Transport for Greater Manchester

Metrolink Phase 3

Monitoring and Evaluation Early Findings Report
May 2016

Metrolink Phase 3: One Year After Monitoring and Evaluation Report

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1 Executive Summary

1.1 Introduction

1.1.1 This one year after monitoring and evaluation report focuses on three extensions to the Metrolink network that form part of the Phase 3 programme of works. These are the extensions to Oldham and Rochdale town centres, East Didsbury and Ashton-under-Lyne. There is also some coverage, albeit limited coverage due to it only having opened relatively recently, of findings in relation to the Airport Line.

1.1.2 With the completion of the Second City Crossing in 2017, Transport for Greater Manchester will have successfully delivered by far the largest expansion of any modern tram network in the United Kingdom.

1.1.3 The report is a 'one year after' report as it relates to evidence collected up to one year after the last part of Phase 3 that the Department for Transport contributed funding towards came into operation. As such, the report presents early evidence from the initial period of operation of the expanded network.

1.1.4 Where possible, in order to enable the Department of Transport to understand the results of central government investment, findings are reported separately by line.

1.1.5 The short-term nature of this initial report means that it offers more in terms of scheme outputs rather than outcomes, which are inevitably still emerging and subject to short-term exogenous factors. The initial findings reported in this one year after report will be augmented by further monitoring and evaluation activity in the coming years. This further work will cover the areas included in this report and, in addition, the study of longer-term issues such as impacts on the economy. These will be made available in a 'five years after' report in 2019, i.e. five years after the last extension part-funded by the DfT came into operation.

1.2 Network expansion

1.2.1 Approval and funding of Metrolink Phase 3 was secured in a number of stages. Phase 3A, comprising the conversion of the Oldham-Rochdale heavy rail 'Loop Line' and extension to Chorlton (both funded in part by the DfT), together with the East Manchester extension to Droylsden (funded locally) formed the initial component of the expansion

programme. Phase 3A was awarded initial approval in 2006 in the DfT major scheme business case process, with full approval in 2008. The DfT-supported programme was extended in 2010 through the award of full approval of further extensions to Ashton-under-Lyne and East Didsbury.

1.2.2 A new operations and maintenance contract was awarded in 2007. Subsequently, a bespoke Metrolink Phase 3 design, construct and maintain contract for the new extensions was awarded in 2008.

1.2.3 Both the Metrolink Phase 3 design, construct and maintain contract and the operations and maintenance contract were designed to enable subsequent expansion of the programme. The DfT supported schemes and the Droylsden extension have also been augmented by further locally funded expansion. This has included extensions to Manchester Airport via Wythenshawe, a loop off the Phase 3A Oldham and Rochdale Line passing through Oldham town centre, an extension from Rochdale railway station to Rochdale town centre, and lastly, a new route across Manchester city centre, the Second City Crossing.

1.2.4 Prior to the development of the Phase 3 extensions, a programme of capacity and renewal works was agreed with DfT in 2005. As a consequence the Phase 3 programme was procured against a background of significant investment and works to the existing Metrolink system. Among other items, investment included the first of a new-to-Metrolink type of tram, track replacement on the Bury and Altrincham Lines, a new signalling and control system, and accessibility improvements to existing Metrolink stops.

1.2.5 Other external funding has enabled additional Metrolink development. The most notable example of this has been the MediaCityUK extension, comprising a spur off the existing line to Eccles via Salford Quays. This short extension was a significant factor in the BBC's decision to locate its new northern headquarters in Salford Quays. The level of commercial development at MediaCityUK simply would have not been possible without the enhanced public transport capacity provided by this Metrolink extension.

1.2.6 Locally funded additions to Metrolink Phase 3 have included a programme of park and ride facilities. These have comprised a mixture of new sites and expansion of existing, heavily used facilities. In the case of Hollinwood and Derker, new car parks integral to the Phase 3A scheme have been augmented by local funding to provide significantly larger

capacity. Furthermore, using local resources the tram fleet has been expanded beyond that originally anticipated to enable the original set of trams to be retired, enabling more efficient operation than a mix of new and old trams would have allowed for.

