage M Ch	Running lines & speed restrictions	Signalling & Remarks
		U&D 30 mu 70	NSTR Crediton SB (CN) RAS
COPPLESTONE	185 67 T		Platform - 87m, 95yds
	185 74 ★		
MORCHARD ROAD	187 38	30 mu 55	Platform - 90m, 98yds
LAPFORD	189 65	①	Platform - 81m, 89yds
			① Out of use
Chenson No 1 (UWC)	191 24 T		
Chenson No 2 (UWC)	191 62 T		
Chenson No 3 (UWC)	192 08 T		
Single line Jn	193 49 ★		
		up 15 15	Barriers operated by Driver (Down Trains) Barriers operated by Guard (Up Trains)
Eggesford LC (TMO)	193 54		
EGGESFORD (TEP)	193 57	DOWN	Down platform - 63m, 69yds Up platform - 56m, 61yds CL 263m, 861ft (Down) CL 186m, 609ft (Up)
Single line Jn	193 71 ★		
Chawleigh Week (UWC)	195 29 T		
		30 mu 55 U&D	

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW606	004	Cowley Bridge Jn to Barnstaple	NDN	Western	02/02/2013

Location	Mileage M	Mileage Ch	Running lines & speed restrictions	Signalling & Remarks
			U&D 30 mu 55	GSM-R NSTR Crediton SB (CN) RA5
Collaton Barton Farm 1 LC (UWC)	196	02	T	
	197	40 *	UP 30 mu 50 DOWN	
KINGS NYMPTON	197	51		Platform - 90m, 98yds
	197	60 *	30 mu 55	
Newnham Barton Farm LC (UWC)	198	01	T	
Higher Doomsford LC (UWC)	198	59	T	
Braggamarsh 1 LC (UWC)	199	15	T	
Braggamarsh 2 LC (UWC)	199	42	T	
Portsmouth Arms 1 LC (UWC)	200	38	T	
PORTSMOUTH ARMS	200	38	T	Platform - 74m, 81yds
Portsmouth Arms 2 LC (UWC)	200	51	T	
Scoop 1 LC (UWC)	201	47	T	
Harris LC (UWC)	202	11	T	
			30 mu 55 U&D	

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW606	005	Cowley Bridge Jn to Barnstaple	NDN	Western	02/02/2013

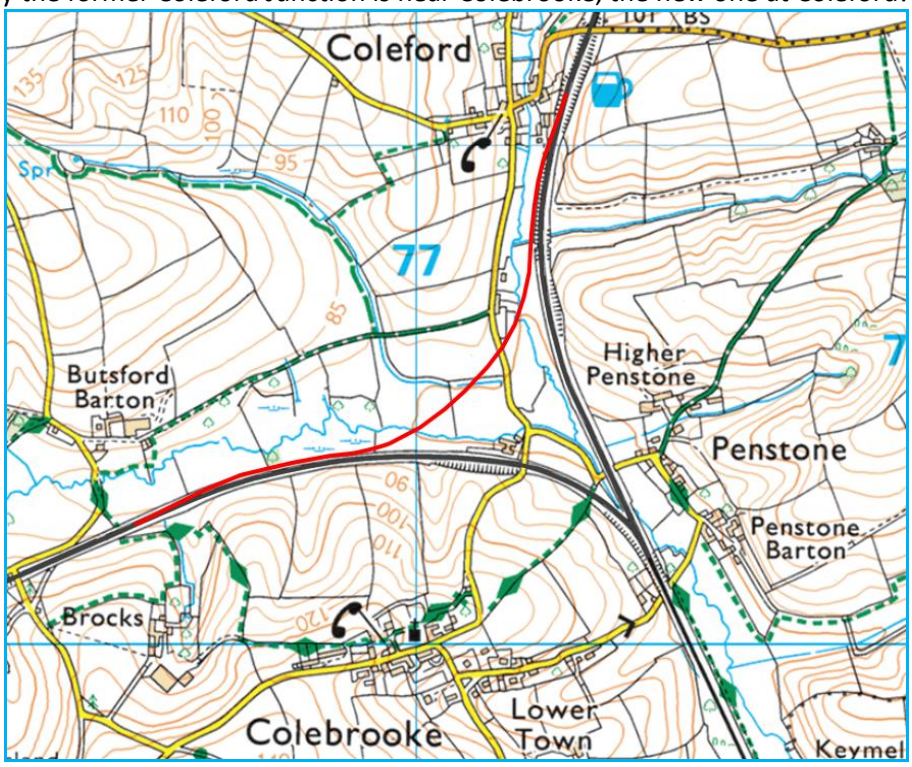
Location	Mileage M	Mileage Ch	Running lines & speed restrictions	Signalling & Remarks
			U & D 30 mu 55	GSM-R NSTR Crediton SB (CN) RA5
Shortridge Farm 2 LC (UWC)	202	54	T	
Shortridge Farm 3 LC (UWC)	202	71	T	
Brightly Weir Farm 1 LC (UWC)	203	23	T	
Brightly Weir Farm 2 LC (UWC)	203	34	T	UP DOWN 30 mu 55
Brightly Weir Farm 3 LC (UWC)	203	44	T	
Brightly Mill LC (UWC)	203	66	T	
Brightly Barton 1 LC (UWC)	204	00	T	
	204	27 *	30 mu 55 A10 25	
Umberleigh LC (AOCL)	204	32	A10 25 30 mu 35	
	204	40 *	30 mu 35	
UMBERLEIGH	204	52	T	Platform - 139m, 152yds
	204	67 *		
Little Weir Farm 2 LC (UWC)	205	06	T	
			30 mu 60	
Fishley LC (UWC)	206	43	T	
			30 mu 60 U & D	

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW606	006	Cowley Bridge Jn to Barnstaple	NDN	Western	05/07/2014

Location	Mileage M	Mileage Ch	Running lines & speed restrictions	Signalling & Remarks
			U & D 30 mu 60	GSM-R NSTR Crediton SB (CN) RA5
CHAPELTON	207	02	T	Platform - 100m, 109yds
Chapelton Station LC (UWC)	207	06	T	
Great Fisherton Farm 1 LC (UWC)	207	72	T	
Great Fisherton Farm 2 LC (UWC)	208	27	T	UP DOWN
			30 mu 60	
	210	78		
	211	14 *	20	
Barnstaple GF	211	18		
BARNSTAPLE	211	25	T	Platform - 127m, 138yds
End of line	211	31		

Barnstaple-Okehampton-Plymouth?

95. There is a medium term goal to make the most of any reopening of the North Dartmoor Line via Okehampton to Plymouth, by defining a new corridor between Plymouth, West and North Devon with a through rail service. This would use the Okehampton and North Devon Lines, with a new chord to create a West to North link near Coleford Junction. A local map is set out below, to show how little additional track would be needed to connect the two railways in this direction. Confusingly the former Coleford Junction is near Colebrooke, the new one at Coleford!



New West to North chord for Barnstaple-Okehampton-Plymouth service

96. New chord junctions would be staggered to avoid pointwork on tight curves, and so permit higher speeds. The new single track chord would be about $^{7}/_{8}$ mile long, with a 480 metre radius (24 chain) curve which should allow 50 mph speed, comparable with the permitted speed for an upgraded Okehampton Line where it curves away at the former Coleford Junction.

Stopping patterns and timing issues

97. Key to how a West and North Devon service could benefit the wider Plymouth, West Devon and North Devon economies would be how fast it could be to link principal catchments, not how many villages it could serve. However the round-the-corner link between Barnstaple and Okehampton would give some scope for local connectivity. An hourly service is envisaged. Taking this strategic view, points to stops on the North Devon line section only at:
    - **Barnstaple**, for the North Devon coastal catchment.
    - **Umberleigh**, for South Molton (Torrington is quicker via Sampford Courtenay).
    - At **Eggesford** or **Copplestone,** for villages to the north and east to reach Okehampton and Plymouth. There could be an alternating 2-hourly service at each, to minimise overall times and keep timings consistent on the Okehampton-Plymouth section.

98. It is therefore sensible to take in the round the various aspirations for the North Devon Line, so that infrastructure is a good fit for all requirements. This should be set alongside the current scale of travel demand, shown below, where several stations, particularly Portsmouth Arms and Chapelton, are shown as probably deserving closure, providing passengers can easily access the stations at Umberleigh and Kings Nympton. The infrastructure needs for a desired faster railway might also point in this direction.

	NDevon < > trains	Inter-stn miles	Annual Pax entry+exit					2018-19 Tickets by fare			Peak travel if	Peak user	Other user	Total
	per week Dec 19	(straight line)	1998-99	2008-09	Max 08-19	2017-18	2018-19	Full	Reduced	Season	season+½ full	400 jnys /person	20 jnys /person	user
Exeter Central	**186**		924,744	1,514,418	2,607,502 (1718)	2,607,502	2,532,450	329,046	1,613,314	590,090	754,613	1,887	88,892	90,778
		0.5												
Exeter St Davids	**240**		1,409,906	2,128,584	2,842,898 (1617)	2,605,166	2,619,776	287,506	2,106,736	225,534	369,287	923	112,524	113,448
		3.9												
Newton St Cyres	**68**		771	1,868	3,212 (1112)	2,468	3,000	732	2,248	20	386	1	131	132
		1.9												
Crediton	**244**		28,494	32,344	58,390 (1617)	56,006	57,670	5,926	46,588	5,156	8,119	20	2,478	2,498
		2.8												
Yeoford	**229**		10,138	7,946	18,580 (1617)	18,156	17,116	2,086	12,820	2,210	3,253	8	693	701
		2												
Copplestone	**229**		2,841	7,422	17,868 (1819)	15,262	17,868	1,336	13,402	3,130	3,798	9	704	713
		1.7												
Morchard Road	**229**		6,057	4,170	13,210 (1617)	12,134	12,378	1,126	7,338	3,914	4,477	11	395	406
		2.2												
Lapford	**61**		9,697	2,058	2,704 (1415)	1,498	1,316	82	1,192	42	83	1	62	63
		3.5												
Eggesford	**240**		27,464	21,298	31,628 (1718)	31,628	29,802	2,296	21,112	6,394	7,542	19	1,113	1,132
		3.2												
Kings Nympton	**79**		7,131	1,542	8,030 (1617)	6,640	5,000	142	2,606	2,252	2,323	6	134	140
		2.5												
Portsmouth Arms	**32**		835	844	1,510 (1415)	444	466	100	366	0	50	1	21	22
		2.8												
Umberleigh	**235**		14,444	16,256	37,608 (1415	34,784	33,060	1,512	23,478	8,070	8,826	22	1,212	1,234
		2.2												
Chapelton	**32**		749	176	566 (1617)	188	446	22	236	188	199	1	12	13
		4												
Barnstaple Junction	**240**		283,920	283,920	443,450 (1617)	440,404	432,196	17,062	346,236	68,898	77,429	194	17,738	17,932
Total on North Devon Line			392,541	379,844	636,756	619,612	610,318	32,422	477,622	100,274	116,485	293		
(divided by 2 for originating journeys)			**196,271**	**189,922**	**318,378**	**309,806**	**305,159**	**16,211**	**238,811**	**50,137**	**58,243**			
		Straight line to Exeter Central												
		Difference between (eg) Barnstaple and Chapelton, is measured as the distance between Barnstaple and Exeter Central, and Chapelton and Exeter Central)												
		This method discounts the wiggly nature of the North Devon Line, and tests the relative proximity of neighbouring stations, in relation to the main destinations of Exeter												
		Note that several stations' busiest years were early on, not more recently. The reason for this is not known, but may be train calling patterns												

99. Cumulatively, we are looking at infrastructure required for 3 trains per hour each way in the medium term, one fast to Plymouth, one fast to Exeter, and one calling at local stations to Exeter. In the contra-peak direction, there are three choices:
    - A similar contraflow 'express' service. That might become more worthwhile if the line were extended eventually to, say, Bideford or Ilfracombe, or if frequent North Devon catchment feeder buses were available at Barnstaple.
    - An all stations contraflow service by all northbound AM peak trains, to maximise the attraction of rail travel to Barnstaple. That might be worthwhile if there were more Barnstaple local stations with an eventual line extension (eg Barnstaple Town and Barnstaple NW Industry), or alternatively would depend on sufficient demand to Petroc College and to the walkable catchment of Barnstaple Town.
    - A skip-stop service, with alternate trains calling at a few shared and some different stops towards Barnstaple (and return in the evening), so that all catchments were served but not with unduly long journey times. This could work in a variety of contexts.

100. Timetable options will affect the preference for relaying sections of double-track or creating new ones plus some line speed improvements. Originally the whole of the Exeter-Barnstaple line was

built with sufficient width to accommodate two tracks throughout, although it was never fully equipped with that. The main single track section was Copplestone to Umberleigh. It will be possible to flex line speeds within that double track formation, while several other sections might benefit from new alignment outside the existing railway. To compete with car, a target journey time is 45-50 minutes between Barnstaple and central Exeter, and one hour from Bideford. This would make a substantial difference in the attractiveness of the railway to commute to Exeter.

101. Current and possible speed limits are described below, between Barnstaple and Yeoford. North of Yeoford, double-track is required in conjunction with the Okehampton Line reopening. A ladder junction is assumed north of Yeoford, to/from a 70-80 mph Barnstaple line. An outline specification for practical changes to speed limits, line elevation on curvatures etc is shown. A Plymouth-Barnstaple chord would join north of Coleford village (~184½ MP).

A solution - flighting trains

102. The only way in which 6 trains would go into a smaller number, is to have dynamic loops where a primary two trains in one direction, following each other in close formation, pass by less critical trains heading the other way. The situation is reversed for another part of the hour.

103. It is assumed below that the wider public benefit of 2 tph to/from Exeter, and a 1 tph to/from Plymouth, overrides the retention of Chapelton and Portsmouth Arms stations (the two which are explicitly least used on the line). This isn't to say that these stations might not be retainable, if a core railway service weren't impaired by these stations existing – but the starting presumption in testing services should be that they wouldn't exist. Retention would require more detailed review.

104. A 4-5 minute single line headway is assumed below on the North Devon Line, to enable trains to be flighted. This will require some intermediate signalling between stations spaced apart. Timing margins are included at Eggesford, Colebrooke and Crediton, to help reliable operation, plus margins between a train arriving at a passing loop or dynamic loop, and a train heading the other way. Similar margins are used on the largely singled line between Salisbury-Exeter. A larger margin applies to the new chord for Barnstaple-Plymouth trains.

105. Based on the fast/fast/slow sequence described above, reversed for a return timetable, an indicative timetable can be devised, based on an assessment of possible improvements to speed limits, plus selective double tracking and dynamic loops.

106. It is <u>only</u> a combination of faster line speeds and selective double tracking which achieves this outcome. Best timings between Barnstaple and Exeter Central are about 47½ minutes incl. margins, which meets the objective of a 45-50 minute headline journey time.

107. Potential relocation of Copplestone station should be noted. The station is to the north of the local development area, and not convenient for railheading via the A3072 county road. A railhead station close to the A3072 would be more convenient for most residents. It does not affect timetabling choices.

108. An hourly Barnstaple-Okehampton-Plymouth service can work providing that it is flighted. This sequence should also assist similar pathing needs on the line via Okehampton to Plymouth, with

the North Devon train flighting with a fast Exeter-Sourton service. This is expected to minimise infrastructure needs on the route via Okehampton.

109. An outline estimate of infrastructure between Crediton and Barnstaple is defined by the accompanying Tarka Line timetable modelling spreadsheet, where sectional times are estimated on a 'live' basis and respond to changes in specification for line speeds and station stopping patterns.

Section of line	Proposed track arrangement (speeds and distances from Tarka Line modelling spreadsheet)
At Exeter Central station	Potential requirement for additional reversing platforms from the west, or more trains towards Exmouth and/or Axminster. Space available for platforms in former through lines.
Exeter Central-Exeter St. David's	Double track as is. Additional intermediate signalling may be required if higher frequencies.
Exeter St. David's-Cowley Bridge Jcn	More trackage as part of Devon Metro. Eventual segregation of Intercity and regional lines as far as Cowley Bridge Junction.
At Cowley Bridge Junction	Grade separation at Cowley Bridge Junction with 55 mph double track to North Dartmoor/North Devon Line.
Cowley Bridge Junction-Crediton	Double tracking and flood relief works. 65 mph from 173-74, 85 mph from 175-07.
At Crediton (179 miles 20 ch)	Fully capable double track station, 75 mph from 178-69, 60 mph from station to 180-21.
Crediton-Coleford former junction	Double track on this section. Proposed ladder junction for North Dartmoor and North Devon lines at ~183-40 (former Coleford Junction not to be re-instated).
Coleford former junction-Morchard Road (187-38)	Copplestone station relocated to near A3072, with improved 70 mph alignment through former station. Double track to continue to Morchard Road station. Line speed 80 mph to 184-08 then 70 mph, then 85 mph from 186-00 to 187-28, then 70 mph again. New chord line from Okehampton to join at ~184-47.
Morchard Road-Eggesford	Keep as single track on improved alignment, 70 mph to 188-11, then 60 mph through Lapford to 191-13, then 70 mph to 193-06, then to 60 mph then 30 mph from 193-46 on approach to Eggesford (all trains call).
At Eggesford (193-57)	Automate signalling functions and make station capable of 30 mph minimum, with faster departure speeds.
Eggesford-Umberleigh (204-52)	Provide double track as dynamic loop to King's Nympton, with 70 mph from 194-70 and 85 mph from 195-72 to 199-33 (single track from north of King's Nympton station). 60 mph from 199-33 through Portsmouth Arms and multiple curves beyond, to Umberleigh where 40 mph design useful in station area (esp. for train acceleration on departure). Umberleigh station to be start of double track northwards.
Umberleigh-Barnstaple (211-25)	Reinstate double track with curves realigned to allow 80 mph until Barnstaple approaches. Double track station proposed, with capacity to reverse trains, and to detach/join portions if eventual operation on to Bideford and/or Ilfracombe.
	Likely that various user-worked crossings will require removal or automation to support safer train running at higher speeds.

110. A limited stop service calling just at Exeter Central, Exeter St. David's, Crediton, Eggesford, Umberleigh and Barnstaple is estimated to take 47½ minutes, including station stop basic margins of 2½ minutes and pathing and performance margins of 5 minutes. An hourly fast could in theory be operated with just 2 trains, with 12 minute termini margins, additional to the present hourly slow service. Extensions beyond Barnstaple are discussed in the next section.

Conclusions on Exeter-Barnstaple proposals

111. Overall, the ambitions of the Tarka Rail Association can be addressed, but it will come at a price, which is a requirement for faster overall line speed wherever this is considered feasible, and a timetable pattern which flights trains.

112. Network Rail might also require considerable reduction in the number of User Working Crossings and other crossings across the railway, to permit higher speeds. The present very severe speed limit at Eggesford, including provision for train staff to operate signals, must be abolished and automated.

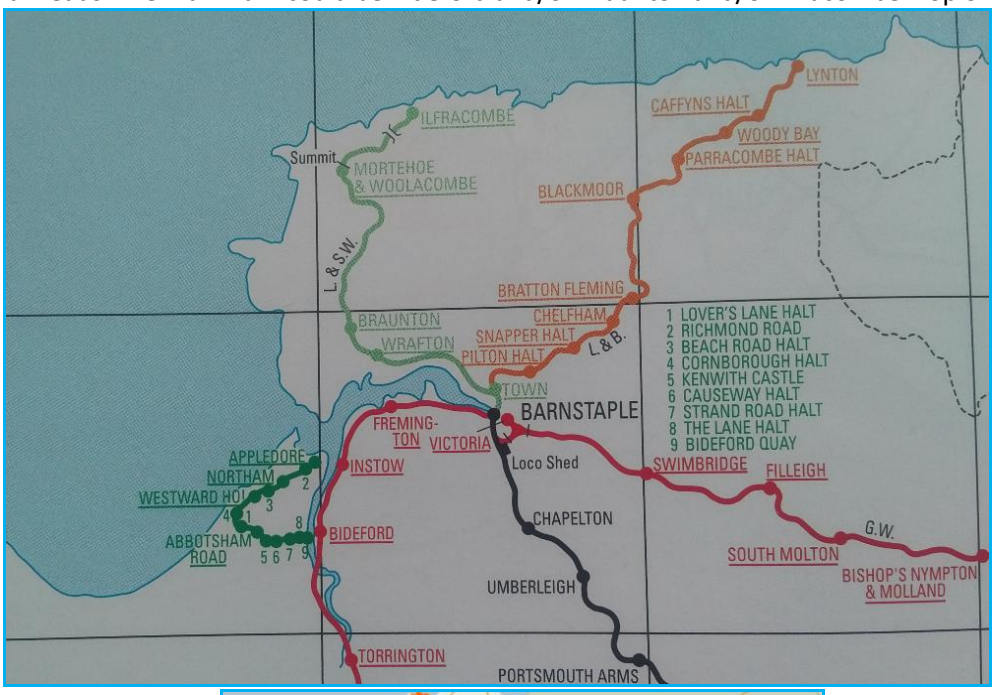
113. The overlay of a Barnstaple-Okehampton-Plymouth direct service will increase infrastructure requirements, but not unduly so. A new chord near Coleford/Colebrooke is straightforward and does not create timetabling problems providing that fast trains can be flighted in each direction. It is the retention of a slow stopping train to maintain a service to local communities, which creates the main pressure on single track infrastructure, and may require further double tracking or dynamic loops, or some additional waiting time at passing stations.