1.2.7 As noted earlier, the Phase 3 programme has, and continues to be, delivered under a bespoke design, construct and maintain contract – supported by a delivery partner. The combination of this contract with the operation and maintenance contract has provided the necessary flexibility to augment the programme as new funding streams were confirmed.

1.2.8 Weekday service frequencies of at least 5 trams per hour on all of the Phase 3 extensions have contributed significantly to the connectivity of the transport network in Greater Manchester. Passenger numbers have increased on all the new lines even though the core of the system is affected by works associated with the construction of the Second City Crossing. Higher service frequencies are planned to be introduced following completion of the Second City Crossing and as passenger demand requires.

1.2.9 In due course, once the Second City Crossing is complete in 2017, the Phase 3 programme will deliver an increase in passenger capacity of all public transport (bus, rail and Metrolink) into the regional centre of almost 10%, relative to the without-Phase 3 situation. At the time when this report was prepared in 2015, the increase in overall public transport capacity into the city centre was 5%, compared to a without-Phase 3 scenario.

1.2.10 In the future the infrastructure provided by Phase 3 has the potential to support further capacity increases over time, including the proposed Trafford Park Line services, the operation of double trams in response to growing passenger demand and the introduction of tram-train routes.

1.3 Initial findings

1.3.1 Despite the complexity of the overall programme described above, Metrolink Phase 3 has been delivered within overall budget and on schedule. The report notes that there are variances contained within the relevant budget of £764 million, relating to the part of the programme elements that the DfT has contributed to, but any changes in cost have

been allowed for through adoption of best practice risk management techniques and the delivery of offsetting cost savings.

1.3.2 The major line openings were achieved on schedule. In the event, however, the timing of sub-sections varied from the dates that were published originally. This was due in part to the scale of technical change and system integration issues in relation to existing Metrolink systems. These challenges included a new signalling and control system.

1.3.3 As the earlier technical and integration challenges were overcome, and with the benefit of experience and lessons learnt during the course of the programme, delivery subsequently accelerated. Airport Line services were able to commence over a year ahead of the published date. This demonstrated the value of the continuing contract arrangements that permitted an experienced team to retain knowledge and apply it as the project expanded.

1.3.4 In terms of initial impacts, the report illustrates the strategic significance of the Metrolink extensions, where for each of the key destination types of employment, further education and healthcare, there is a significant increase in public transport accessibility at a Greater Manchester level.

1.3.5 In the case of the corridors benefiting from the extensions, half of the population in the corridors experience an increase in public transport accessibility to employment and healthcare of 10% or more. This means that there is a 10% or greater reduction in the overall time required to access a range of each type of opportunity. For further education, over a third of the population experience an increase in public transport accessibility of 10% or more. Over 180,000 people in the corridors have benefited from this scale of increase in public transport accessibility.

1.3.6 In the case of deprived communities, the improvement in accessibility is more marked than for the corridor population as a whole.

1.3.7 From another perspective, the ability of Metrolink to attract people out of their cars, observed from Phases 1 and 2 of Metrolink development, has been confirmed in the case of Phase 3. Initial findings at this early stage are that a quarter of all trips on the new extensions would have been made by car if the option of travelling by tram had not been available.

1.3.8 Furthermore, across Phase 3 survey findings indicate that over a quarter of new park and ride users would have otherwise driven all the way to

their destination and a further 4% would not have made their trip at all had the parking spaces not been provided.

1.3.9 The period since 2006 has seen dramatic changes in the economic background following the 2008 start of the recession, against which the Metrolink Phase 3 programme has been delivered. While the programme's delivery has supported the Greater Manchester economy, the various scheme business cases were based on pre-recession rates of economic growth, development activity and growth in employment. The report analyses the effects of lower than anticipated economic growth and other factors on out-turn patronage.

1.3.10 Other factors considered in relation to patronage development related to the nature of business cases developed prior to the Second City Crossing case, namely that they only considered committed expansion of the Metrolink network. For this reason, the business cases for the extensions covered in this report did not take account of the potential effects on Metrolink services of the construction of the Second City Crossing or other system enhancement works. This has affected service frequencies in particular.

1.3.11 Patronage figures are nevertheless an important measure of progress towards delivering eventual longer-term outcomes. Patronage figures for the most recent year of operation have been compared to the figures that were expected at this stage of maturity of the Phase 3 network. Patronage for 2014/15 was found to be approximately half the level that had been anticipated by this time (in the original business cases).