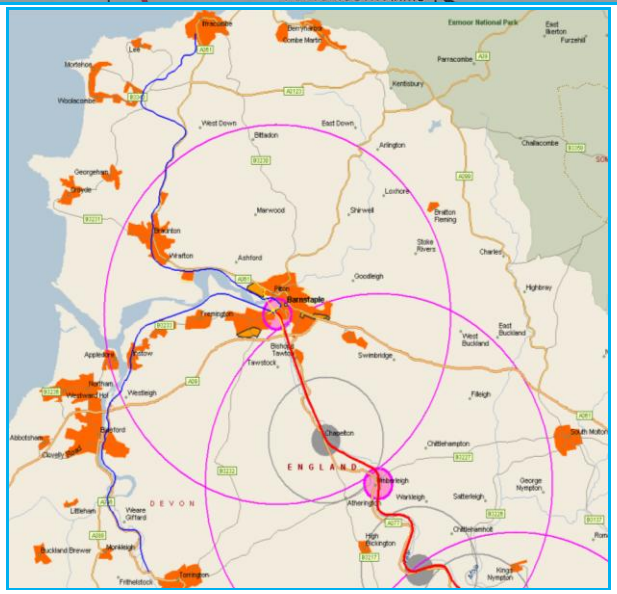
114. JRC has also given preliminary thought to how a line could be re-extended across the Taw estuary. However an initial potential is only towards Central Barnstaple/Civic Centre (not on the same 'cross-Taw' alignment as the former railway), and possibly as far as the NW Industrial Zone. This would depend on a strong buy-in by local stakeholders to re-instate the railway as a key part of future decades' economic growth in the wider Barnstaple catchment. It likely that a reinvigorated railway would first need to prove itself using Barnstaple's existing station and railhead, before more investment might be considered worthwhile.

D: Beyond Barnstaple

115. Ignoring the Taunton route, lines historically extended beyond Barnstaple:
    - Via the coast to Bideford then inland to Torrington – a considerable loop doubling back on the Taw Valley so inefficient in time from Exeter and beyond, in these days of car ownership.
    - Across the Taw estuary to Barnstaple Town, then via Braunton and a steeply graded railway to the top of Ilfracombe town – where gradients prohibited entry into the heart of Ilfracombe.
    - As light railways, from Barnstaple to Lynton and from Bideford to Westward Ho! and Appledore.

116. The old railway geography is below, with the current day settlement patterns shown at similar scale, with the old main lines overlaid. There is a diffuse spread of communities, unlikely to be served efficiently by a traditional rail network. The main opportunity would be a fast run from Exeter to a few railheads. The maximum could be Bideford and/or Braunton and/or Ilfracombe 'Top of Hill'.





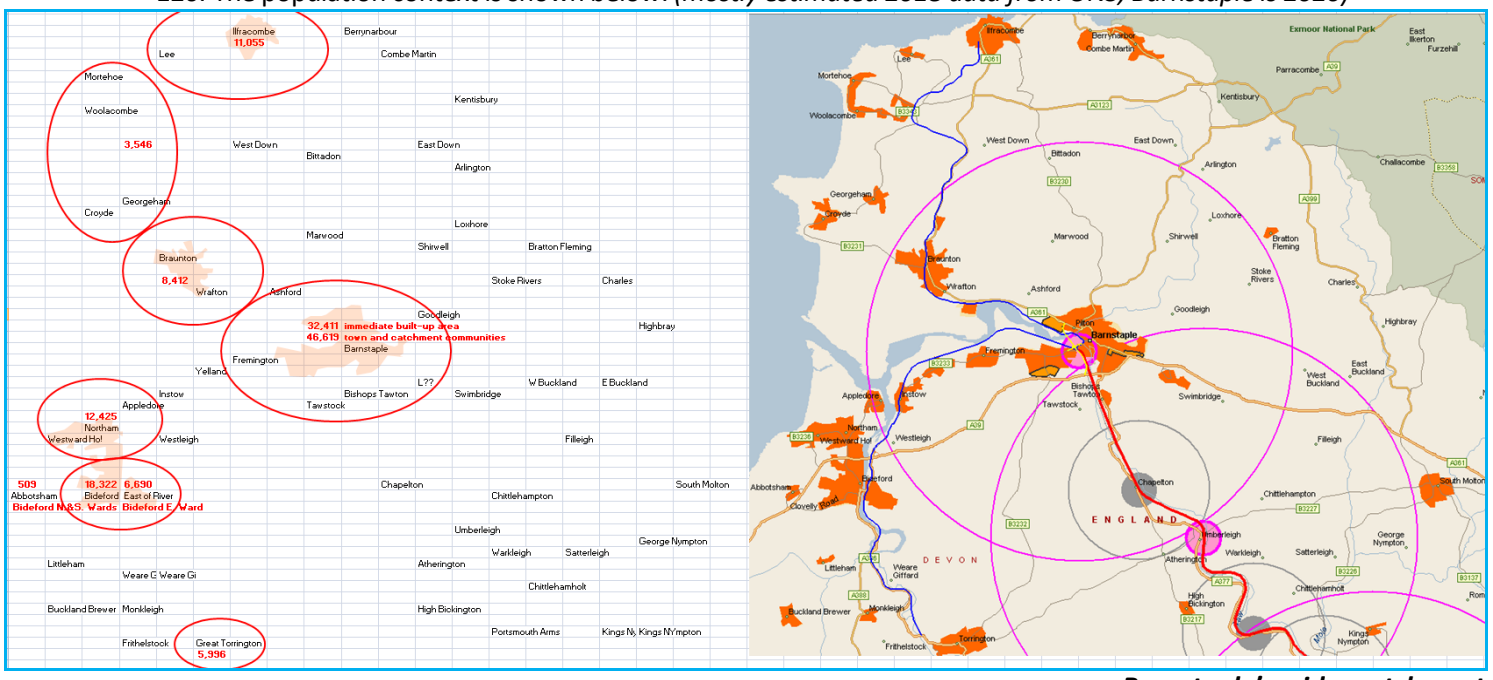
Poor railway geography

117. It is clear from the maps that the railway did not serve well as a local service either the wider Bideford catchment (across the river from the station), nor Ilfracombe with local topography.

118. Today's main all-year demand volume will be local (as always), to schools, colleges, hospital and business parks, and, at holiday times, through travel to resorts from the rest of Britain. Barnstaple Town has the North Devon civic offices while the town centre is busy. So most travel clusters around Barnstaple.

119. There is a case here to review the merits of local light rail, as a feeder to 'Barnstaple Main Line' railhead and above all with a good frequency service into the heart of principal local communities, and key destinations in Barnstaple, as a contrast with a selective main line extension.

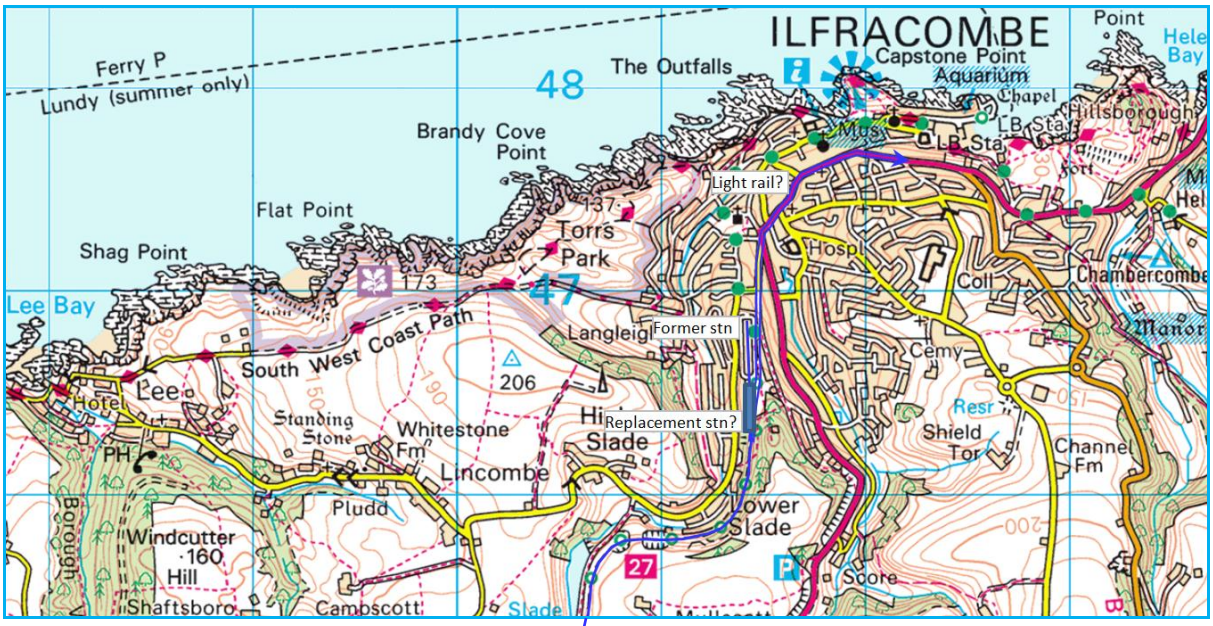
120. The population context is shown below: *(mostly estimated 2018 data from ONS, Barnstaple is 2020)*



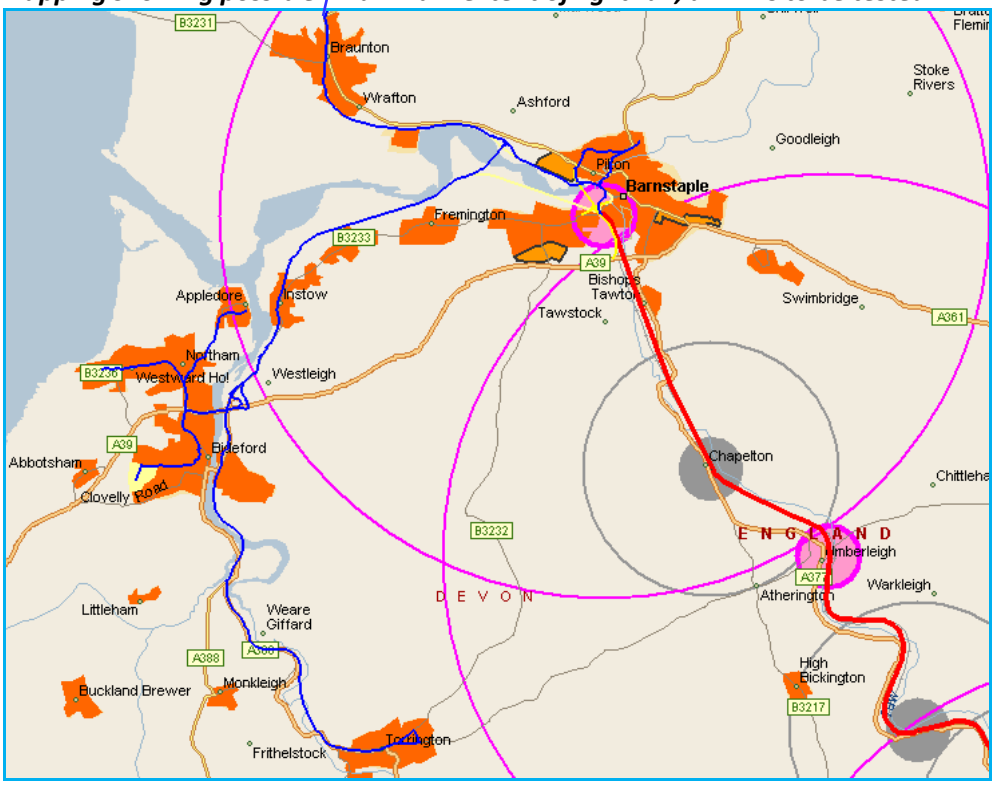
Barnstaple's wider catchment

Light rail options

121. There are light rail options which could be modelled against heavy rail, with a significant spread of population even if not all might be served:
    - Main corridor through Barnstaple from Petroc College and railhead across the estuary (more directly than formerly) to the town centre and civic centre.
    - Link to Pilton College and North Devon District Hospital.
    - Put light rail in tandem with Tarka Trail, alongside former heavy rail route to Braunton (this is the starting point of the Combe Rail scheme: http://www.combe-rail.org.uk/light-railway/)
    - Design – to the extent justified – a light rail route into Central Ilfracombe, likely to be mostly on former heavy rail alignment but to enter Ilfracombe on local streets to the town centre. (The former terminus is built on, so any heavy rail station would now be even further out of town!).
    - Review options for light rail into Bideford.



Mapping showing possible maximum extent of light rail, all links to be tested



122. For light rail access into Bideford, options exist for:

- Use former heavy rail route in tandem with Tarka Trail, but use A39 bridge as shared route into 'Greater Bideford', with various spurs as justified, eg Appledore, Westward Ho!, Central Bideford and indeed (continuing along the former line), to the 'East the Water' community.
- The latter might be the simplest way of continuing to Great Torrington (if merited), along the former railway, then up the hill into Torrington.

- A more radical alignment, to connect 'Greater Bideford' across the estuary towards Braunton/Chivenor and use the northern corridor into Barnstaple, would create a direct public transport link between Bideford, Braunton and Ilfracombe. The environmental effects should be investigated. A fixed cross-estuary bridge for light rail and Tarka Trail users could be located east of Fremington (avoiding the Braunton Burrows 'biosphere' further west).
- The costs of a bridge could be offset against reduction in infrastructure costs towards Barnstaple, and compensated also by more light rail use on a Bideford-Ilfracombe corridor.

Heavy rail options

123. As described earlier, the population characteristics are not helpful for extensive local use of heavy rail. The most that might be justified would be for trains to serve several other railheads, as a regional service to/from Exeter.

124. To reach Ilfracombe, a crossing of the Taw estuary would need to be recreated, at a different location to the historic one. It is possible that a station might be justified near to Barnstaple Civic Centre and town centre, plus railheads at Braunton, Mortehoe and Ilfracombe 'Top'.

125. Towards Bideford, the former railway skirted the local populations until Instow. A railhead at Bideford 'East the Water' and possibly a parkway station at the A39 bridge crossing, would be the most probable locations. Instow built-up area population was just 648 in 2018, so does not merit a service, but a parkway station would be only about 5 minutes distant.

126. The service would need to be a projection of suggested fast trains from Exeter, in order to attract road users to rail. The principal populations north of Barnstaple amount to 23,000 people, with Ilfracombe and the Mortehoe area having declined slightly since 2011. West of Barnstaple, the 'Greater Bideford' area including Instow is almost 39,000 and Great Torrington another 6,000. Both Bideford and Ilfracombe would also serve a seasonal holiday population.

127. The priority route for reopening is therefore Bideford.

128. Journey time for the 9.1 mile journey should be no more than 12 minutes non-stop, and could be faster. The previous steam service took 20-25 minutes calling also at Instow and Fremington, and had a maximum speed limit of 45 mph which was unattractively slow. A non-stop line should mostly be capable of 80-90 mph, although slower through Instow and with one or two stations in the Bideford area. A redesign of the former railway may be required – which was single track – to avoid the historic railway between Barnstaple and Instow which is a Tarka Trail foot and cyclepath, and to eliminate some of the curves which were built into the previous line. There is a benefit to be achieved by a more direct and faster new rail alignment.

129. The Tarka Line timetable modelling spreadsheet examples a 90 mph run to near Instow, then speeds in the 45-55 mph range. 10½ minutes is feasible with an A39 Parkway station and a second station at Bideford Bridge. The time from Bideford to central Exeter could be around one hour (58 minutes from A39 Bideford Parkway, 61 from Bideford Bridge), which meets the one hour objective and could be a game-changer for Bideford's ability to participate in Exeter's economic growth.

130. A timetable based on extension of a rail service beyond Barnstaple might not be efficient if it were designed as an extension from a timetable geared to Barnstaple being a terminus. This is because the out and back times to further destinations (eg, Bideford, Ilfracombe) plus a waiting margin at the further end could lead to train utilisation inefficiencies. If would be better with any extension beyond Barnstaple to redesign the timetable to allow for extension(s) to be part of the basic timetabling.

131. For example, re-opening to Ilfracombe would be at a significant cost, with 14.6 miles of track and re-engineering through Braunton to a heavy rail standard. A new terminus at Ilfracombe 'Top' would be required, probably more distant from the town than the previous station site which is built on. The route was steeply graded, at 1 in 36-41 for much of the final 6+ miles into Ilfracombe. Speed limits had been 15 mph over the Taw estuary and through Barnstaple Town station, 55 mph to Braunton, 40 mph to Mortehoe and 30 mph down the hill to Ilfracombe. If any such re-engineering is desired, it should aim to be efficient in its utilisation.

Changes to train operating priorities

132. Consequently, a timetable design is preferred, that the timings (and related infrastructure) on the Exeter-Barnstaple section should be organised so that they are also efficient on the sections beyond Barnstaple – so that a minimum 15 minute margin is achieved at the further termini and appropriate track and passing loops are inserted elsewhere.

133. Working backwards from this requirement, suggests a need for careful consideration of the interactions on both operational sides of Barnstaple. For example a tight turnround at Bideford would put undue pressure on reliability of the return service, particularly south of Barnstaple. A relaxed turnround time appears to work best for both sides. As an example, if the fast Exeter trains were hinged around the proposed double track section between Umberleigh and Barnstaple (a 4-5 minute running time will better standards), then, for example, an xx:05 arrival from Exeter might convert to an xx:08 to Bideford (~xx:18-20) and an xx:11 to Ilfracombe (~xx:45).

134. Using the same example, return workings might leave Bideford at ~xx:45-47 (Barnstaple xx:57, becoming the x1:00 to Exeter), and Ilfracombe at ~x1:16 (Barnstaple ~x1:50), which could connect into a Plymouth train and also become part of the x2:00). Note that the Ilfracombe train returns as a portion an hour later, not the same hour as the Bideford train. However overall train utilisation improves, and there is good margin at termini for each branch. The Barnstaple-Bideford section would be a simple single track, with single platforms and no passing loop required. The Ilfracombe Line would be mostly single track but requires an approximate 3 mile dynamic loop north of Braunton, possibly between former MP 219 MP and MP 222.

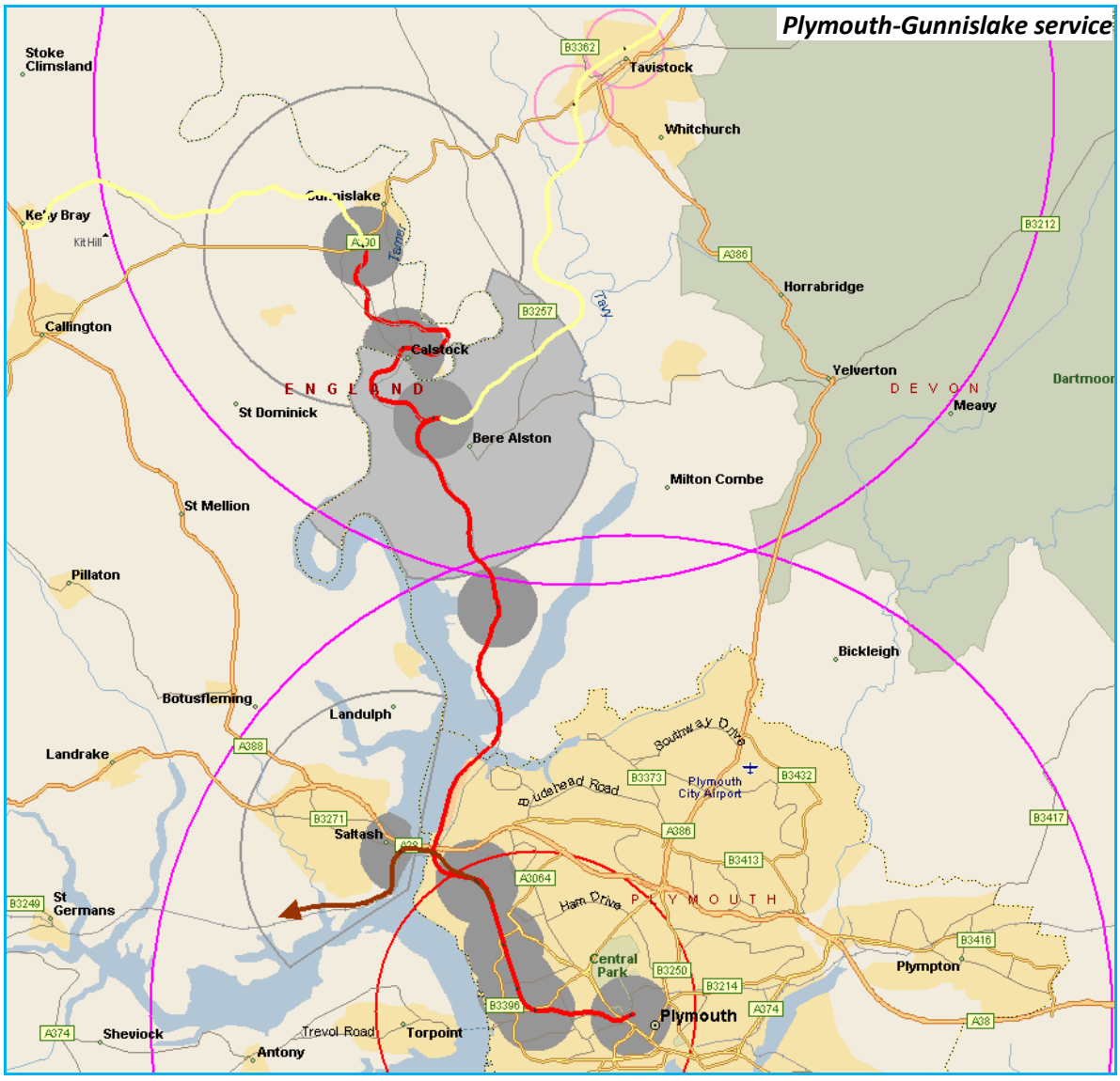
Option comparisons to be undertaken

135. This short analysis above should provide a basis for assessing the infrastructure and headline operational costs involved for hourly heavy rail service extensions beyond Barnstaple. These can be contrasted against potential revenues, and also contrasted with higher frequency and more accessible light rail options. Further infrastructure consequences south of Barnstaple have not been examined, but would require consideration.