1.3.12 Further analysis was carried out in order to understand this difference. Part of the overall difference was attributed to factors external to Metrolink and related to the relative weakness of the economy in recent years; these factors include suppressed growth in regional GVA and in city centre employment, plus significant developments that have yet not materialised along the corridors in comparison to the original business cases.

1.3.13 The remainder of the difference that it has been possible to explain to date relates to the technical development of Metrolink services on the Phase 3 network; these are primarily service frequencies and tram speeds. Frequencies will be improved in the future, once the Second City Crossing is operational. Tram speeds will also be improved in the future, as the network will be stable for a number of years, allowing

opportunities to tighten up run times to be taken up. Other factors that have affected capacity in the recent years, such as periods of city centre closure and single line running relating to the Second City Crossing, will also be lifted and will enable a more extensive range of marketing activity to take place.

1.3.14 In the meantime, patronage has been growing across the Phase 3 network. In the case of the Oldham and Rochdale Line, patronage has more than tripled since Metrolink's introduction, in comparison to the last full year of operation of the Oldham Loop rail service.

1.4 Conclusions

1.4.1 Some of the main positive lessons learnt in relation to delivery of Phase 3, obtained through interviews of the delivery team, were that:

- the appointment of a contractor with an ability to extend services offered enabled the retention of knowledge for the benefit of efficiently delivering an expanding programme of works;
- the decision to appoint a delivery partner and create an integrated delivery team allowed for an effective mix of public and private sector resources, scaled to the phases of the programme, to be deployed;
- secondment of delivery team staff into utilities companies enabled accelerated agreement and delivery of utility diversion works;
- mirroring the structure of the contractors' team via the delivery team structure enhanced working relationships and the monitoring of progress;
- creation of a Disability Design Reference Group meant that opportunities to make the network fully accessible were exploited at all stages of design and delivery;
- development of go-live procedures to enable all necessary tasks to be completed assisted in the active management of the run-up to opening new sections; and
- development of a computer-based driver training simulator halved the time it took for drivers to become familiar with new routes.

1.4.2 Other lessons learnt observations that require further reflection were that:

- the impacts of suppressed economic growth and development activity have had a negative impact on outturn patronage performance in the initial period of operation, not anticipated at the business case stage; and
- success in securing funds for further expansion of the Metrolink network, beyond that taken account of in earlier-stage business cases, has meant that disruptive short-term operational impacts of further network expansion were again not anticipated in the original business cases prior to the Second City Crossing business case.

1.4.3 To sum up, the report presents interim findings in relation to the implementation of Metrolink Phase 3. In overall terms, the programme has been delivered on time and on budget. Early indications are that the system's expansion is beginning to generate the benefits anticipated, which is encouraging. The 'five years after' report will revisit the areas covered by this report as well as examining longer-term impacts, such as those on the economy of Greater Manchester.

2 Introduction

2.1 Purpose of this Report

2.1.1 The purpose of this report is to summarise evidence from the monitoring and evaluation of Metrolink Phase 3. The monitoring and evaluation activity has been designed to provide evidence to a range of Greater Manchester and national audiences, and in order to fulfil Department for Transport funding conditions.

2.1.2 The evidence contained in this report includes 'after' data collected approximately one year on from the final section of Phase 3 that the Department for Transport contributed towards opening for passenger service; the extension to Ashton was opened in October 2013.

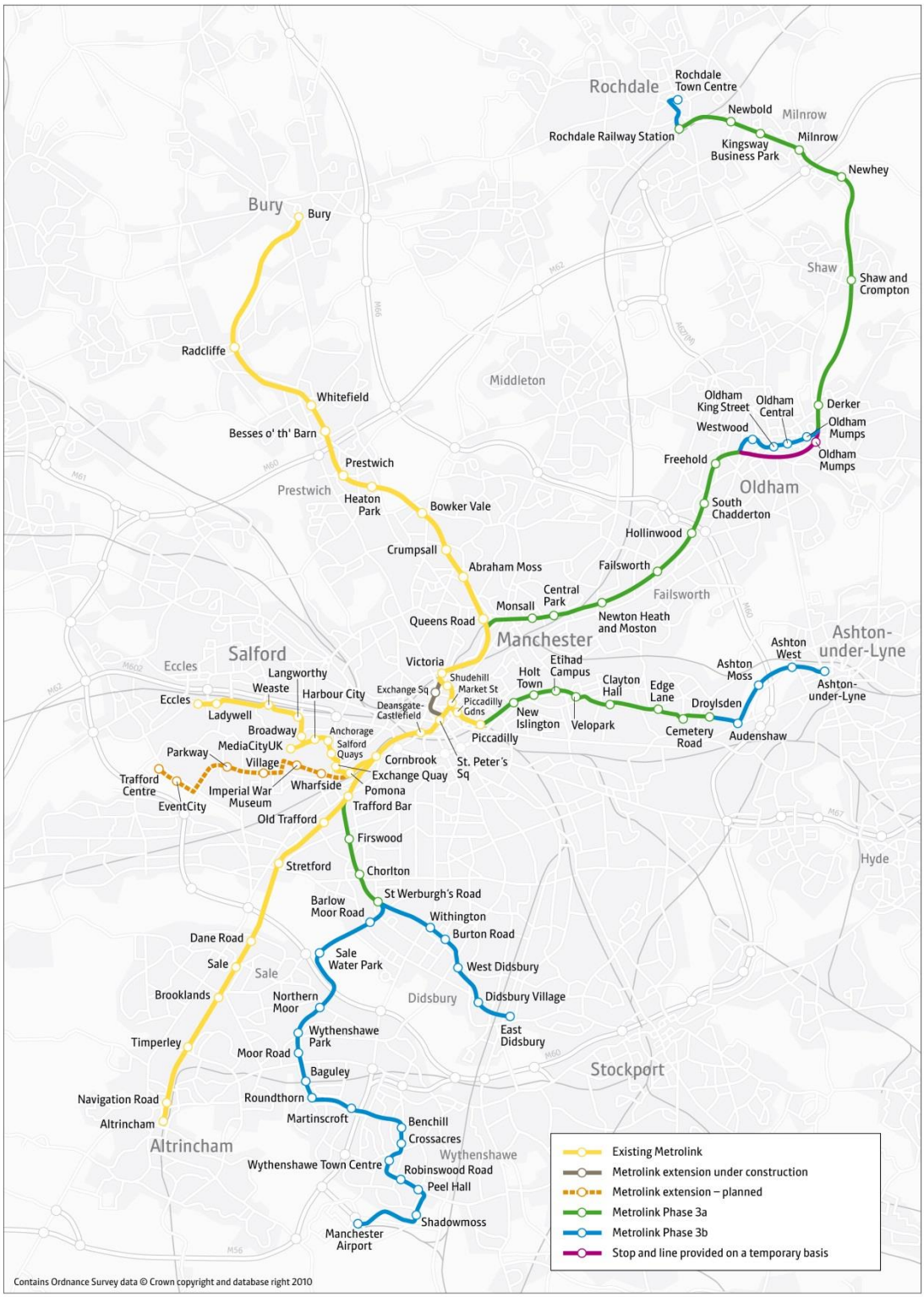
2.1.3 The approach taken within this report is consistent with the DfT's monitoring and evaluation framework for local authority major schemes[1] and is structured around the research questions agreed with the DfT.

2.2 Scheme Coverage

2.2.1 The report covers Metrolink Phase 3 and relates to the network shown in Figure 2.1. Components of Phase 3A are shown separately from those of Phase 3B. The report includes findings in relation to Phase 3A and Phase 3B.

[1] Monitoring and Evaluation Framework for Local Authority Major Schemes. September 2012. Department for Transport.