E: North Dartmoor route – Plymouth-Tavistock section

136. Reopening between Bere Alston and Tavistock is the second main objective of the North Dartmoor project. After the Southern route via Okehampton was shut as a through line, a residual railway was retained as a commuter service to Plymouth from St Budeaux (on the Plymouth-Penzance main line), to Bere Alston, where trains reverse to reach Gunnislake in Cornwall, via a tortuous alignment and viaduct over the Tamar at Calstock. Gunnislake is a survivor of a former line to Callington (actually to Kelly Bray, as Callington is a mile further). That railway is no longer at risk of closure, but has not yet merited improvement. Callington is unlikely to merit a long term extension as the low speeds north of Bere Alston mean that road will be continue to be quicker than rail.

137. The map highlights the difficult catchment geography, with incised river valleys and few roads. The railway viaducts north of Saltash and at Calstock made the case to retain much of the line. The sections which were closed are shown in yellow. 800 metre local and 2 km or larger 6 km catchment circles are shown, both limited at Bere Alston and Calstock by the river valleys.



Residual service to Gunnislake

138. A 'one-train' service was retained between Plymouth and Gunnislake, which is provided with a frequency of approximately once every two hours, with a journey time of 45-48 minutes calling at all stations and including the reversal at Bere Alston. The section between Bere Alston and Gunnislake is operated as light railway, with a maximum speed of 25 mph allowed.

139. Any improved service to Gunnislake (eg hourly), would require an additional train, and a passing loop which could be arranged half-way in journey time, at Bere Alston. Its improvement would not impede the requirements of a Plymouth-Tavistock service. Service options are discussed below.

Reopening to Tavistock

140. The growing town of Tavistock, currently about 12,500 population, is a key local development and commuter dormitory for the Plymouth sub-region. It is shown on the map above. It is 5.3 miles distant by rail from Bere Alston (4.3 miles in a straight line) to a Tavistock West station, and the alignment is protected throughout until the northern part of Tavistock (where the former Tavistock North station was built on). Additional housing has been accepted by Devon County Council and West Devon District Council, subject to a railway being reopened.

141. There had been a former (GW) railway to Tavistock, via Yelverton. However this could not now be reopened as a significant part of that route is built on, particularly north of Yelverton, and at Horrabridge and within Tavistock. There might be scope to re-open from Marsh Mills (east of Plymouth on the GW main line) to a Yelverton Parkway station, but this does not meet Tavistock's needs. So for Tavistock to regain a rail link, the corridor between St Budeaux and Bere Alston will require improvement, and then be reinstated on the former Southern alignment into Tavistock. The small extent of reopening required, points to Bere Alston-Tavistock being the obvious objective.

Journey time factors

142. With a current journey time of 16 minutes calling at all stations between Bere Alston and Keyham (south of St Budeaux Junction on the double-track GW main line), this sets a maximum limit for a non-stop running time on the present single track section as far as Bere Alston. Plymouth-Bere Alston takes 23 minutes northbound and (with a timing margin) longer southbound.

143. Previous (pre-closure) diesel timetables also showed several standard 30 minute (uphill) timings northbound between Plymouth and Tavistock North calling only at Devonport (5 minutes to *leaving* Devonport, then 25 to *leaving* Tavistock), or calling only at Bere Alston (20 minutes to *leaving* BA, then 10 minutes on to *leaving* Tavistock). There was a 35 minute southbound (downhill) timing from Tavistock North to Plymouth calling at Bere Alston, Bere Ferrers, St Budeaux and Devonport, so notionally less than 30 minutes with only one stop!

144. There were no speed limits set northbound (uphill to Dartmoor) in the 1960 Southern sectional appendix, which allowed up to 85 mph for loco-hauled expresses, after a 20 mph limit at the St Budeaux Junction to/from the GW lines (the Southern had previously had their own railway as far as Devonport). It is however unlikely that steam engines could have achieved much more than 60 mph uphill even with a moderate load, while many curves were more limiting, 55 mph or less!

145. It was different southbound (downhill from Dartmoor). There was a limiting 40 mph speed limit imposed from 206¾ MP north of Lydford station, all the way to St Budeaux Junction (and further along the Southern route). This was principally to provide a braking safety margin on the many curves. The Network Rail sectional appendix now sets an upper 55 mph speed limit throughout on the Bere Alston-St Budeaux section, and in places it is lower even for lightweight diesel units.

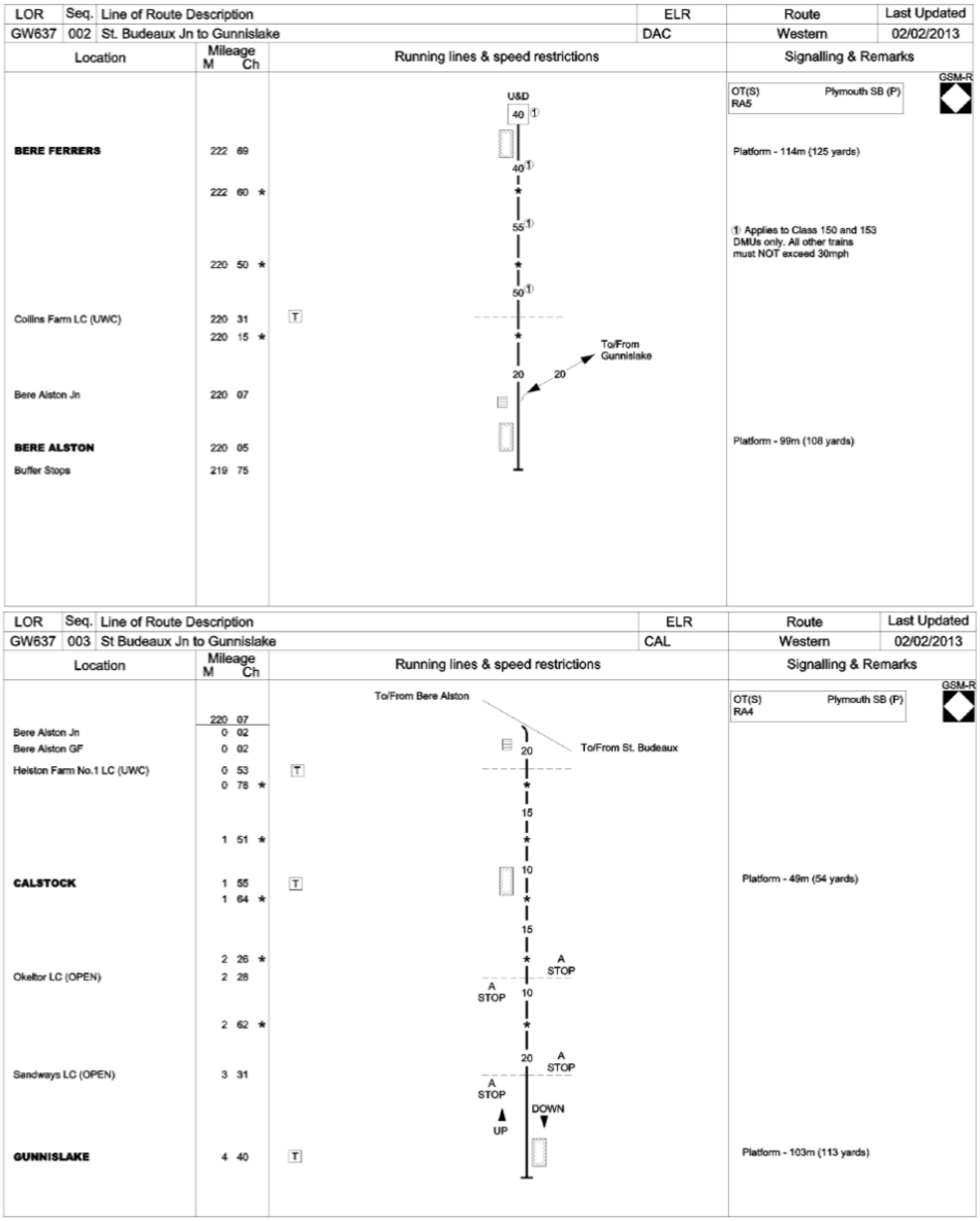
146. The sectional appendix limits are below. Severe speed limits are the 15 mph junction from the Plymouth direction into St Budeaux Victoria Road station, the general 25 mph limit there, and 40 mph over the Tavy Viaduct and through Bere Ferrers (platform on a curve). Platforms are generally adequate for 4 car trains as far as Bere Alston, which should not be a constraint.

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW108	021	Fordgate to Penzance	MLN2	Western	15/03/2014

Location	Mileage M Ch	Running lines & speed restrictions	Signalling & Remarks
		UM DM 50 50	TCB Plymouth SB (P) RA8 GSM-R
Keyham East GF	249 17		
KEYHAM	249 25	2 1	Platform 1 - 129m, 141yds Platform 2 - 123m, 135yds
		15 15 15 To Devonport Dockyard	
Keyham West GF	249 38		
Dockyard Jn	249 41		
	249 70	15	
St. Budeaux Jn	250 00	25	
ST. BUDEAUX FERRY ROAD	250 15	To/From Bere Alston GW637 seq 001 2 1	Platform 1 - 124m, 136yds Platform 2 - 126m, 138yds
	250 20 *	50 40	
Single Line Jn	250 25	T 40 50 U&D	

LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
GW637	001	St. Budeaux Jn to Gunnislake	DAC	Western	02/02/2013

Location	Mileage M Ch	Running lines & speed restrictions	Signalling & Remarks
		To/From Plymouth GW108 seq 021	OT (S) Plymouth SB (P) RA5 GSM-R
	250 00		
St. Budeaux Jn	227 22	To/From Saltash GW108 seq 21 25	
ST. BUDEAUX VICTORIA ROAD	227 02		Platform - 110m, 120yds
	226 68 *	*	
Ernesettle South GF	225 79	15	
		55 ① DOWN	
Ernesettle North GF	225 58	15	① Applies to Class 150 and 153 DMUs only. All other trains must NOT exceed 30 mph
	225 02 *	MOD * 50 ①	
	224 33 *	UP * 40 ①	
	224 16 *	* 55 ①	
	222 75 *	* 40 ① U&D	



147. There are two main options for a Tavistock service. The first is to replace the Gunnislake through service with a shuttle between Bere Alston and Gunnislake and to focus on running a Plymouth-Tavistock service.
    - With a ~45 minute round trip time between Bere Alston and Gunnislake on the 'light railway' section, this would suit an hourly shuttle, provided that it could connect into Tavistock trains passing at Bere Alston.
    - That would offer a more frequent service than a 2 hourly through train, so would be a benefit.
    - However the quality of connections would also be a function of the specification of the Tavistock service.
    - If that were *hourly* then the trains would need to pass at Bere Alston to achieve hourly interchange for Gunnislake, but that would lead to inefficient operation of the Tavistock service with ~40 minutes terminal time there.

- Tavistock trains might instead pass on the GW main line between Plymouth and Keyham, and be integrated with regional services east of Plymouth, in which case only a 2 hourly connection to Gunnislake would be possible at Bere Alston.
- Alternatively, a *half-hourly* Plymouth-Tavistock service would need to pass at Bere Alston, with single track beyond to Tavistock and return, and so would enable an hourly link to Gunnislake.

148. The second option is to keep a Gunnislake through service, either 2 hourly (minimum) or hourly, calling at local stations, and in addition have a fast service to Tavistock with 30 minute journey times, perhaps with alternating intermediate stops at Devonport and Bere Alston. The construction of that timetable is considered below.

149. While a start-up service from Tavistock might only be hourly, this would not be very attractive to potential users at Tavistock, and will achieve a poor diversion from car use and relief of peak time congested roads approaching Plymouth / Devonport. The potential catchment for a Tavistock station includes a wider population extending as far as Marytavy and Milton Ford wards, and the parishes of Marystow, Sampford Spiney and Whitchurch, with a combined population of 16,800.

150. Taking an average 600 journeys per year per person (post-virus), and only 2½-5% on regional rail (a crude commuter catchment percentage) gives 250-500,000 rail journeys per year, of which the bulk would be to nearby regional centres, so particularly Plymouth / Devonport. Cascading this volume to weekday peak time flows, points towards 125-250 commuters per high peak hour, and 280-560 peak volume overall for 3-hour with-flow peak travel, from Tavistock station on its own. Additional passengers will be available off the Gunnislake line and locally in the Bere Alston catchment.

151. This supports an emerging half-hourly service, with the benefit of the doubt favouring service and infrastructure development in any event to support medium term 2 tph services as part of the strategic North Dartmoor second corridor project. Weighting the impact of different service options should also take account of the effect on infrastructure requirements. Basically there are three constraining sections, not all of which are harmonious with each other.

Tavistock-Bere Alston

152. The modelled running time including curvature assessment is 7-8 minutes or less between Bere Alston and a Tavistock West station, and 10-11 minutes to/from a Tavistock North station. So it would be possible to devise a simple single track extension from a passing loop at Bere Alston, and have time in hand for a 7-10 minute reversal at Tavistock, with the first train meeting the next train at the Bere Alston loop. This puts some dependency on reliable presentation of both trains at Bere Alston loop, but this is a local branch line with some flex also possible (up to a point) on the main line from St Budeaux to Plymouth and v.v.

153. This would suggest a regular interval 30 minute headway on the Tavistock-Bere Alston section, with an absolute minimum of a single track and a single platform needed to start with. A third platform would be needed for the Gunnislake branch, if this were not part of the core service to/from Plymouth. Tavistock station would eventually need an additional track and platform, to accommodate through trains starting at Exeter or Barnstaple, but providing these can be managed at a consistent half-hourly frequency then they can take over where an interim Plymouth-Tavistock service begins (they might require a greater operating margin at Tavistock or Bere Alston).

Bere Alston-Keyham

154. If Tavistock were an hourly fast service, this in theory could allow an hourly Gunnislake service on the other half-hour, or, if Tavistock were half-hourly, either as described above with a Gunnislake-Bere Alston shuttle, or three fast trains in two hours to/from Tavistock and the fourth train to be a Gunnislake one replicating the all stations service south of Bere Alston.

155. The crux on this sector is the effective (and reliable) time southbound to reach the GW main line at Keyham, to release capacity on the single track for a northbound train onto the Tavistock line towards Bere Alston (plus any relevant Gunnislake trains).

156. Recognising that curves and gradients will continue to influence permitted speeds, even with a single track line able to make creative use of the former double track formation with some improved curvature and track cant, a modelled non-stop train from Bere Alston to passing Keyham would take ~10½ minutes. Calling at all stations would be another 3 minutes. It is proposed to model a 50 mph connection onto the GW main line at St Budeaux (currently 25 mph southbound, 15 northbound), to avoid timetabling risks with GW services, discussed below.

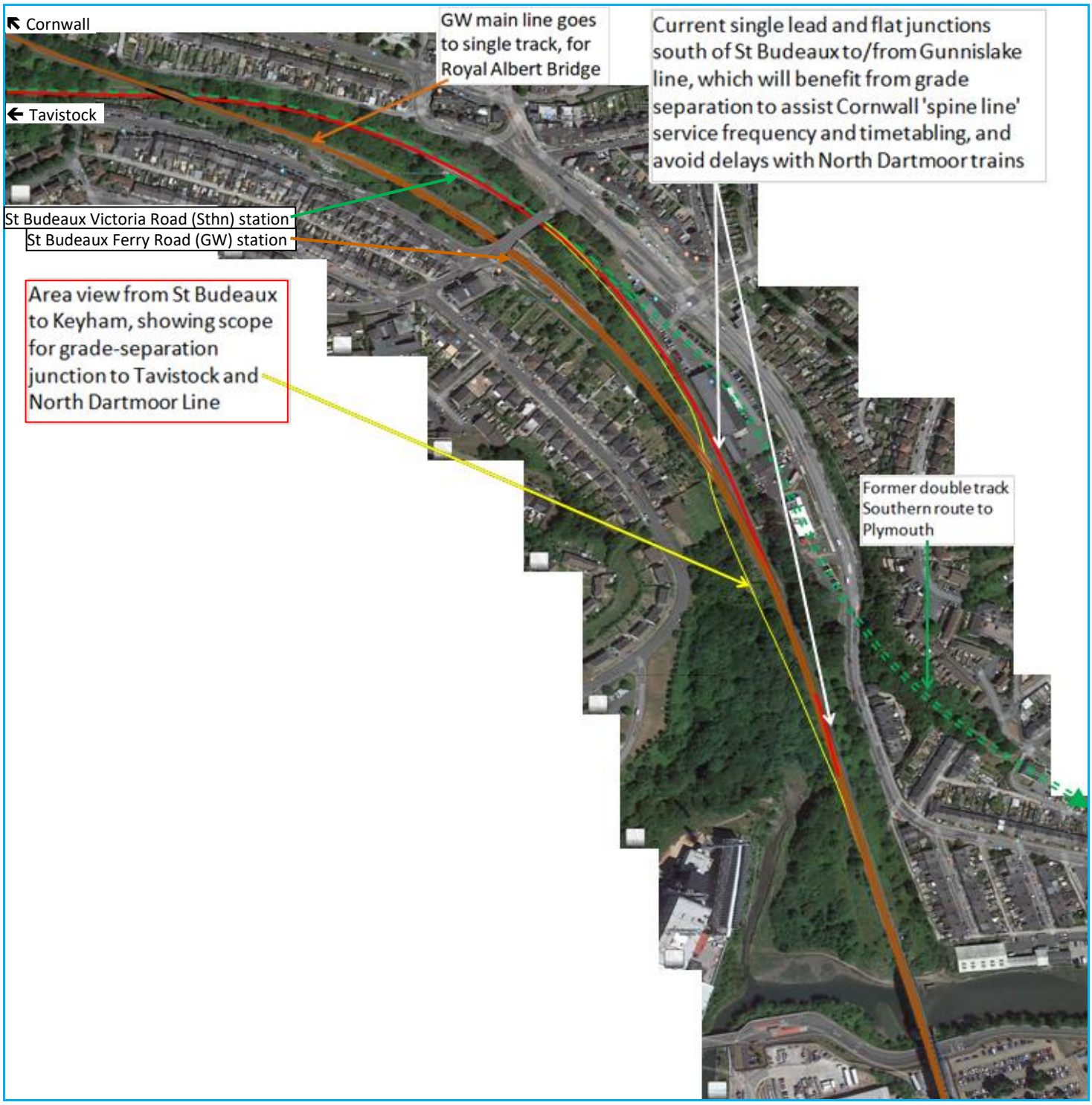
157. What this means is that if a half-hour interval is determined by Tavistock trains passing at Bere Alston (or Gunnislake trains substituting for Tavistock ones if an hourly Tavistock through service), then timing would allow Tavistock/Gunnislake trains to pass at Keyham or further towards Plymouth, on the double-track GW main line, with an adequate running time southbound to reach Keyham or beyond plus an adequate margin for the northbound train. Inclusion of local stops on a few southbound trains would not matter, providing that the train with local stops southbound were matched by a *fast* train northbound, and v.v. But it will be essential that times of Tavistock trains in the Keyham area are manageable when meshing with the GW services on this corridor, while to avoid any planned wait at Bere Alston for trains to pass, a 3 mile dynamic loop should be built there.

Keyham-Plymouth

158. St Budeaux Junction-Keyham-Devonport-Plymouth is a double track line, with sequential trains permitted at up to 4 minute intervals under the 'Rules of the Plan'. However the Royal Albert Bridge over the Tamar is a slow 15 mph single track railway from St Budeaux Single Line Junction (see diagram above), which limits train frequency west of St Budeaux to Saltash, to conform to 'Absolute Block' rules. In practice the regular GW timing points are at St Budeaux Junction (the Tavistock Line junction) and at Saltash, which simplifies assessment.

159. The Absolute Block implies at best about every 6½-8 minutes for successive Cornwall trains in either direction (depending on whether trains are non-stop or call at St Budeaux Ferry Road and/or Saltash), or a ~14-16 minute single track margin at St Budeaux Junction for a westbound then an eastbound to enter and clear the single line in both directions, and allow the next west.

160. There will be sensitivity about any impact of Tavistock Line services and their frequency, on the operation of the GW route between St Budeaux and Plymouth. The crux on this sector is therefore how a potentially 2 tph service from the Tavistock/North Dartmoor direction can be accommodated comfortably at St Budeaux Junction, as this is a flat junction with a slow (15 mph) single lead across, heading from Plymouth towards Tavistock. An area view shows the preferred option:



161. There are three apparent solutions, but only one which provides an operationally robust solution. They all require a grade-separated junction in the St Budeaux area, to improve operability in a situation when more trains might be anticipated to/from Cornwall:
    - To provide grade separation west of St Budeaux Ferry Road, with a northbound chord dropping onto the Tavistock Line after Ferry Road station. Only southbound trains from the Tavistock

direction would then serve Victoria Road station. However the chord would be tight to existing housing. Operationally, it would not allow St Budeaux Ferry Road to be a holding point for trains to Cornwall, between the Tavistock Line junction and the Single Line junction, to be held to wait for a late eastbound train over the Royal Albert Bridge. This is unlikely to be acceptable.