Figure 2.1: Metrolink Network Covered in this Report



2.2.2 The elements that were jointly funded with capital grants from the Department for Transport are shown in Figure 2.2. These were the Phase 3A extensions:

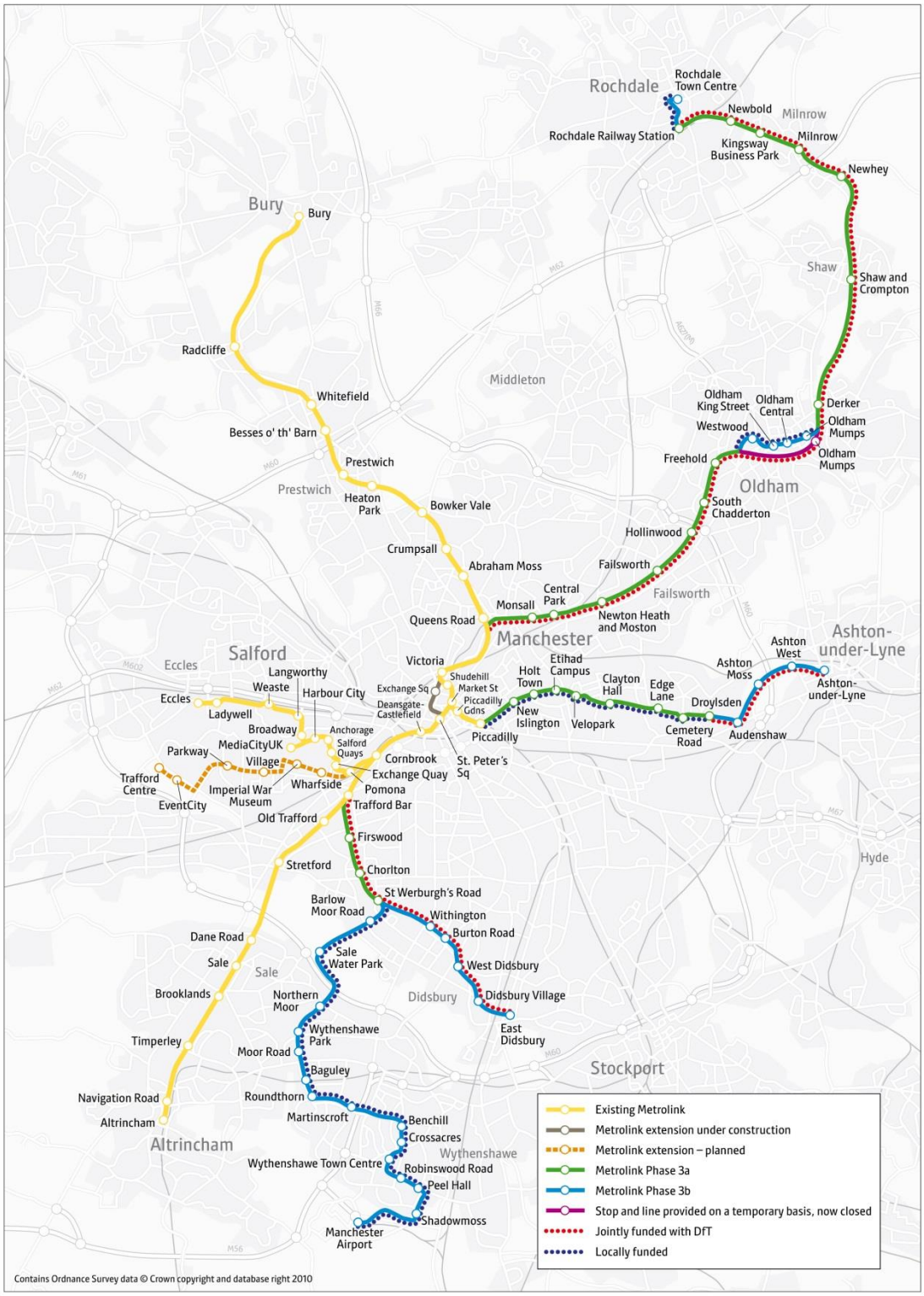
- to Rochdale Railway Station (direct, i.e. not via Oldham Town Centre);
- to St Werburgh's Road.

2.2.3 The Phase 3B extensions with grant contributions from the DfT were:

- from Droylsden to Ashton-under-Lyne; and
- from St Werburgh's Road to East Didsbury.

2.2.4 Where feasible in this report, the analysis has separated out content that relates to the sections that DfT contributed towards from evidence for those sections that were entirely locally funded.

Figure 2.2: Metrolink Network – Phase 3 by Funding Arrangement



2.3 Scheme Opening Dates

2.3.1 Table 2.1 summarises the opening dates of Phase 3 extensions.

Table 2.1: Opening of Phase 3 Lines from 2011 to 2014

Date	East Didsbury	Oldham & Rochdale	Ashton	Airport	Event
07/07/2011	●				Firswood to **St Werburgh's Road section opened**
13/06/2012		●			Monsall to **Oldham Mumps section** opened
16/12/2012		●			Derker to **Shaw and Crompton section** opened
08/02/2013			●		New Islington to **Droylsden** section opened
28/02/2013		●			Newhey to **Rochdale Railway Station** section opened
23/05/2013	●				Withington to **East Didsbury** section opened
09/10/2013			●		Audenshaw to **Ashton-under-Lyne** section opened
27/01/2014		●			**Oldham Town Centre** section opened
31/03/2014		●			**Rochdale Town Centre** stop opened
03/11/2014				●	**Barlow Moor Road to Manchester Airport section opened**

2.3.2 By the mid-point of the programme of delivery, extensions were being delivered in advance of the public opening dates. In relation to the most recent line opening, the Airport Line in November 2014, the extension was open for public service more than one year early.

3 Scheme Context

3.1 How does the delivered scheme compare to that at the full approval stage?

3.1.1 The purpose of this section is to describe what has been delivered and, crucially, any changes in the service offered to passengers compared to the anticipated service. This analysis enables any variation in the outcomes observed at this early stage, that are reported upon in later sections of this report, to be better understood.

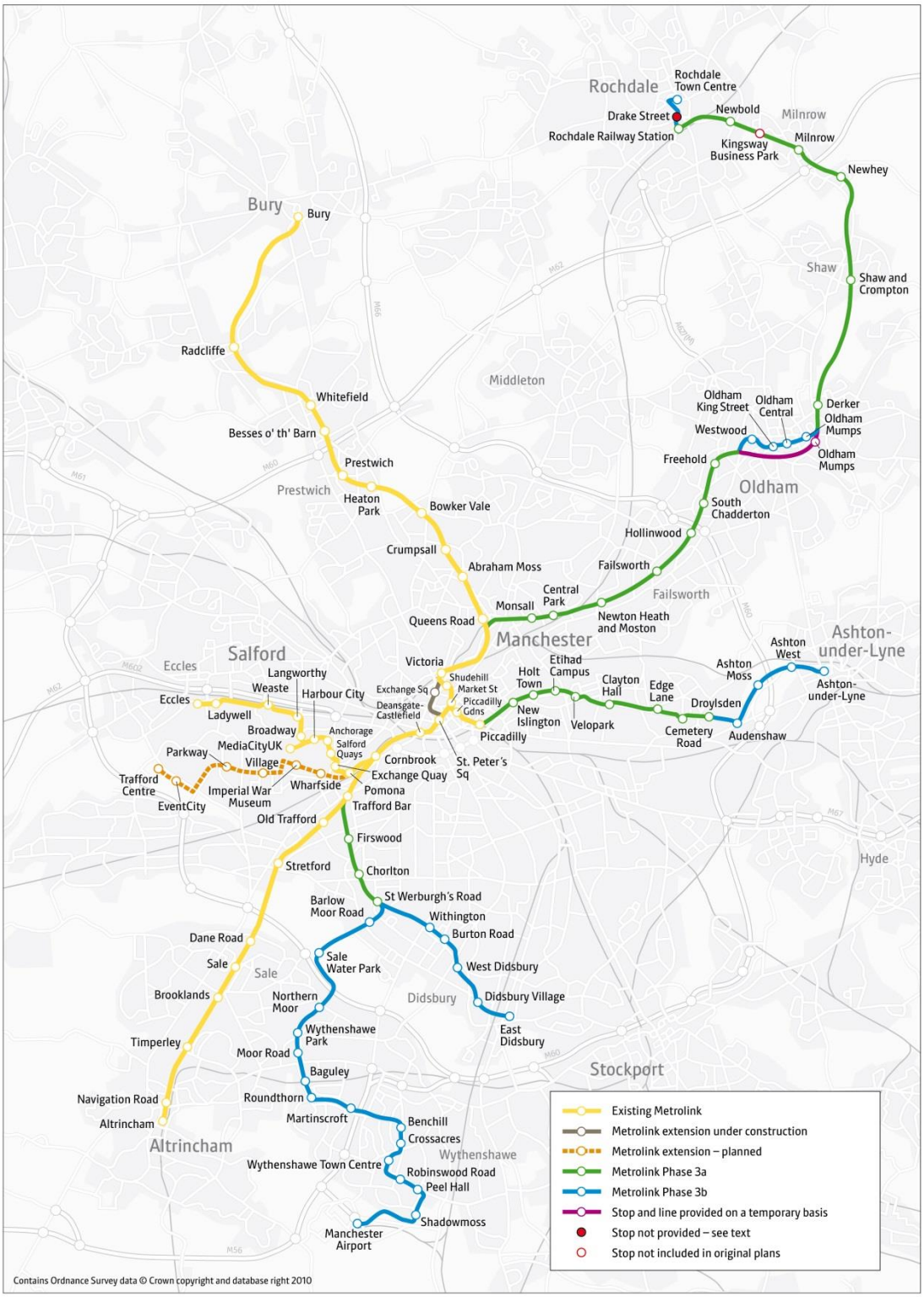
3.1.2 Figure 3.1 gives a comparison of the stop locations identified in the different lines' business cases with what has been provided. With the exception of the Oldham town centre extension[2], the alignments have not varied from those set out in the business cases.