- To slew the GW track over the Tavistock Line, onto an alignment just north, so that a chord onto the Tavistock Line uses the existing GW solum and doesn't intrude onto the existing housing more than the present GW main line does. However this still does not solve the operational constraint unless GW double-tracking continued closer to the Royal Albert Bridge (which it used to do).
- To use railway and open land south of St Budeaux stations, to enable a low-level grade-separation of the northbound Tavistock Line, under the GW route and into a double-tracked St Budeaux Victoria Road station, with the grade separation starting north of Weston Mill Viaduct. This is shown above.

162. The practical two choices are the second and third options, of which the third is the least intrusive and likely to be the lower cost, so it is preferred.

163. A further benefit of the third option is that practical double-track capability is then created for the Plymouth-Tavistock/Gunnislake services, from Plymouth at least until the western end of St Budeaux Victoria Road station, and as far north towards Tavistock as would be considered desirable for main line operating margins for Cornwall services.

164. This further reduces the time duration of the improved (and now shortened) single line section south of Bere Alston, so that the single track section would then be more resilient to late train running in the opposite direction.

165. A final point is the possibility of relocating Bere Ferrers station on a straighter piece of track just south of the present station, if this enabled higher speed on the curve through the present station site. This would create additional timing benefit, including for scheduling on the main line.

Conclusions on Plymouth-Tavistock

166. Whether with an hourly or half-hourly Tavistock service, and whether with a through Gunnislake service or a shuttle from Bere Alston, the full requirements of a Plymouth-Tavistock railway can be accommodated satisfactorily. Three trains will be required, plus one for Gunnislake.

167. An improved and speeded-up single track line, a passing loop at Bere Alston (and if needed, a branch platform there, and a 3 mile dynamic loop to avoid waiting time), and a grade-separated junction at St Budeaux into a double-track Victoria Road station, should make the railway fit for purpose between Keyham and Tavistock for the medium and long term.

168. A decision on best location for a final station(s) at Tavistock can be considered as part of the Okehampton-Tavistock assessment, meanwhile an interim station should require only one platform. It is possible that, in this interim, train requirements can be optimised at Plymouth by means of through running eastwards linked to other regional services, or by other initiatives to improve rail accessibility in the wider Plymouth catchment (see Annex A).

F: North Dartmoor route – Okehampton-Tavistock section

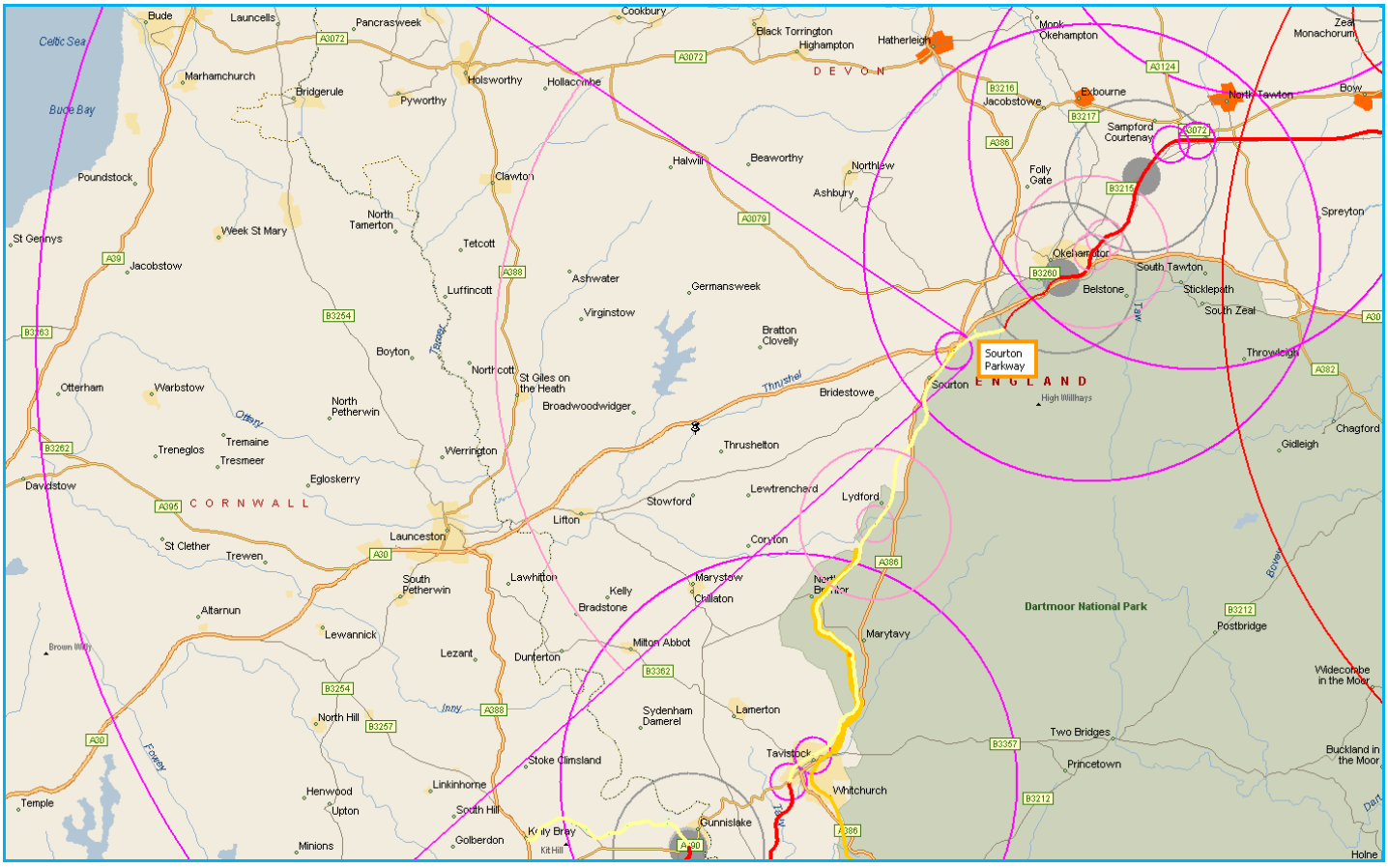
169. The final link in the North Dartmoor chain is the 15.3 miles former railway from a potential Tavistock (West) interim terminus to Meldon Quarry, and the existing 2.1 mile heritage line from there to the current Okehampton station, which is 17.4 miles in total. It is possible that a further 1.2-1.7 miles to an Okehampton East station would also be reopened, if that were not made available with the initial Exeter-Okehampton reopening (see discussion in paras. 70 and 79 above).

170. The alignment is largely safeguarded, although some is used as a public right of way, which needs consideration and practical solutions. Those are discussed in the sectoral analyses below. Much of the route adjoins or is within the Dartmoor National Park, another matter requiring care.

171. It would be nice to think that solutions were simple, but this isn't the case. We should start by defining the service proposition, and then follow with consideration of the elemental items on a sector by sector basis. A map of the Okehampton-Tavistock sector is shown below. The railways to be reopened are shown in yellow and thin red.

172. Proposed stations are highlighted at Sourton Parkway and Lydford, also a possible second station at the former Tavistock North site. Local catchments are shown for 800 metres / ½ mile, and for 2 miles, wider catchments at 6 miles and, in the case of Sourton Parkway which would be a railhead for much of West Devon and North Cornwall, 12 miles and 24 miles because of the fast car access times via the A30 dual carriageway.

Line reopening Okehampton-Tavistock via Sourton Parkway



At Okehampton, and general timetabling

173. The earlier discussion on Exeter-Okehampton allowed for half-hourly trains from Exeter to terminate either at a new Okehampton East station, on a double-track section of railway from a Sampford Courtenay Parkway station, or, if return running time permitted, to continue as a double-track line to the present Okehampton station. Basically one eastbound Exeter train would be expected to pass the next arriving train, on the Okehampton-Sampford Courtenay sector.

174. Through services to Tavistock and Plymouth would require continuation of the double track to the west end of Okehampton (heritage) station, and its opening for regular passenger use if not before then. This would create an effective 5-5.6 mile dynamic loop between Sampford Courtenay Parkway's preferred new location, and Okehampton (west), or be the end of a long double-track section from Coleford or further east if that were preferred.

175. With through services, there is the potential for three trains every hour, each way through Okehampton:
    - Exeter-Okehampton-Tavistock-Plymouth and v.v.
    - Exeter-Okehampton-Sourton Parkway and v.v.
    - Barnstaple-Okehampton-Tavistock-Plymouth and v.v.

176. There would be no case for more than half-hourly throughout the Okehampton-Tavistock sector, until decarbonisation started to bear down heavily on vehicle mileage for more journeys and National Park policies restricted car use. The purpose of Exeter-Sourton Parkway is to provide a reliable rail alternative at adequate frequency to bear comparison with the A30 dual-carriageway between North Cornwall and Exeter. In the long term an express railway might be created direct to Launceston and/or further into Cornwall.

177. With one train an hour terminating at Sourton Parkway, there is then the scope to maintain a reliable railway service using a single line for much of the distance, with dynamic loops as required. This could also assist with management of the public right of way and cycle corridor (the Granite Way), with a largely single line of railway on a former double track formation, and a walking and cycling corridor alongside making use of the railway formation. There is also the section between Lydford Gorge and north of Tavistock, where there were once two parallel lines (the Southern route, and the GW Plymouth-Launceston railway), which opens other possibilities, discussed below.

178. There is a requirement already discussed in the Plymouth-Tavistock topic, for trains to present themselves reliably at Tavistock / Bere Alston, so that trains on the final single track section before the GW main line into Plymouth can be depended on for timekeeping. This in turn requires timetabling and infrastructure to be carefully managed on the section south from Okehampton.

179. Reliable timekeeping is also required in the reverse direction, so that departures eastwards from Sampford Courtenay Parkway onto a possible single track section will be also dependable. With the measures already proposed for train management on the Plymouth-Tavistock sector, a northbound departure from Tavistock can be trusted, so again it is the way in which timetabling and infrastructure is managed north to Okehampton which matters most.

Okehampton-Sourton Parkway

180. This is a complex section of former railway. It is convenient to consider first the section from Okehampton to Meldon Viaduct.

Okehampton-Meldon Viaduct

181. This section of railway has a heritage capacity, with Okehampton station preserved as an example of Southern Railway architecture and facilities, plus a heritage shuttle train to Meldon Viaduct [1].

182. Retention of a heritage service for viaduct sightseers is a plausible option, and could be allowed for in the future timetable design:
    - This could include passage of the viaduct by heritage train (currently not possible) and reversal west of this, before Meldon Junction, with a reinstated siding or loop near the start of the former North Cornwall and Bude railways, to stay clear of regular passenger services.
    - Passengers could be deposited there, and picked up at Meldon Quarry Halt (preserved and on the Okehampton side of the viaduct), once they had crossed the viaduct on foot to fulfil their visit having gained a personal appreciation of the surroundings.

183. Okehampton station would need to be updated sympathetically to provide 2020s standards of passenger rail facilities (eg, level boarding, and capability for Persons of Reduced Mobility) whilst not intruding into the heritage appearance of the station.

184. There is a parallel long distance cycle track and footpath, the Granite Way, largely sharing the railway formation to Meldon Quarry which has been reduced to a single line of railway. See map overleaf.

185. Meldon Viaduct is a **Scheduled Monument** owned by a not-for-profit organisation, the Meldon Viaduct Company, which exists to protect and maintain the viaduct, and is effectively a subsidiary of Devon County Council.

186. There are actually two parallel single track viaducts. The original is a wrought iron structure (only one other now exists in the UK, in the Midlands). This is on the north side, the second viaduct is made of steel and is on the south side, which was built in the fast time of 16 weeks in 1878 despite trains still running on the original structure! [2]

187. The viaduct has been strengthened at various stages during its life, but regular rail services ceased in 1968, and its remaining use as quarry rail sidings ceased in the 1990s with concerns about its current load bearing capability. It is now used as part of the Granite Way route. See link here for more details:- https://en.wikipedia.org/wiki/Meldon_Viaduct.

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[1] The heritage service is stopped at present, while the line ownership – the Dartmoor Railway is owned by an American company – was in administration before the present virus crisis.

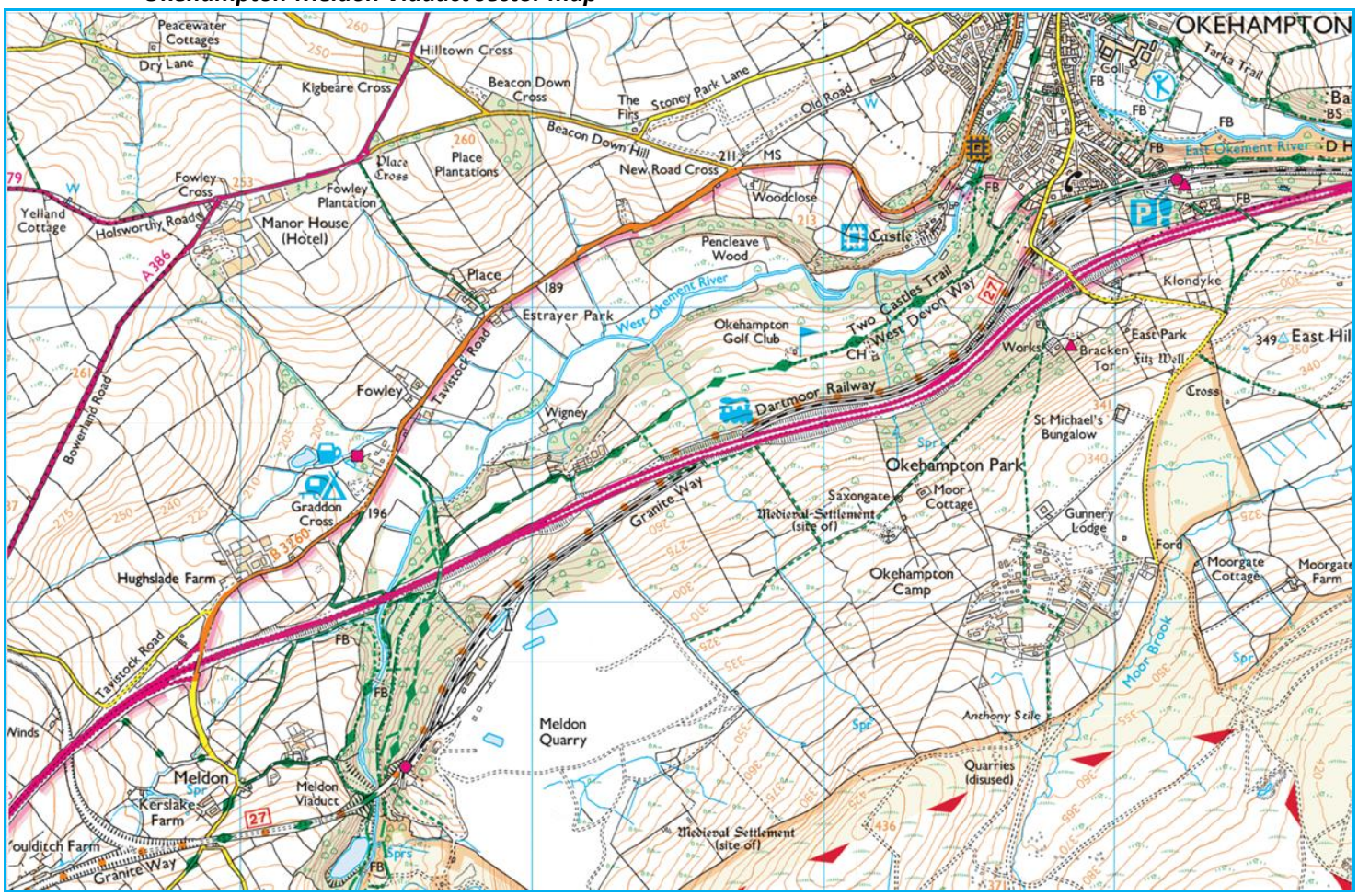
[2] **From the Historic England scheduling reference for the Viaduct: "Reasons for Designation**
"Despite necessary modern refurbishment to maintain the structural integrity and safety of the superstructure, Meldon Viaduct is dramatic in terms of both its location in a steep valley and its appearance as an intricate metal bridge of complex appearance. Described as a 'monument to Victorian engineering ingenuity' it is the last surviving high metal viaduct in the country." *[The Forth Bridge is in Scotland.]*

188. While there are concerns about its load bearing, the extent to which the (southern) steel viaduct would require reinforcement to again carry passenger services is not clear. Similar strengthening concerns (for a brick viaduct) were used by BR when it sought to close the Settle-Carlisle Line over Ribblehead in the 1980s, but a solution was found there.

189. According to Network Rail in a 2014 study following the Dawlish seawall collapse, the condition of Meldon Viaduct was a significant obstacle to the re-opening of the line and it would need to be replaced before trains could run on the line.

190. JRC considers that it warrants a full investigation of what a single track railway would require, as re-doubling would not be needed for the specification proposed here. The technical options for strengthening the steel viaduct or building a new viaduct require more analysis.

Okehampton-Meldon Viaduct sector map



191. The support of the Meldon Viaduct Company and Dartmoor National Park would be essential for railway reopening, if the railway were able to reuse the second, steel structure. Provision would also be required for the (northern) wrought iron viaduct to retain a safe right of way for the Granite Way users. At present the Granite Way route straddles the two viaducts in the centre of the structures.

192. If investigations concluded that a third new viaduct would be needed for railway purposes only (which assumes the Granite Way stayed as it is now in the centre of the current two viaducts), it is most unlikely, from the rationale for Scheduling, that the third would be allowed to look anything different to the appearance of the existing viaducts. So it would need to harmonise and blend with what is there, and would possibly need to be a similar steel design as the second viaduct.

193. Meldon Viaduct had a 20 mph railway speed restriction between 199¼ MP and 199¾ MP, because of various factors:
    - Railway curve with a horizontal radius of 600 metres (on ground, this would allow 85 mph).
    - Affect on structure viability of higher train speeds with lateral forces.
    - High winds sometimes experienced during passage across the steep sided valley below.

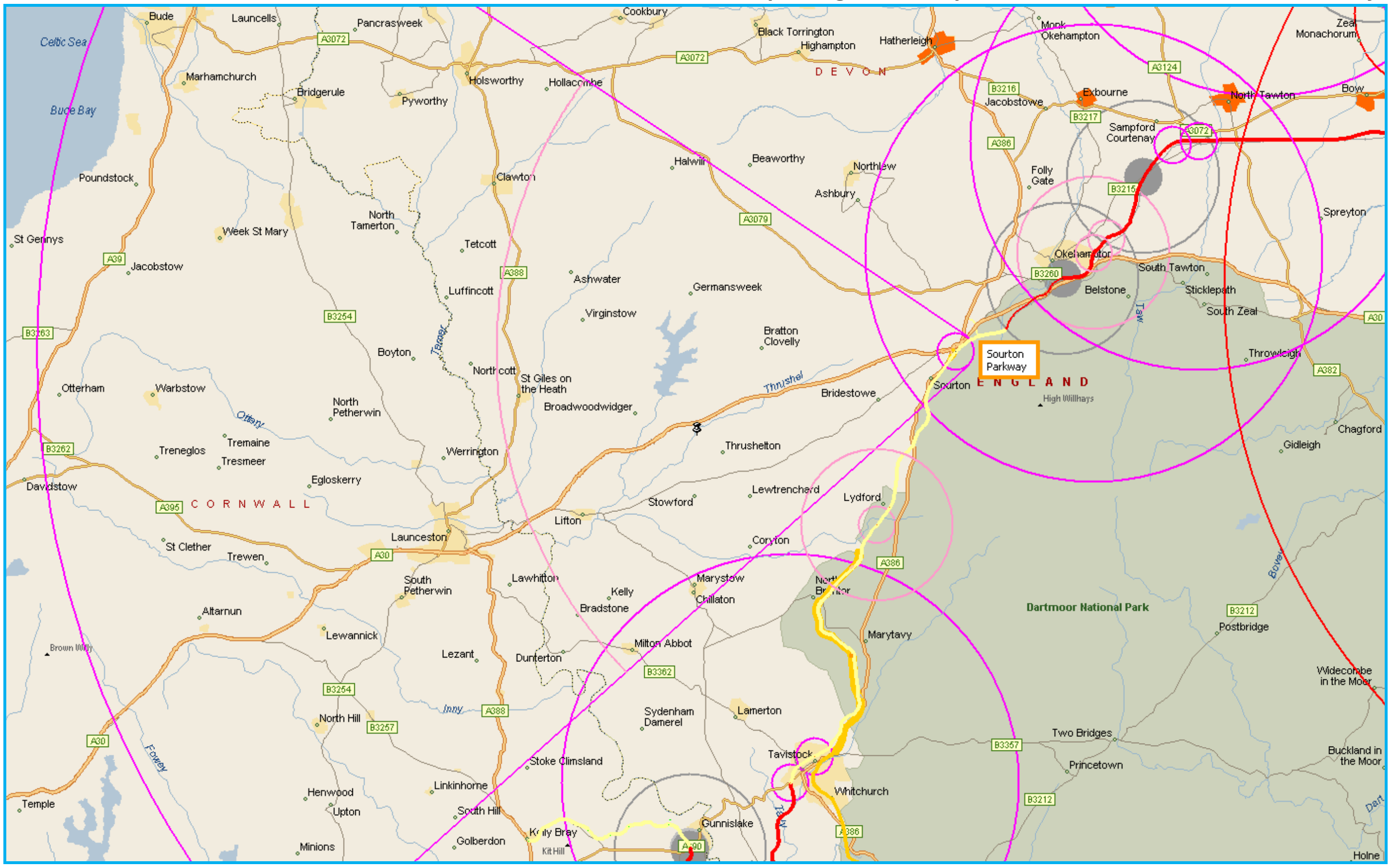
194. It is assumed for timetabling purposes that a 20 mph restriction would be retained for the future railway. This is because of the second and third reasons, and the (probable) requirement that, if needed, any new viaduct should harmonise with the existing ones so shouldn't have any different characteristics. If the reasons were valid before, they will continue to be valid.