3.1.3 The only stop variations were on the Oldham and Rochdale Line. Here, a stop was not provided at Drake Street and a stop was added at a different location in Rochdale, namely Kingsway Business Park. The primary reason for not providing a stop a Drake Street was the proximity of the stops at Rochdale Railway Station and Rochdale Town Centre, with the former stop some 200m away. Removing this stop strengthened the value for money case for the town centre extension and also allowed for an improved track alignment. This decision was made at a meeting of the Greater Manchester Integrated Transport Authority's Capital Projects Committee in March 2011.

3.1.4 In tandem with this decision, the Capital Projects Committee agreed to approve the addition of a stop at Kingsway, to serve a key strategic site in Rochdale, Kingsway Business Park. This stop was part-funded by Rochdale Development Agency.

[2] In the case of the Oldham town centre alignment, new powers were secured that allowed for variation in the alignment at the Manchester Street roundabout and provided for temporary running at Mumps in Oldham.

Figure 3.1: Metrolink provision in comparison with business cases



3.1.5 In relation to service frequency, the business cases for most lines anticipated that a service would eventually be provided every 6 minutes. Exceptions to this included the section of the Oldham and Rochdale Line north of Shaw, where a 12 minute headway was envisaged, and the Airport Line, for which a 12 minute headway was foreseen in the business case in the initial years of operation.

3.1.6 The level of service offered in October 2014 was a 12 minute headway on the East Didsbury, Ashton, and Oldham and Rochdale Lines. In the case of the Airport Line, on commencement in November 2014 the level of service was also a 12 minute headway.

3.1.7 Several unforeseen but co-dependent factors have led to the frequencies on some lines running at half that of the business case assumptions, which have in turn affected performance against patronage forecasts.

3.1.8 Firstly, operating at the ultimate frequencies would significantly increase the demand and throughput at key, existing junctions – most notably at Cornbrook to the south of the city centre, where several lines converge. This required the existing 'block-style' signalling on the original network to be replaced with a new, bespoke line-of-sight tram management system (TMS). The development, installation, integration and migration of this new system is still underway due to the unforeseen complexities and technical challenges experienced. The entire Bury line and final section of the Altrincham line are due to be migrated in 2016. Only when all junctions are operating under the full TMS solution will there be potential to operate increased frequencies.

3.1.9 The introduction of this new line-of-sight system on a live network not only brought significant operational challenges, but also required the safety systems on the existing tram fleet to be migrated as well. From late 2009, the Metrolink fleet was an ever-increasing mix of original 'T68' vehicles and new M5000 trams, procured specifically for the network's expansion. As this migration was dependent on progress with the installation of the signalling system, the operator's ability to run additional capacity to meet demand on the new and existing parts of the network was severely restricted. Further to this, the drastically poor performance of the old trams compared to the new ones quickly became apparent and the decision to retire and replace the entire T68 fleet was made in July 2012 – a process which was finally completed in April 2014.