Meldon Viaduct-Sourton Parkway

195. West of Meldon Viaduct, and allowing there for a potential siding and platform for heritage trains, the former Southern route reaches its highest point on Dartmoor at about 200¾ MP, at ***Meldon Summit,*** beyond Meldon Junction. The railway is now at 290 metres (950 feet) above sea level. It is downhill from here to Plymouth. We are still within Dartmoor National Park. A map shows the sector here, along with former Meldon Junction for the railway to North Cornwall and Bude.

196. A potential ‘Sourton Parkway’ railhead is then close by, and is one of the fundamental rationales for reopening the Exeter-Plymouth railway via North Dartmoor. The core geography was shown in the map below para. 172, and is repeated here.

Line reopening Okehampton-Tavistock via Sourton Parkway



197. It is the transformational journey time effect of the A30 dual-carriageway from Cornwall which creates this unique opportunity to provide a Cornwall railhead in West Devon. The A30’s fast speeds and short driving times, can be matched to the local accessibility of the North Dartmoor railway from the A30, at Sourton A30 Services west of Okehampton. The A30 vector shown above illustrates the opportunity.

198. When BR Western Region closed the former railway west of Okehampton in 1968, they relied on people being willing to use the inconvenient Okehampton station, instead of specifying and locating a new Cornwall ‘Parkway’. The remaining trains at Okehampton were however infrequent and all-stations, so not at all attractive, and closed in 1972. The highly successful Bristol ‘Parkway’ opened in the same year, 1972 [3], with a different service proposition linking to frequent fast services.

199. The proposal now is for a true Cornwall ‘Parkway’ station <u>and</u> standard of rail service, at Sourton Parkway.

[3] Bristol Parkway station was opened in 1972 by British Rail, and was the first in a new generation of park and ride stations. It is the third-most heavily used station in the West of England, after Bristol Temple Meads and Bath Spa, and also serves the expanding Bristol urban area.

200. If the strategy is viable, its success will still depend on details. The local map, further above, shows the general location of a possible station located on the former Southern rail route, within Dartmoor National Park lands and with a suggested one-way road access directly onto and off the A30 Sourton junction, which should be as convenient as it can get, providing adequate car parking is provided.

201. This is a critical matter of detail. Potential A30-rail interchangees are unlikely to want several hundred metres of walking distance from their car to the station platform… (For example, try just getting from one side of a motorway service area to the facilities on the other side at night, if your side is shut!). Potential users would try it once or twice and then decide to avoid the interchange and possibly carry on by car the third time! Also imagine standard or worse British weather on the top of Dartmoor, in an all-year context… So a high level of perceived interchange convenience is *very* important.

202. It is possible that Dartmoor National Park might be concerned about allocation of car parking facilities within the Park planning zone for a road-rail interchange, instead of them being favourable to this. In a difficult case, this could require a review of the location of a Parkway station, so that its car parking capacity were located outside the park boundary. Worse still, in order to maintain the important proximity of the rail platforms and the car parking, the *whole* railway and its station might then need to be relocated outside the Park boundary, with attendant planning issues and design and construction costs.

203. At present, it is assumed for timetabling and railway infrastructure costing purposes that a railway station and A30 vehicle interchange can be supported within the National Park area, but this is not guaranteed. Discussion is required with the National Park authority and Devon County Council.

Railway operations as far as Sourton Parkway

Timetable pattern

204. So far as the railway requirements are concerned at Sourton Parkway, the station is expected to be a termination point for one train per hour each way from Exeter in normal circumstances, and a through station for two trains per hour each way (one from Exeter, one from Barnstaple), where as discussed above, those trains will need to be well behaved in both directions and form a half hourly service towards Plymouth and on their return, towards Exeter and Barnstaple.

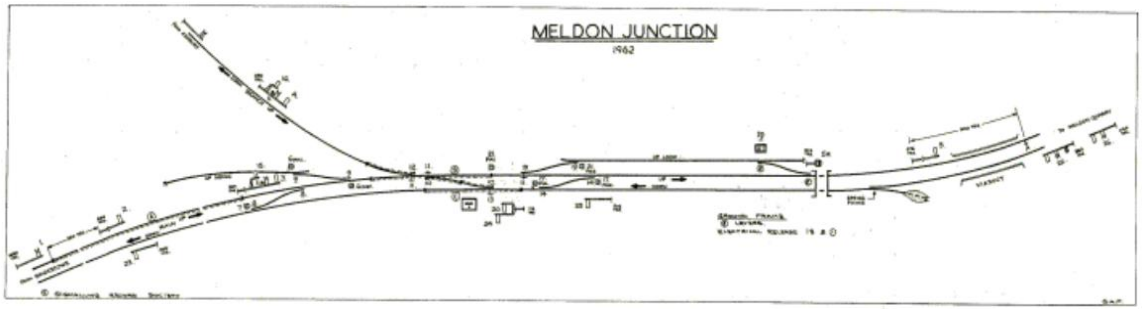
205. A regular interval service might still be the standard strived for any diversionary trains, if they had to avoid the Dawlish-Teignmouth area, which would inevitably cause a change to normal services. Possibly the first hourly diversionary service could replace the hourly Exeter-Okehampton-Plymouth slot in the first instance, with a further ‘variation timetable’ requiring development if a half-hourly frequency were required between Exeter and Plymouth via Okehampton, for example to include CrossCountry hourly trains or more GW Cornwall trains.

206. Such a timetable should be available ‘on the shelf’ for operation when needed, including how Barnstaple-Okehampton-Plymouth travel should be facilitated if the otherwise regular train service on that route also had to be interrupted at short notice.

207. A further alternative is for more double-tracking to be provided so that a faster diversionary route were available via Okehampton. A fully non-stop train from Exeter St. David’s to Plymouth

North Road would incur about 72 minutes, including ~6 minute pathing margins, which is impressively fast for a diversion service. However, if diversion trains were not to fulfil the basic regional service functions, then diversion infrastructure and a timetable would need to ensure that the basic regional service wasn't disrupted unduly.

208. It is possible that Okehampton, or the Meldon heritage train siding/loop (suggested above in para. 181), would be needed to accommodate a short working Barnstaple service terminating there, to connect into a diversionary Plymouth train, to use the timing slot for the other hourly service to and from Plymouth, in lieu of the Exeter-Sourton Parkway hourly train and then onwards in the path of the Barnstaple train. Such a siding/loop existed previously, as shown in a 1962 Meldon Junction signalling diagram.



209. Also, there is space on the ex-double track railway to use the former second line as a siding alongside the intended single running line. It would be preferable that such a siding had a visitor platform abutting the Granite Way path, so in this location it would best for the Granite Way to be on the northern/western side of the passenger tracks, so that there was a simple continuation off the Viaduct – where the Granite Way would either be on the current two viaducts, or on the northern wrought iron structure.

210. The running time from Okehampton to Sourton Parkway would be about 6 minutes, including 20 mph over Meldon Viaduct, if the line speed limit were otherwise about 75 / 80 mph west of 198¼ MP (the end of the Southern's former 45 mph speed limit through the Okehampton area). In practice, a higher speed doesn't achieve much useful (50-60 mph is shown for this section, for non-stopping uses through Okehampton) until after the western end of the Meldon speed restriction.

211. At Sourton Parkway, there could be a passing loop to be used as a reversing point for the Exeter-Sourton hourly terminating train (an island platform would assist passenger transfer between trains). Otherwise, it is not expected that the normal through train sequence would require a second platform for regular use, as a dynamic loop would be located further along the line for regular half hourly services from Exeter and Barnstaple. The location of Sourton platforms relative to the Granite Way and the railhead car park would need to be determined based on the Devon County Council and Dartmoor Park Authority planning decisions about where car parking and the adjoining station should be permitted in the locality.

Baseline timing estimates

212. The underlying timetabling issues to be addressed are as follows:
    - As discussed in the Exeter-Okehampton section, there is a project requirement for a competitive journey time with the A30. This is relevant at both Sampford Courtenay as a NW

Devon parkway station, and at Sourton Parkway as a competitive alternative to the A30 dual-carriageway from West Devon and North Cornwall (in the short term, until the line were extended to Sourton, Okehampton East station would be available for A30 parking).

- As line operational issues will be focused eastwards from Okehampton on the timetabling required for the Tarka Line and the critical section of railway between Crediton, Cowley Bridge Junction and Exeter station, while south of Tavistock operational issues will be focused southwards on the dovetailing of Tavistock-Plymouth trains (and any Gunnislake through services) with the GW main line from Cornwall to Plymouth, it follows logically that the section of railway between Okehampton and Tavistock will be the buffer section in-between.
- Okehampton-Tavistock must therefore provide enough timetabling and other resilience so that trains can be forwarded reliably onto the following operational section in each direction, and internally be able to accommodate trains passing each other in opposite directions with adequate margin and scope to recover from perturbations, on what might be a single line railway with substantial dynamic loops.

213. Looking at the first objective, a railway which is competitive with the A30, requirements will be influenced by what are reasonable times by car, and what are feasible times by train.
    - Taking the time between Sourton Parkway and Central Exeter as the target, driving from Sourton Services to the A377 roundabout (25 miles), need take only 25 minutes (though not all will drive at full speed for the whole distance), and in off-peak, 8 minutes on local roads in Exeter to the Guildhall Centre car park, so ~33-35 minutes in total. Doubling that local time in peak periods plus a queue to exit the A30 ramp, could add another 10-12 minutes.
    - The time taken to park a car and start walking to the final destination is assumed to equal to the time at Sourton Parkway parking the car, reaching the platform, and also leaving Exeter Central station efficiently. Currently the exit at Exeter Central can be a cause of 5+ minutes' delay (from personal experience), as Central station's gate facilities are inadequate at peak times with passenger volumes and require improvement. There is little point accelerating a railway service if time is lost leaving the principal station.
    - Overall then, and with a margin for the waiting time for a train, the railway should be offering a journey time of 45 minutes or less to be competitive at peak times. While journey time may be less critical during the offpeak, it would be desirable to achieve end-to-end times from Sourton Parkway which are close to 35 minutes.
    - From Sampford Courtenay to Central Exeter, the car time from the crossroads of the A3072 and A3124 is only 2 minutes less than from Sourton, as more time is needed on local roads in West Devon. The equivalent rail time from Sampford Courtenay Parkway (C station) should be inflated by the car time to that station from those crossroads, which is 2 minutes more.
    - JRC has undertaken detailed timing analyses to test the service options which best approach that rail vs road objective at reasonable cost and operability. A modern diesel multiple unit (DMU) is assumed, capable of 90-100 mph. Reasonable but not exceptional acceleration is assumed, and standard braking rates. A table below sets out the basic assumptions and then variations on how the train services could be optimised.

214. The basic working timetable specification between Exeter Central and parkway stations at Sampford Courtenay (C station) and Sourton is described below, along with possible adjustments and their implications:

- Existing speed limits are adhered to between **Exeter Central and Exeter St. David's**, with a 1 minute wait (currently normally 2 minutes) at St. David's after the 2½ min time between stops.
- It is assumed that track and line speed improvements will be undertaken between **Exeter St. David's, Cowley Bridge Junction and Crediton**, to allow higher frequency regional services from the Exeter Central line to/from Taunton, Barnstaple and the North Dartmoor line. **This should allow 55 mph and double tracking, at Cowley Bridge Junction, for the North Devon and North Dartmoor lines**. This presumes grade separation for Intercity services (possibly to be on high level tracks) and local/regional services, to allow most (improved) trackwork to be for local/regional use.
- From Cowley Bridge Junction, JRC has used detailed LSWR chainage and curvature used for the railway as far as Plymouth, on a part-mile-by-mile basis, and has adapted those to the modern Permanent Way (PW) cant and accepted 'cant deficiency' standards adopted for a modern railway (using cant allows more comfort by tilting the track so that speeds are less noticeable – there are upper limits in order to stay safely on the rails). No extra cant deficiency (=less comfort) has been applied, while upper (modern basis) speed limits have been reduced to the next lowest x5 or x0 mph. So the speeds applied are less than the normal cant maxima.
- Excluding a stop at Newton St Cyres (NSC), a train would take 6 minutes between St. David's and passing NSC, and a further 3½ minutes to a stop at Crediton, this includes a 1 minute operating margin for Cowley Bridge Junction.
- At **Crediton**, there is an area 40 mph speed limit for 71 chains (0.89 miles) while at present the station has 15 mph pointwork in various directions. It is assumed that a minimum future speed at Crediton for all main movements should be 40 mph, with a higher speed permitted if possible, and with double tracking continued west. The baseline timetable assumes that all trains call, with 60 mph possible for any non-stop train.
- The line between **Crediton, Yeoford and the former Coleford Junction** is gently graded and curved. While currently limited to 70 mph it has previously allowed up to 85 mph in Southern days. Actually the curved chainage (80 chains) would allow 100 mph, but JRC is only aiming for 80 mph as there is nothing more to be gained in ½ minute train timings by going faster (unless you could achieve 100 mph), when there is shortly a 20 chain curve!
- We need also to allow for this curve (historically 40 mph, future 50 mph) at Coleford where the track swings to the left towards Dartmoor – it is a straightish line towards Barnstaple. The base case adopted is for the speed limits beyond to be 85-90 mph to Sampford Courtenay Parkway station (where the C site is adopted, for reasons discussed below – SCP C).
- The baseline timing from **starting at Crediton to calling at SCP C** would be 11 minutes.

215. Cumulatively, this means that **the basic journey time between Exeter Central and a Sampford Courtenay Parkway station (C site) could be 25 minutes** (2½+1+9½+1+11) if calling at Crediton, and with appropriate track and line speed improvements. Even if adding 2 minutes for the equivalent car diversion time to reach SCP C station, this is 27 minutes between the car equivalent of SCP C and Exeter Central (excluding car parking time, etc), which contrasts with 31-33 offpeak car minutes or up to 43-47 minutes in peaks. Rail will be competitive.

216. Onwards from SCP C station to Sourton Parkway, there is a new intermediate station proposed at Okehampton East and reopening to regular use of Okehampton heritage station. The proximity of Okehampton East station A site to the existing Okehampton town, and to the location of the proposed additional housing and businesses in Okehampton Hamlets, makes a

good case for the A site to be favoured for a station here to become a future principal station for travel towards Exeter, with the existing Okehampton (heritage) station supporting the existing local community in both directions, towards Exeter and Plymouth. An Okehampton East B site is too far from currently intended developments to be justified, unless a possible future expansion of Okehampton continued in that direction. The population pull of Okehampton town is likely to continue to support an A site in that event.

217. **Journey times through the Okehampton sector** could be constrained by the historic 45 mph speed limit because of curvature, between 195¼ MP and 198¼ MP. Modern curvature speeds would allow 60 mph as far as Okehampton. Modelling starts by assuming that all trains would call at both Okehampton East A site and the Okehampton heritage station, after SCP C station.

218. The three stations are in close succession, followed by the 20 mph over Meldon Viaduct. This means that there are only small benefits in this base case from trying to raise the local speed limit. There are no direct time savings from changing the speed from 45 to 60 mph, because the savings are an aggregation of the rounded times expected at Okehampton East, Okehampton and near Meldon as individual timing elements, even though an aggregate ½ minute would be saved in actuality. However, 50-60 mph is adopted as a benefit, for example in case non-stopping trains were to be modelled, eg on diversion, and for faster offpeak Exeter-Sourton trains. As single track would resume west of Okehampton heritage station, a ½ minute is also allocated at Okehampton (heritage) station as a reliability factor onto a single line towards Meldon (and v.v.).

219. There is little time saving to be gained between Okehampton heritage station and west of Meldon Viaduct. Modelling shows that west of Meldon Viaduct there is also no time saving gained above 65 mph if all trains are to call at Sourton Parkway, though again 80 mph is shown as a potential benefit for non-stop diversion trains.

220. The consequent baseline overall time between Exeter Central and Sourton Parkway is 39 minutes. This is competitive with the estimated peak travel time by car, though it is about 4-6 minutes slower than car in the offpeak.

Optional timing changes on Exeter-Sourton Parkway section

221. These options are reviewed in order to understand how much more competitive the railway could be, in peak times, and how much closer to the offpeak car time from Sourton Parkway to Central Exeter.

222. **Cowley Bridge Junction-Crediton**: If a higher speed were then permissible at Cowley Bridge Junction for trains to/from North Devon and North Dartmoor (but still with a 1 minute margin because of the junction), then the next significant time reduction (a ½ minute) would be if 70 mph were possible most of the way from Cowley Bridge Junction to Newton St Cyres (NSC), and some of that would be difficult. Timetable modelling instead favours a phased increase from 55 mph at Cowley Bridge Junction, lifting to 65 mph at 173-74, and to 85 mph at 175-07.

223. **At Crediton**: There is an option for the short working Exeter-Sourton train to non-stop Crediton, when there should be consideration of a higher speed through the station. At present there is a 70 mph limit between Newton St Cyres and Yeoford, excluding Crediton (40 mph), which incurs 7½ minutes if trains call at Crediton with a ½ minute stop there, or 6 minutes if non-stop.

Whether a 70/40 or 70/50 combination, the non-stop running time would still be 6 minutes when aggregating the sectional times. It would take 60 mph through Crediton to shave off a further ½ minute.

224. **Crediton-SCP C station**: Modelling has guided preferred track speeds west of Crediton, as far as stopping at a possible Sampford Courtenay Parkway (SCP - site C) station on the North Dartmoor line (the rationale for the C site is discussed below):
    - 80 mph west of the current local Crediton 40 mph, then 50 round Coleford curve (modern curve speeds), then 85 mph as in Southern days, with a section of 90 mph available beyond.
    - This is based on the Barnstaple Line junction being set further back than it was historically (a 'ladder' junction is proposed around 183½ MP).

225. The conclusion from this modelling is that **11 minutes** should be feasible between **starting at Crediton and stopping at Sampford Courtenay Parkway (C site)**, with a 80 mph upper speed from the end of the Crediton local speed limit to Coleford curve, 50 mph round the curve, and then 85-90 mph for the section to SCP.

226. **Choice of Sampford Courtenay Parkway B or C sites for a station**: There is a choice to be made between SCP B and C sites for a station. The operational advantage for a B site is that it would allow a maximum run at high speed for a longer distance, so potentially help overall journey times, potentially important when this (and Sourton) are Parkway stations.

227. The disadvantage of the B site is that North Tawton village is just to the north-east of the C site, so that a location there could influence the case if it achieved higher passenger volume.

228. Most principal populations are dispersed NW and West, though North Tawton exerts a significant pull from the NE (see the localities in the Exeter-Okehampton mapping). After allowing for a weakening of demand the further away one is from a possible station location, the combination of population and mileage within an 8 mile distance points to the balance of advantage favouring SCP C, although only with a small differential (within a 5% margin).

229. Testing the differential for railway operational timing, the train time outcome is the same overall, regardless of whether the station is a SCP C or B. On that basis, the passenger volume case should support the potential additional demand from North Tawton, which is 1.8 miles (4 minutes) by car from SCP C (27 mph average) and 2.7 miles from SCP B (about 6 minutes at a similar speed), so SCP C should be preferred.

230. **Option to non-stop Okehampton heritage station**: A sensitivity test has been applied, for trains terminating at Sourton Parkway to calling only at Okehampton East. In the latter case, the hourly **through** Exeter-Okehampton-Plymouth and hourly Barnstaple-Okehampton-Plymouth trains would continue to call at the heritage station. A ½ minute timetable margin would still be applied to all trains. **Non-stopping would save 1 minute**.

231. Overall, the plausible time savings for Exeter-Sourton trains are:
    - 1½ minutes non-stopping Crediton.
    - 1 minute non-stopping Okehampton heritage station.

    This would save a total of 2 minutes (2½ minutes ignoring NR rules on rounding up ½ minutes for terminating trains), and bring down the offpeak time to 37 minutes, so only 2-4 minutes longer

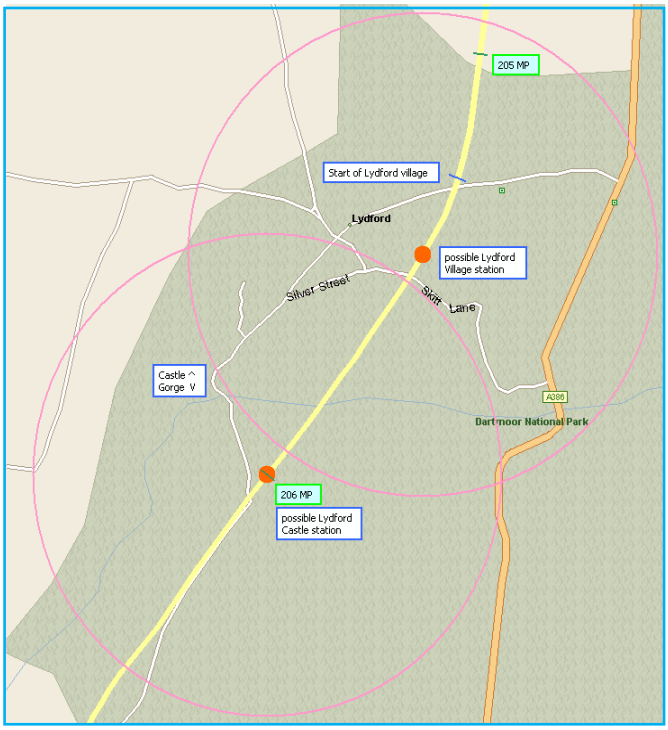
than the best offpeak car time. Rail was already competitive in peak periods at SCP C and Sourton Parkway stations, and at SCP C for the offpeak. It would now be more competitive with a range of A30 journeys from Sourton Parkway.

232. This is worth consideration, to **maximise road to rail travel diversion**.

South of Sourton Parkway, and a Lydford station

233. From Sourton, trains start their descent to sea level from 290 metres (950 feet). This involves gradients mostly in the range 1 in 70 to 1 in 200. As the line becomes more curvy, the Southern historically set a 40 mph southbound speed limit from 206¾ MP (just north of the former Lydford station, all the way to St Budeaux and beyond, to 228¾ MP). This was a consequence of unfitted goods trains (with no through brakes), and general caution about train braking capability. The speed requirements for the Tavistock-St Budeaux route are discussed in the Plymouth-Tavistock section. Better braking is now normal.

234. Stations used to exist at Bridestowe (Southern), Lydford (shared station with platforms on GW and Southern), Brentor (Southern), Marytavy (GW) and two in Tavistock (one on each route).

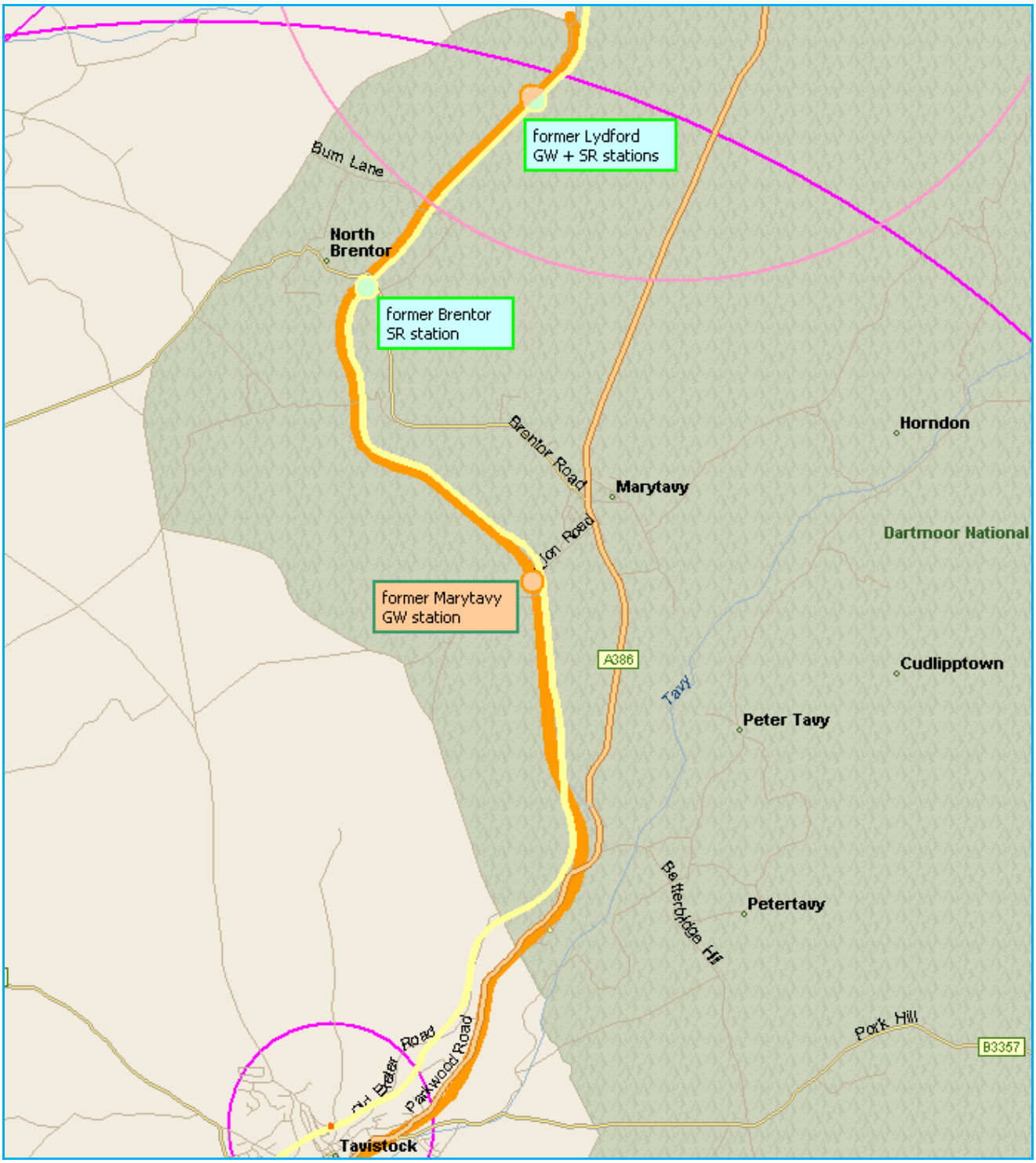


235. Only **Lydford** is proposed as a new station, closer to the village and tourist atractions than the previous stop, with any station mainly justified because of National Trust visitors, and for future plans to decarbonise tourism and promote public transport and green modes in and near National Parks. Lydford is within Dartmoor National Park, and it is possible to foresee a visitor centre associated with railway reopening.

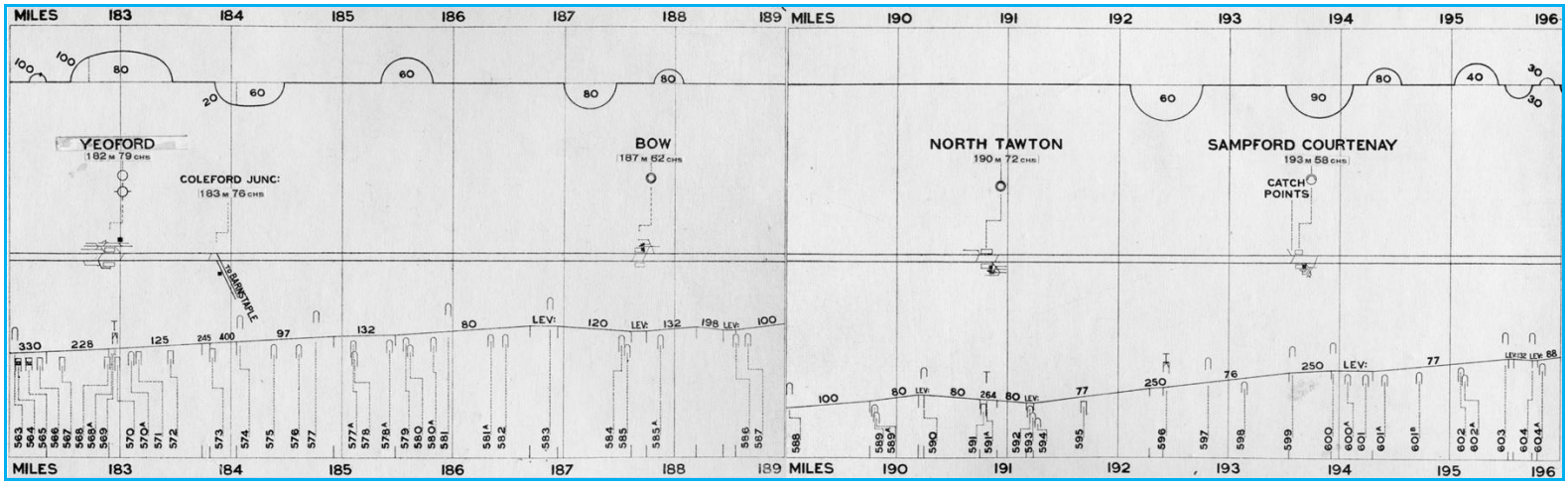
236. Lydford is a small community (~400 people) but is heavily visited during the year because of the village, Castle and Lydford Gorge (National Trust), so there is a potentially good case for a regular train service here, with a station close to the village, not where it was previously. Links are here: https://www.nationaltrust.org.uk/lydford-gorge/features/a-brief-history-of-lydford, http://www.palmer-associates.co.uk/lydford/. A station would be just one stop from Sourton Parkway, and with capability for through trains from Exeter, Barnstaple and Plymouth.

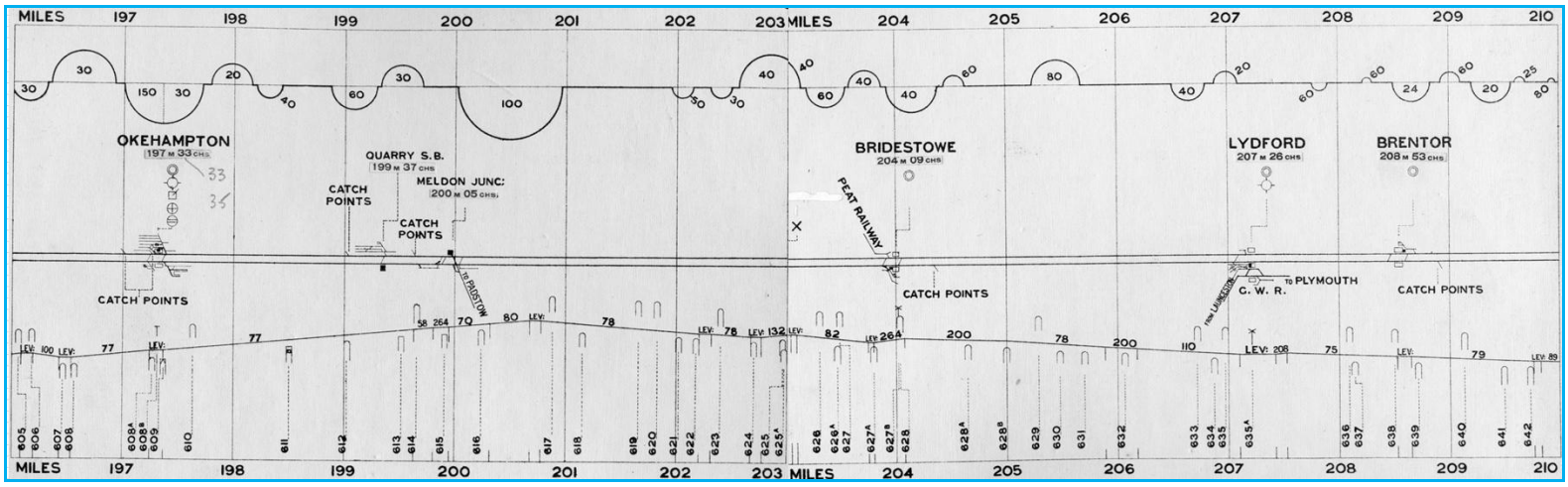
Making use of the parallel GW corridor between Lydford and north of Tavistock

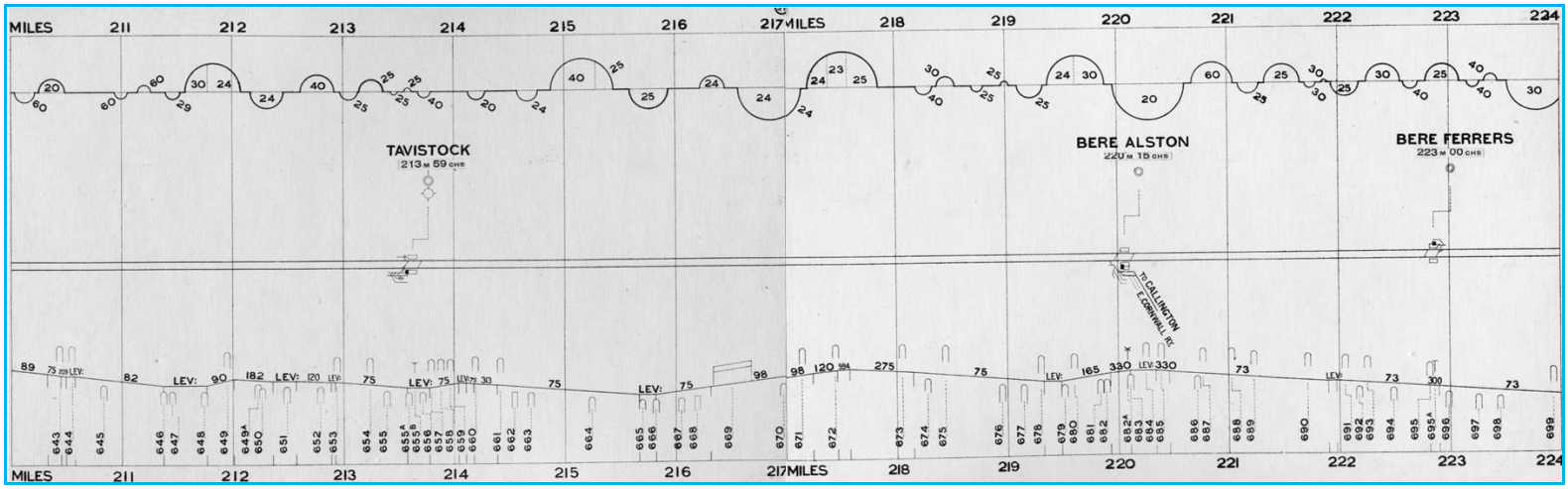
237. A snapshot of the two former lines south of Lydford is shown below.



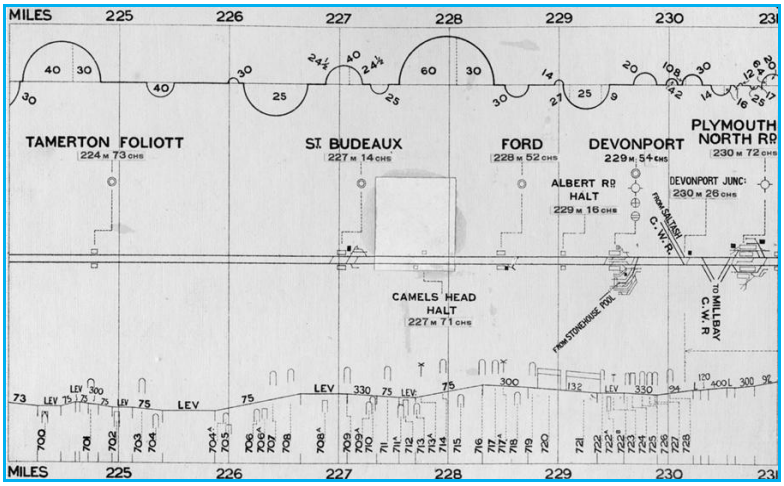
238. Historic LSWR chainage and curves are set out below, and have been used in compiling the timetable model, along with proposed revised curvature with railway realignment. The chainage shown at stations is for the signal boxes, not for platform locations. The curved railway geography railway is self-evident from these diagrams.





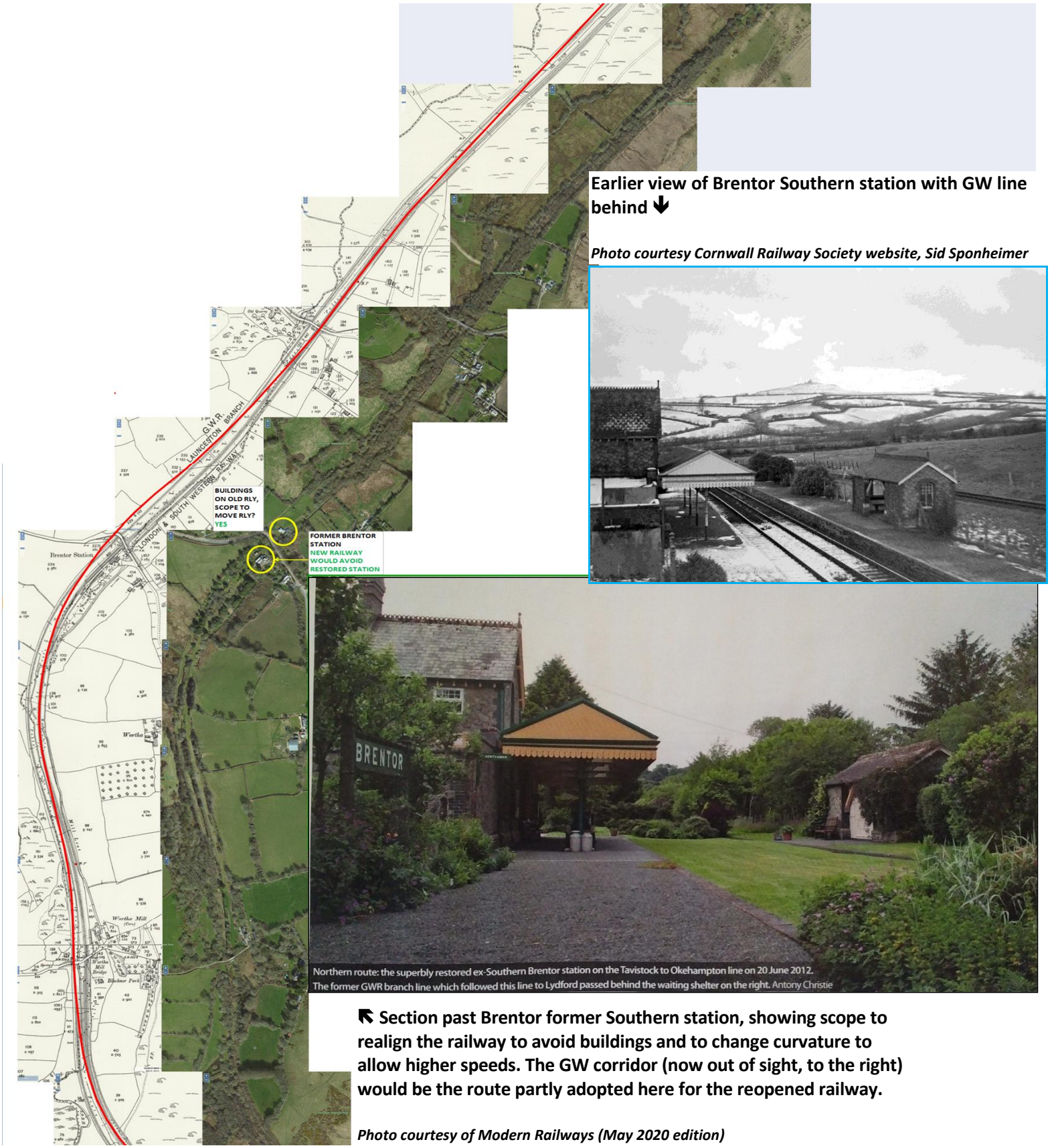


239. The unique situation of two parallel railways between the former Lydford station and north of Tavistock, mostly across the fence or a small field from each other, could help unravel some of the tight curvature and hence line speed limitations on this section, with a new 50-85 mph range (previously 40 mph). The GW was a single track line, the LSWR/Southern was double-track throughout and opened in 1890 as an independent route to Plymouth, after previously sharing the GW route south of Lydford. As much of the two formations is not built on, the existence of two parallel lines can also assist alignment availability where one of the formations now has housing or barns on it, or, in one case, a restored station as a private dwelling (Brentor). Mapping is shown below over several pages.



Capability to create a faster, gently curved railway between Lydford and Tavistock

Section past former Lydford station, showing scope to realign railway to avoid house south of Lydford ↟



Earlier view of Brentor Southern station with GW line behind ⬇

Photo courtesy Cornwall Railway Society website, Sid Sponheimer

⬉ Section past Brentor former Southern station, showing scope to realign the railway to avoid buildings and to change curvature to allow higher speeds. The GW corridor (now out of sight, to the right) would be the route partly adopted here for the reopened railway.

Photo courtesy of Modern Railways (May 2020 edition)

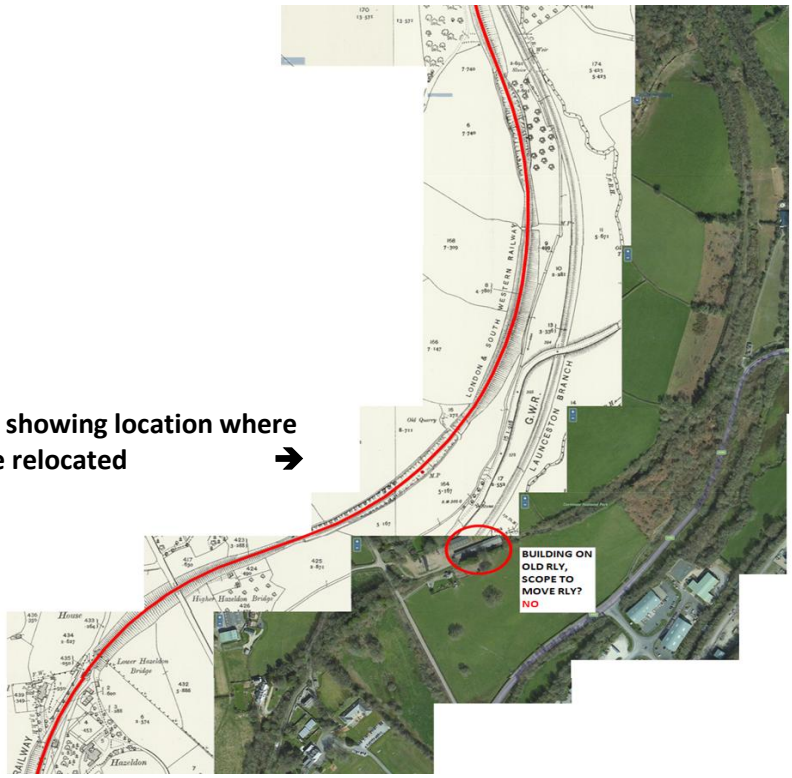
Another view of the parallel railways near Brentor. ➔

Photo courtesy Cornwall Railway Society website, Mark Roach
http://www.cornwallrailwaysociety.org.uk/southern-route-devonport-kings-road-to-okehampton.html

🡅 Section past Mary Tavy former station on the GW line, with a 1963 view showing scope to realign railway to avoid buildings and change curvature to allow higher speeds. The Southern route is in a cutting in the distance (the brown strip in the background).

Photo courtesy of Mary Tavy Parish Council website

Section towards Tavistock, showing location where buildings would need to be relocated ➔



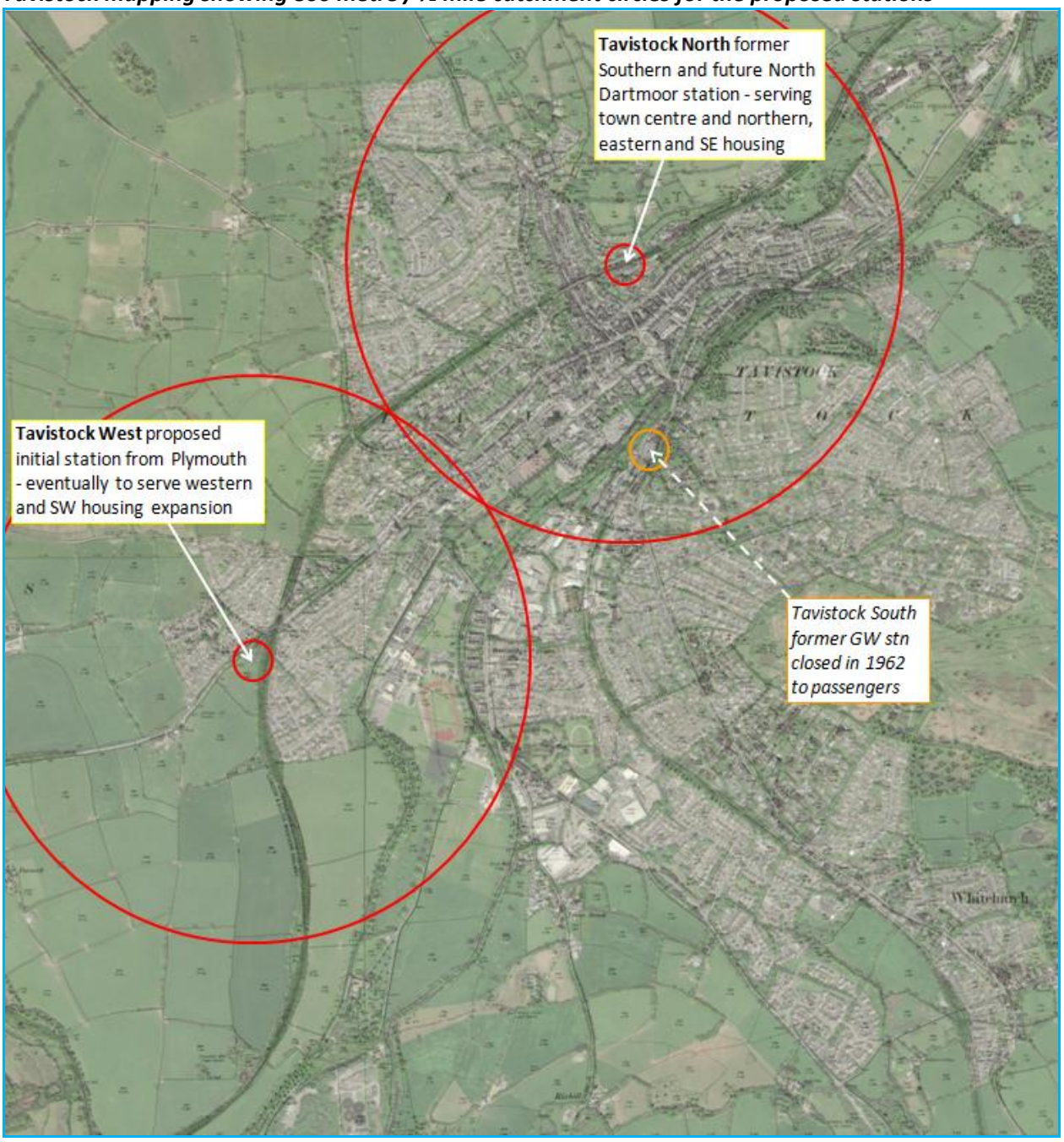
240. This section also needs to anticipate the requirement for a dynamic loop amounting to double-track, for about 4 miles of the distance between Sourton Parkway and Tavistock North. At Tavistock North, a further section of double-track, or a single track with passing loops at each station, is assumed for the 1 mile to a Tavistock West station (the intended interim terminus from Plymouth). A single track should be considered as there is a cyclepath. Provisionally – but this depends on more precise timetabling – the 4 mile dynamic loop would be required from approximately the former Bridestowe station at 204 MP, southwards to 208 MP near Brentor.

241. The bulk of this corridor, until south of the former Lydford joint station, would use the Southern double track formation. A replacement cycle/footpath for the Granite Way would require construction parallel to the double track railway, between Bridestowe station and the first road bridge in Lydford, unless detailed timetabling allowed that section to be a single track railway. The section of the Granite Way south of Sourton Parkway to Bridestowe could be retained as a single track railway with a cycle/footpath alongside.

A Tavistock North station?

242. The former Southern station at Tavistock (later known at Tavistock North), was just north of the town centre, and was located as shown on the map overleaf. This map shows the original railways and town as in 1906, and is shown now as overlaid by modern housing expansion. The human geography which results favours eventual reopening of Tavistock North station, as the natural railhead for the town centre and for the bulk of the housing, which extends north, east and south east with access roads which are better served by a town centre station. The 800 metre / ½ mile catchment circles represent easy walking to a station – although less easy in the case of Tavistock as there are valleys and hills. Cycle and car access may be preferred for longer access distances.

Tavistock mapping showing 800 metre / ½ mile catchment circles for the proposed stations



243. There are other practical reasons to favour reopening of Tavistock North, as well as a first station (to be retained) at Tavistock West:
    - Accessibility from much of Tavistock will be easier to a North station, with road geography.
    - The local catchment for each stations complements the other.
    - Journey times to Plymouth are sensitive to total time incurred, as shown by modelling, therefore a fast rail access at the Tavistock end of the journey will encourage use of rail for the main journey. Plymouth North Road station (as discussed in Annex A) is not convenient for all main Plymouth city centre destinations, so good access in Tavistock is very important.

244. A Tavistock West station remains strategically useful, as a commuter station for Tavistock, and as a development growth station for western and SW housing expansion at Tavistock.

245. It is therefore proposed that when a railway is reopened fully past Tavistock, that two stations are provided, with Tavistock North reinstated as the main station for Tavistock and the wider catchment, and with a local Tavistock West station principally for commuter use to Plymouth.

246. Since the proposed train service relies on a regular half-hourly interval between trains, for operational reasons in both directions, both stations should be served consistently by all trains.

247. The current cyclepath between Tavistock North and West which uses the former railway requires consideration. It would be most convenient operationally to restore the railway formation (which includes a viaduct) to full double track operation. The section between the two stations is preferred as a dynamic loop to allow trains to pass, in order to be ready for single line south of Tavistock West and north of Tavistock North.

248. Without a dynamic loop and with a single track instead, trains might require additional minutes as a margin, at passing loops at the West and North stations, which would be inefficient and reduce the journey time benefits of rail travel. It may however be possible to create (at cost) a parallel cyclepath including a cycle bridge alongside the railway viaduct, also using Watts Road, in which case a solution may be available. This requires further study.

Overall rail journey times

249. There are four options to consider:
    - Exeter to/from NW/West Devon.
    - Exeter to/from North Cornwall.
    - Barnstaple/West Devon to/from Plymouth.
    - Exeter to/from Plymouth as a diversion railway if the Dawlish-Teignmouth area faced closures.

250. Exeter Central (rail) and the Guildhall Car Park (road) are used as comparators, and Derrys Cross car park in Plymouth.

251. Car journey times are stated for peak (x2 on city local roads – Exeter or Plymouth) and offpeak. Rail journey times allow travel via a railhead to Exeter Central or Plymouth North Road, with 3 minutes interchange and an average 4 minutes additional wait for a train. A local 12 minute walk is allowed at Okehampton heritage station. In Plymouth, it is noted that 5-20 minute walking times between North Road station and Central Plymouth should be added to the rail journey, as the station is considerably north of many city centre destinations (discussed also in Annex A).

252. Summary tables are set out below. Overall, rail can become effective in comparison with car, for multiple journey origins and destinations for NW, West Devon and North Cornwall origins and destinations, to and from Exeter and cities further within England.

NW/West Devon to Central Exeter

253. Rail is competitive with car peak travel times to Central Exeter, though less so in the offpeak unless rail can be trusted to be reliable and train waiting time minimised. Some local travel to

stations will be by car, of course, as well as the evident usefulness of railheads for peak time travel. Okehampton heritage station is less useful for Exeter travel, as discussed previously. There can be a significant reduction in road environmental damage, e.g. pollution and noise, especially on urban roads within Exeter city where growth of congestion can also be restrained on the A377 corridor.

NW / West Devon to Exeter					
Journey times	North Tawton	Okehampton E	Okehampton	Hatherleigh	Gt.Torrington
to Central Exeter					
Road peak (x2 @ Exe)	41	40	41	51	61
Road offpeak	32	31	32	42	52
Rail via SCP C	36			45	58
Rail via OkeE (+car)		41			
Rail via Oke (+walk)			48		
(rail calling at Exeter St. David's, Crediton, and main stations)					
Note that times to Exeter St. David's for Intercity rail connctions will be 3 minutes quicker					
Road miles (rail miles excluded) = most environmental impact					
	North Tawton	Okehampton E	Okehampton	Hatherleigh	Gt.Torrington
to Central Exeter					
Road	23	23	24	31	35
Rail via SCP C	2			8	19
Rail via OkeE		local			
Rail via Oke			local		

North Cornwall-Central Exeter

254. Similar comments are for travel between North Cornwall and Central Exeter. Times via rail at Sourton Parkway are adequate for peak periods, when driving stress will be at its greatest. This could also apply in tourist travel peaks as well as commuting peaks. Rail offpeak times will not be so attractive, though a faster train option could be available. However the ability to park conveniently at Sourton will lessen the driving length of many road journeys. Railheading via Sourton for longer Intercity journeys will be relevant.

North Cornwall to Exeter					
Journey times	Bude	Launceston	Camelford	Bodmin	Callington
to Central Exeter					
Road peak (x2 @ Exe)	81	59	76	81	72
Road offpeak	72	50	67	72	63
Rail via Sourton Parkway	85	63	80	85	76
(rail calling at Exeter St. David's, Crediton, and main stations; faster options for rail times not shown)					
Note that times to Exeter St. David's for Intercity rail connctions will be 3 minutes quicker					
Road miles (rail miles excluded) = most environmental impact					
	Bude	Launceston	Camelford	Bodmin	Callington
to Central Exeter					
Road	54	43	58	63	48
Rail via Sourton Parkway	27	16	31	36	21

Barnstaple/W.Devon to Plymouth

255. Rail will be competitive with car for peak travel, including from Okehampton station. Tavistock is assumed here as Tavistock North station, rail will be faster from Tavistock West. Offpeak rail times are less competitive, but regional roads are not fast, and are quite demanding on driver attention as they are winding with no dual carriageways until Plymouth is reached. The environmental relief of reduced car travel across Dartmoor National Park and on the A386 should also be considered. The topic of improved public transport access within Central Plymouth is discussed in Annex A.

Barnstaple/W.Devon to Plymouth					
Journey times	Barnstaple	Eggesford	Copplestone	Okehampton	Tavistock
to Central Plymouth				(rail + Oke walk)	
Road peak (x2 @ Plym)	115	95	89	73	54
Road offpeak	97	77	71	55	36
Rail< >Plymouth North Rd	102	81	73	68	34
(rail calling at Umberleigh, Eggesford or Copplestone 1 per 2 hr, SCP C, OkeE, Oke, all other main stops)					
Barnstaple location taken as transport interchange ~ Barnstaple station					
5-20 minutes should be added to Plymouth rail time for walk to city centre destinations					
Road miles (rail miles excluded) = most environmental impact					
	Barnstaple	Eggesford	Copplestone	Okehampton	Tavistock
to Central Plymouth					
Road	58	46	42	31	16
Rail< >Plymouth North Rd	local	local	local	local	local

Main line rail diversion timings

256. A 'live' spreadsheet has been created, for estimation of rail timings from Exeter St. David's to Plymouth North Road. This is available separately. A basic 'all stations' service (excluding Newton St. Cyres, Yeoford, and local stations south of Bere Alston), would be 82 minutes from Exeter Central, 78½ from St. David's, which includes extensive use of single line and dynamic loops west of Coleford.

257. A non-stop train on diversion (if full non-stopping were feasible) would be ~72 minutes, which compares with ~56 minutes via South Devon if calling just at Newton Abbot and Totnes. Rail diversion times are perceptually better compared to the hassle, ignominy and delay of transferring from rail to coach/bus and to rail again at the other end of any cessation of through rail service, whether because of engineering works or with wider failure of rail infrastructure.

258. If it were desired for rail diversionary times to be significantly quicker than 80 minutes, then a greater extent of double tracking would be required, to achieve end-to-end times closer to the best shown above, while not needing to replace and replicate the basic regional services, which could then continue to run as intended.

259. More detailed timetable modelling is recommended, to overlay the preferred standard of rail diversion capacity on the proposed specification for regional services that have been discussed in this report.

Annex A: Rail access comparison between Exeter and Plymouth city centres

260. There is a fundamental difference currently between the rail accessibility for Exeter City, and for Plymouth City. We are here looking at regional and suburban rail access, not Intercity standards.

Exeter city centre

261. With its centrally-located station in Queens Road (Exeter Central station), the city has managed to keep a suburban service, from Exmouth, and regional services at (now better) frequency from the South Devon coast and inland from Barnstaple. This has formed the basis of the 'Devon Metro' regional service development and marketing, which continues to improve. This is despite trains from South Devon having to reverse at Exeter St. David's (the Intercity railhead) to reach the city centre. The journey time gain of a direct train into the city centre is worth having for the passenger gain and, more importantly, for the city's accessibility and economic health.

262. Exeter St. Thomas is the third city station, on the South Devon line, and offers convenient access to the renewal part of the city centre within and adjoining Exeter Quay, as well as other city centre destinations such as Fore Street.

263. Not all destinations within Exeter are well served by rail (eg remote locations include Devon County Council offices, and the main district hospital), but the University, major schools, offices and city centre shopping are all easily accessible.

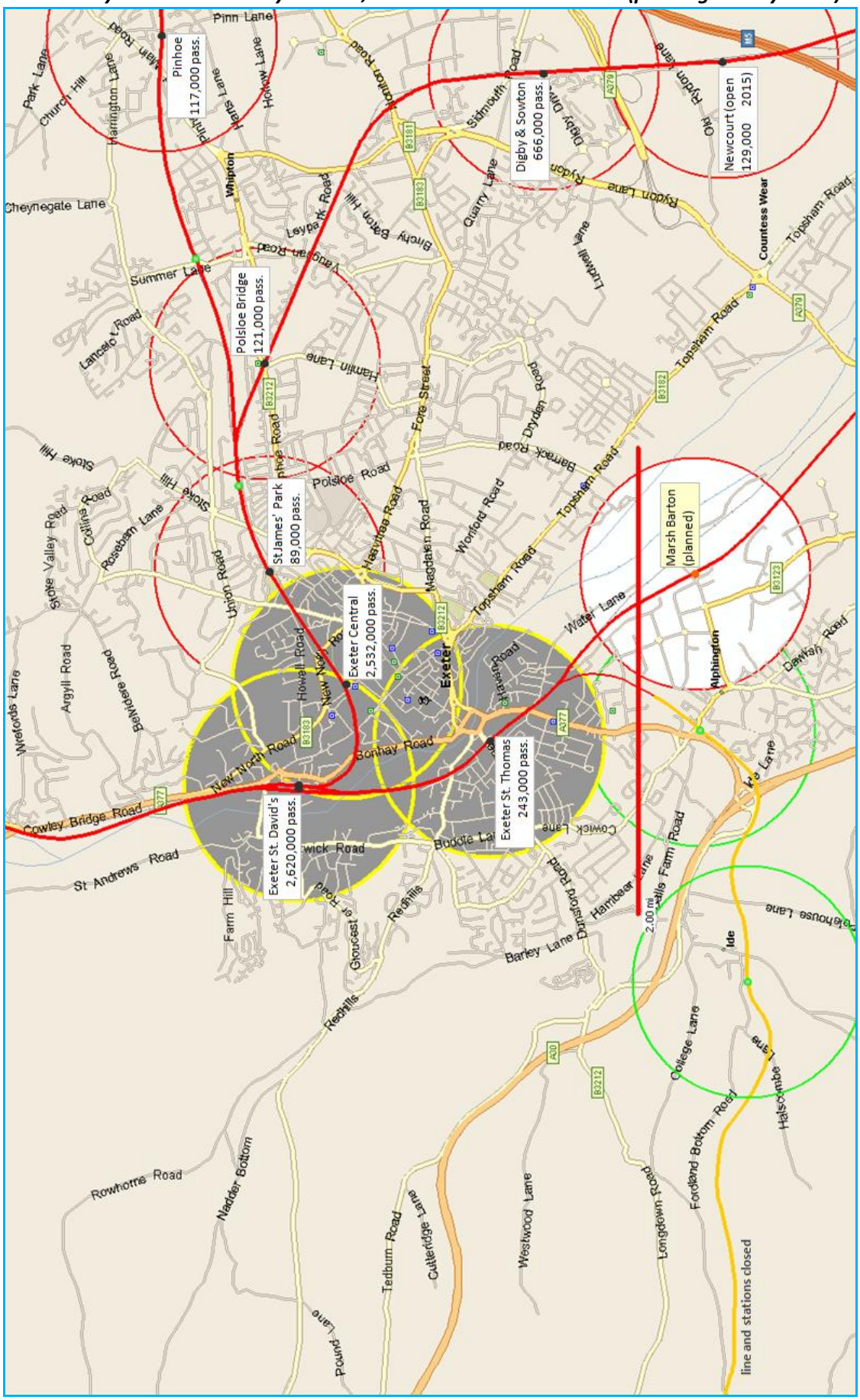
264. The Exeter city economy in numbers is set out below (sources: Exeter City Council and ONS):-
- **Population:** Exeter, the capital city of Devon, has an estimated population of 128,900.
- Combined, the Exeter city and Exmouth corridor agglomeration population is over 180,000.
- The city is at the heart of a Travel to Work area of over 470,000 residents.
- **Employment:** The city's wider area includes much of the district council areas of East Devon, Teignbridge, and Mid Devon. 288,100 of these residents are of working age and just under 241,300 are employed. Well over half the workforce is well qualified, substantially higher than the national average.
- **Commuters**: Approximately 35,000 people commute into Exeter on a daily basis.
- **Geography:** Exeter is one of two large urban centres within the rural county of Devon, Plymouth being the other.
- **Total companies:** 4,877 registered for business rates.
- **Average City Centre footfall:** 1,364,000 people per month.

265. There is high combined use of Exeter's three city centre stations, at 5.4 million passengers entry+exit, with another ~1.2 million interchanges. Individually, Exeter Central handled 2.5 million entry/exit, Exeter St. David's 2.6 million and Exeter St. Thomas over 240,000.

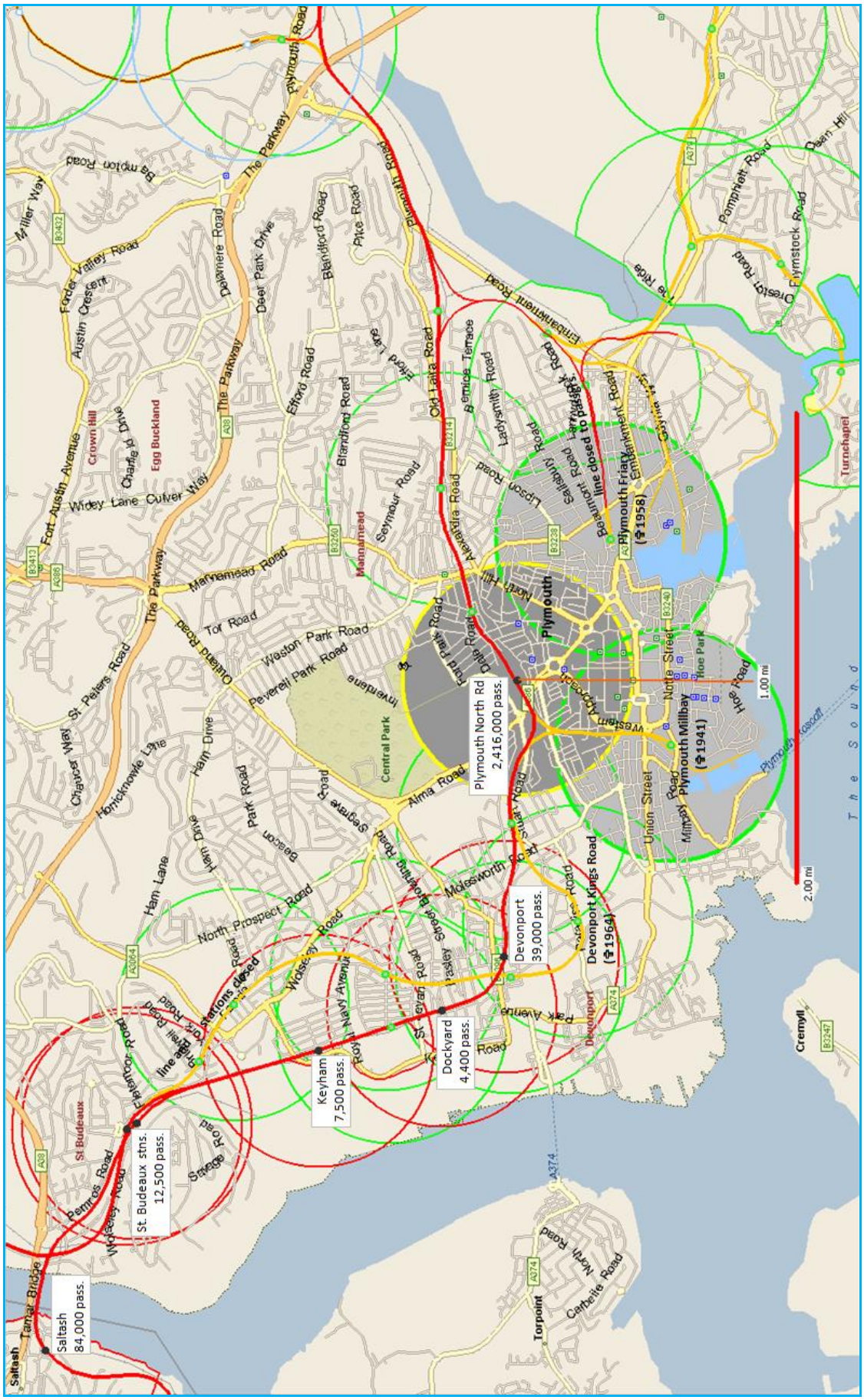
266. Exeter has a compact city centre, which assists rail accessibility with the distribution of stations. While an obvious caveat will apply, that many journeys are generated elsewhere, there can be no doubt that city centre rail accessibility has been a success factor in the Travel to Work area.

267. A map overleaf shows the 800 metre catchments for the main Exeter stations (Central, St. David's, St. Thomas), with a comparable, same-scale map for Plymouth city centre shown after.

Exeter city centre and nearby suburbs, 2018-19 station user shown (passenger entry + exit)



Plymouth city centre and nearby suburbs, 2018-19 station user shown (passenger entry + exit)



Plymouth city centre

268. In contrast, Plymouth city long ago lost most of its suburban railways, as shown by the light brown lines and green stations shown above. Some were earlier railway attempts at competing with tram and bus. The Beeching Axe diverted the residue of the Southern route into Plymouth (nowadays the Gunnislake line), onto the GW corridor in 1964. Much of Plymouth's residential and business park development has been distant from railway corridors.

269. A considerable transport impact, to the detriment of the rail network's accessibility, arose from the combination of Plymouth city centre replanning following its WW2 bombing, and the wartime and post-war closure to passengers of two of Plymouth's three former city centre termini, at Millbay (1941, goods 1971) and Friary (1958). What had been a triplet of stations to serve the city centre devolved to the single survivor, North Road, which is at the north end of the city centre and up to one mile from its southern end, too far for realistic walking.

270. Sir Patrick Abercrombie's 1943 *Plan for Plymouth* prioritised the station as a *gateway* to the city centre (see link here: https://en.wikipedia.org/wiki/Plymouth) – but by definition was not easily accessible from the whole city centre. Until recently, this has been cause and consequence of low frequency regional rail services and poorly used local suburban stations (Saltash is the busiest at only 84,000 passengers a year).

271. Looking ahead, Plymouth's dispersed and car-oriented suburbs merit several new railheads, assuming that Plymouth's future land use geography remains similar in strategy. There is a Joint Local Plan (JLP): http://www.plymouthherald.co.uk/news/local-news/what-huge-plan-future-plymouth-276288, involving Plymouth City, South Hams and West Devon Councils, which is evolving.

272. **Plympton** has been considered for a Parkway station, at either Marsh Mills or Colebrook, which could be served by extension of Tavistock-Plymouth trains to Newton Abbot as regional rail. Further transport investment will be needed on **Plymouth's western approaches**, including potential new park-&-ride and park-&-rail sites, and a co-ordinated sustainable transport programme in Cornwall and Plymouth with genuine alternatives to single occupancy car travel.

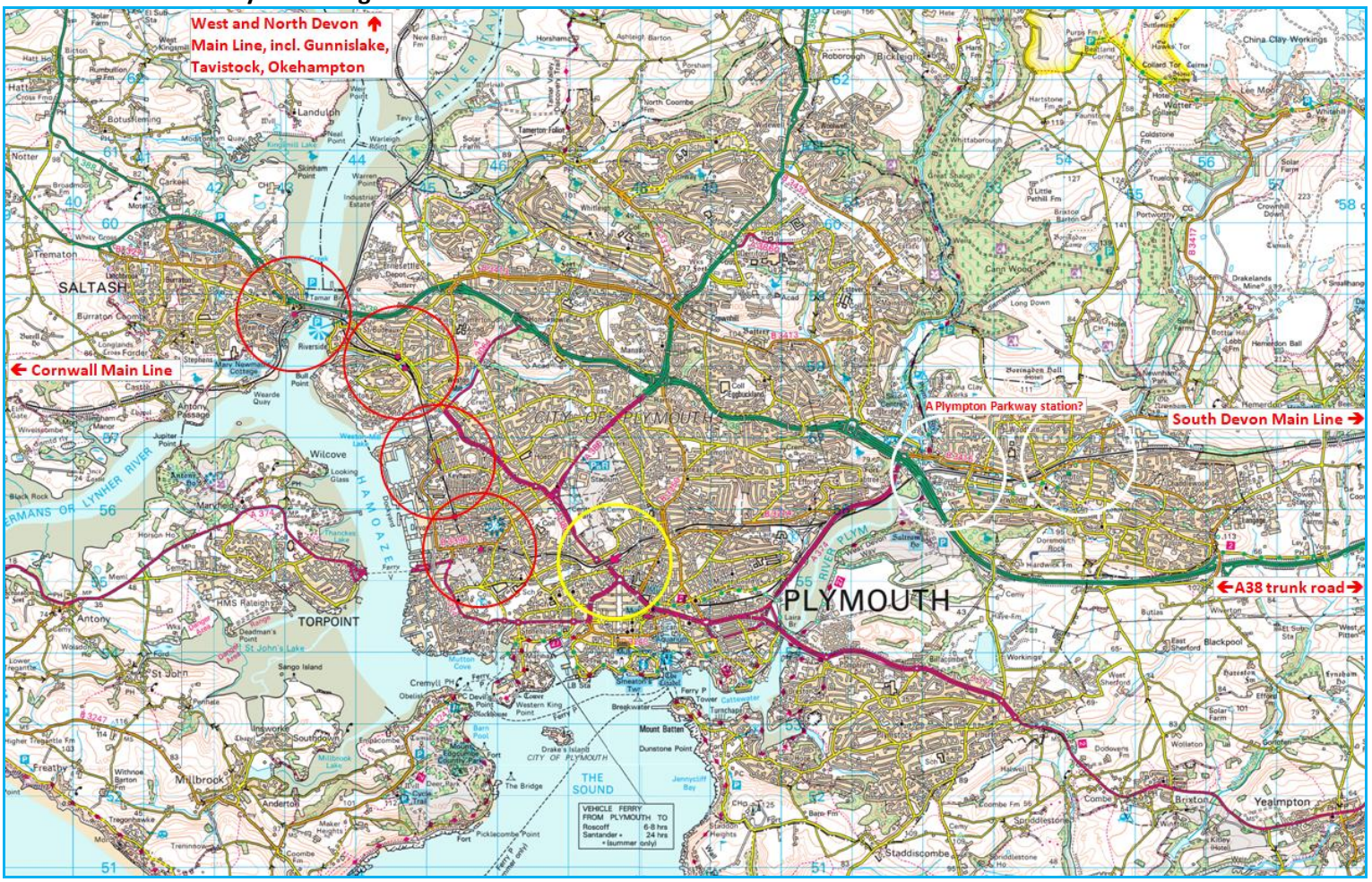
273. The JLP notes that challenges exist in relation to links from Cornwall. Movements across the Tamar are constrained by the capacity of the road bridges and the ferries. The bridge is coping, as is the ferry link, but it and the wider strategic road network is vulnerable to incidents and increases in demand, which have implications for the role South East Cornwall is able to play in supporting sub-regional growth and particularly in regards to accommodating new homes and jobs.

274. However across Plymouth as a whole, the bulk of local public transport will be bus and maybe in due course some form of light rail, where a 'Plymouth Metro' has been mooted (links here: https://www.plymouthherald.co.uk/news/plymouth-news/new-plymouth-metro-could-include-1136309).

275. The Plymouth city economy in numbers is set out below (sources: Plymouth City Council and ONS):
    - **Population**: Plymouth urban area has an estimated population of 263,100.
    - The Plymouth agglomeration population is ~300,000.
    - The city's Travel to Work area includes for catchment planning at least Plymouth City, South Hams and West Devon (~400,000 residents), and could count South East Cornwall as well, totalling ~500,000.

- **Commuters**: About 105,000 people commute into Plymouth on a daily basis, though many go to the city's widespread business parks and industries and the Royal Navy and commercial marine yards. Not all go to the city centre.
- **Geography**: Plymouth is the main urban centre for the western half of Devon and East Cornwall.
- **Total companies**: n/a
- **Average City Centre monthly footfall**: n/a, however one source notes 5,000,000 annual visitors to Plymouth.

Plymouth regional context

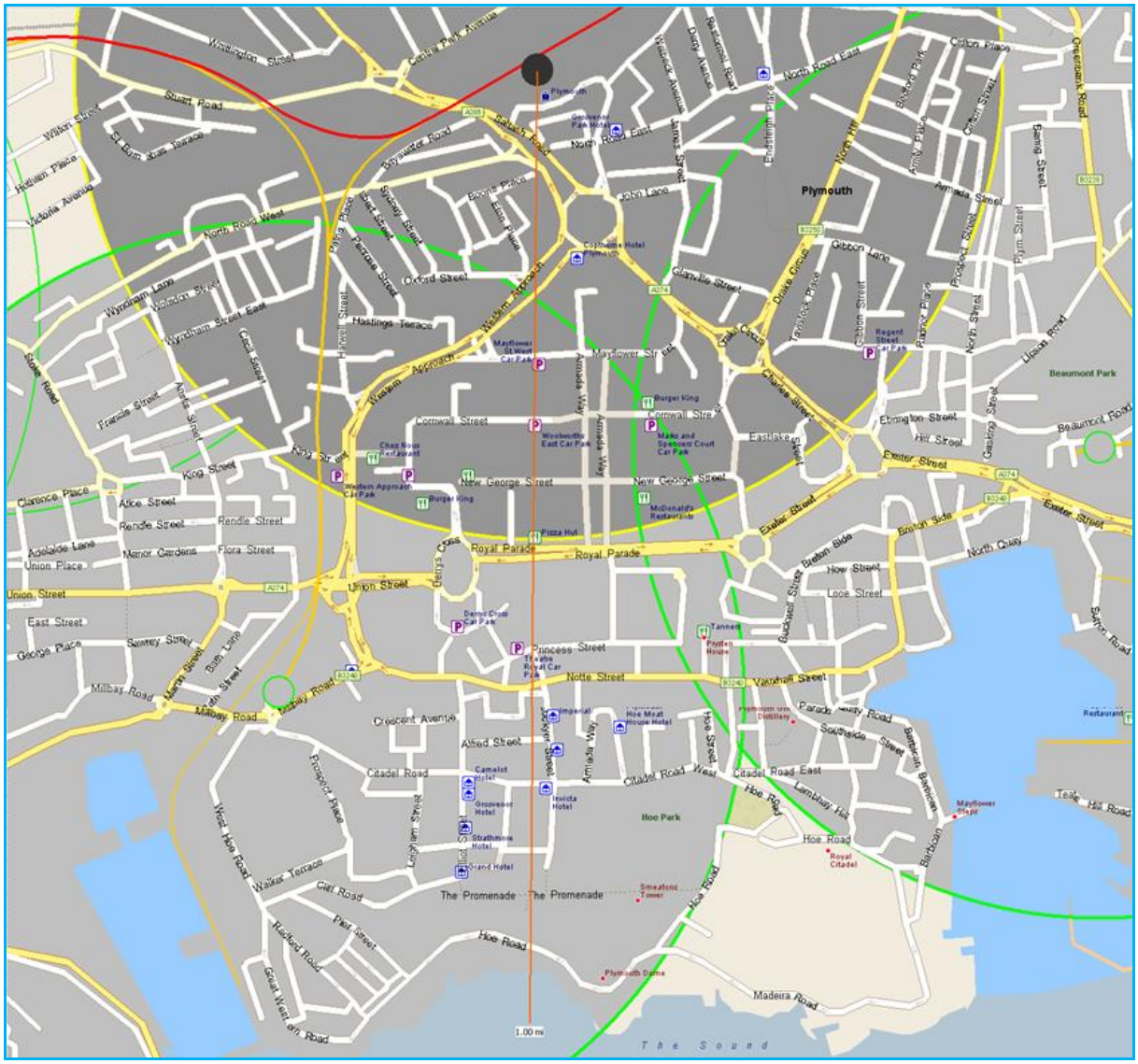


276. The shortfall in city centre rail accessibility remains evident today in Plymouth. Measures will be required to address this if regional rail is to become more relevant for post-Covid lifestyles and for a city centre which faces unknown long term impacts on retailing and office environments (and was facing retailing pressures before then). Link here for examples of Plymouth city centre pressures: https://www.plymouthherald.co.uk/news/business/plymouth-city-centre-company-boss-1756680, https://www.plymouth.gov.uk/sites/default/files/invest_tourism_leisure.pdf.

277. At the start of 2020, Plymouth City Council was bidding for £29 million government grant, as "Plymouth city centre has seen footfall decline by 15% over the past five years." (https://www.plymouthherald.co.uk/news/plymouth-news/plymouth-city-centre-new-blueprint-3736212).

278. The JLP gives considerable priority to Plymouth city centre, and is aiming to promote an improved Plymouth North Road station zone and create extra economic activity there. However this does not address rail's potential to achieve more for the city centre as a whole, where there are two underlying strategic issues:
    - Rail's poor accessibility to the central and southern parts of the city centre, where the central city functions are also more dispersed than in Exeter, with a city centre at least one mile in extent.
    - A high car dependency within the general catchment, and with relatively unconstrained car access to and throughout the central area. A map below indicates the scale of car parking available, which contrasts with an 800 metres/½ mile rail access zone.

279. Changes in favour of better public transport availability, and access to the city centre, and measures (as stated in the JLP) to create a genuine alternative to single car occupancy, will all be required.



Central Plymouth local context, showing ½ and 1 mile from North Road station

Requirement for regional rail access to central Plymouth

280. Despite the scale of Plymouth city (as total local population or wider Travel to Work zone, where the latter is equal to or larger than Exeter's), Plymouth's principal station handled just 2.4 million passengers entry+exit in 2018-19 and 80,000 interchanges. This compares with Exeter's three city centre stations handling 5.4 million passengers and ~1.2 million interchanges. So something isn't working as it should.

281. The effective geography for the city centre and the comparison with Exeter does suggests that an alternative approach might be worth exploring as part of further Joint Local Plan developments: to see whether there could be scope to put regional rail into the city's heart.

282. It is possible to consider whether greater improved interchange onto other modes at Plymouth North Road would itself make regional rail more attractive, although this itself will incur time and effort for rail passengers. An integrated ticket for rail and bus would help. It needn't be a direct rail – other options include high frequent bus links, or a 'Plymouth Metro' with some form of light rail connection or through running 'tram-train' services (although the UK is slow to adopt those).

Option for regional rail into central Plymouth

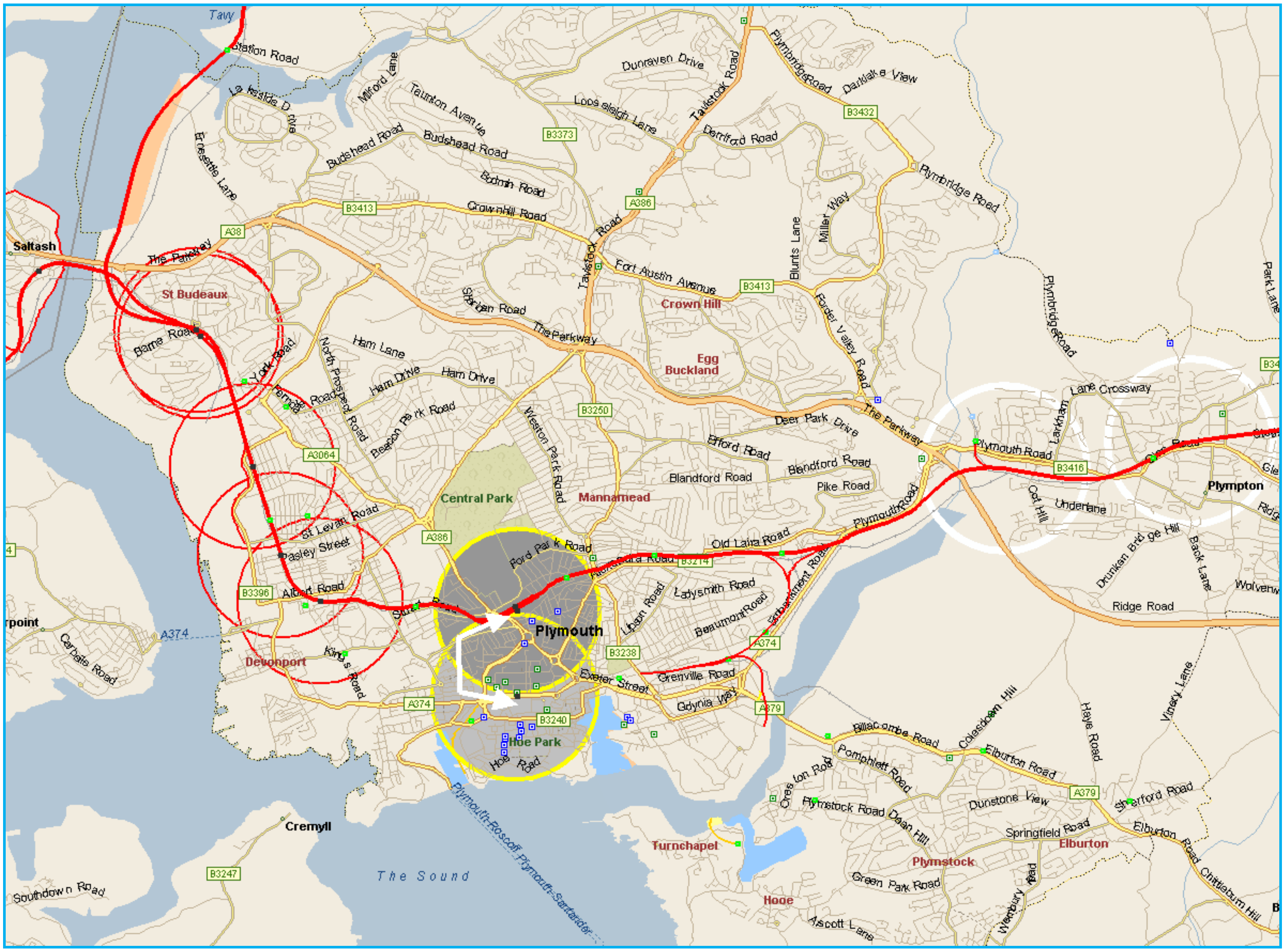
283. Exeter achieves its own direct city centre rail connectivity by means of regional trains reversing (when needed) at the Intercity station and going up the hill to the city centre, as well as through running if no reversal is needed (eg Barnstaple to Exeter Central).
Now visualise North Road as a 'Plymouth St. David's', with regional trains either reversing or running through on a dedicated line (or shared with a 'Metro'), in this case down *the hill into a 'Plymouth Central' station…*

284. The ideal railway to achieve that would have been the Millbay line, which descended mostly on a 1.5-1.6% gradient towards the Harbour, and to create a spur off into a central city station. However the Millbay line is largely built on. The Friary line still mostly exists, but is a long way round (up to 3½ miles from North Road to a central Plymouth station) which could be self-defeating in journey time even with a central station much closer than Friary was.

285. The opportunity might therefore be to create a tunnelled route, associated with area improvements within the central city so that the location and cost of a station could be shared with a development partner. Land availability to start a tunnel is better on the western side of North Road station. A tunnelled curve would then allow the railway, for example, to follow the line of Union Street and Royal Parade with a 1¼ mile line. In the long term, this could be the basis for a Plymouth Metro corridor. Improved city centre accessibility is shown in the notional diagram below.

286. City centre accessibility benefits are self-evident. Based on Exeter's example, through trains from the east could reach the central and southern half of the city centre in 3 minutes, and with 6-7 minutes from the north and west allowing time for efficient train crew change-over for reversal.

287. It is recommended that options for much improved rail access to and within Plymouth city centre should be investigated further, to include bus, light rail and heavy rail options. They should include the potential for a heavy rail 'solo' railway or a design enabling eventual shared use or conversion with a 'Plymouth Metro' in mind. An indicative diagram is shown overleaf.



Plymouth regional rail corridors with a notional city centre spur railway