3.1.10 Therefore the delayed introduction of TMS affected not only the ability of key junctions to operate at higher frequencies, but also the number of TMS-enabled vehicles that could be operated through those junctions

were limited. Individually these issues would have impacted on the business case assumptions, but this was even more the case in combination.

3.1.11 A further principal deviation from the business case modelling has been an expansion of the delivery programme to include the delivery of the Second City Crossing (2CC). The need to provide additional capacity, resilience and reliability through the city centre to operate the Airport Line and other extensions to their full extent, as well as the future Trafford Park Line services resulted in the development of the 2CC proposals. The alignment for 2CC underwent significant revision in 2010, in order to accommodate and complement inter-dependent developments in the city centre. The new alignment required a Transport and Works Act Order, which involved a major public consultation exercise and public inquiry. The requisite powers were ultimately awarded in late 2013 and construction began in early 2014, with the new line due to open in 2017.

3.1.12 Clearly, it would be counter-productive to build up frequencies and demand in advance of the start of the 2CC construction, only to have to curtail a high level of service during what are unavoidably disruptive works. For this reason, business case frequencies will only start to be introduced once the Second City Crossing is complete in 2017, allowing demand to build in an unfettered state, with latent operational and vehicle capacity available in full and no further disruptive works anticipated.

3.1.13 In the short term, to provide additional capacity in the context of the previously mentioned constraints, as at March 2015 half of the trams on the East Didsbury to/from Rochdale Town Centre service were operated as double trams.

3.1.14 With respect to tram journey times, business case assumptions were compared to journey times taken from the end-February 2015 timetable in order to understand any differences. This comparison is shown in Table 3.1.

Table 3.1: Journey Time Comparison with Business Case Assumptions

Section	Journey time	(mins)		% Diff-erence
	Business case	Feb 2015 Timetable	Difference	
Altrincham to Ashton	53	56[(1)]	+3	+6%
Shaw to East Didsbury via Oldham Town Centre	60[(2)]	61[(3)]	+1	+2%
Rochdale Railway Station to St Werburgh's Road via Oldham Town Centre	59	65	+6	+10%
Manchester Airport to Cornbrook*	36[(3)]	41	+5	+14%

Notes: * Airport Line figures represent the very early months of the operation of the line – this journey time difference is likely to be reduced as the line beds in; [(1)] "Timetable" figure taken by combining Altrincham-Cornbrook and Cornbrook-Ashton journey times; [(2)] Business case figure of 56 minutes adjusted by the addition of 4 minutes to reflect Oldham Town Centre running; [(3)] Business case figure of 39 minutes to Deansgate Castlefield minus 3 minutes to reflect Cornbrook termination. "Current Timetable" reflects service offered at February 2015.

3.1.15 The table shows that between 2% to 14% additional running time is being added to journey times in comparison to run times envisaged at the time of the business cases, though it should be noted that the Airport Line figure reported relates to the fourth month of operation only.

3.1.16 The business case run time simulations were based on the outline track alignment designs for each extension. While the outline design made reasonable assumptions regarding particular speeds in certain sections, additional noise or visual intrusion mitigation measures such as physical barriers have occasionally been introduced in response to issues raised by local authorities and local residents. These mitigation measures mean that some speeds are lower to allow for safe stopping distances on the basis of visibility. The design of particular sections, for example highway intersections, is influenced by detailed consideration of complex factors such as crossfall (highway) and cant (rail), which combine to reduce the speed at which trams may comfortably pass through these sections.

3.1.17 In addition, the modelling assumption in the business cases was that a certain level of priority would always be given to trams at junctions. However the remodelling of streets consequent on the introduction of light rail is frequently used as the means by which other desirable features such as pedestrian and cycle facilities may be introduced. The

additional facilities may reduce the overall traffic throughput of an intersection such that it is not practical for the tramway to be accorded the maximum level of priority when approaching more complex traffic intersections. While the opportunity to improve junctions to achieve a wider range of benefits would have been apparent at the business case stage, at the detailed design and implementation stage the levels of relative priority accorded to different users of junctions appear to have altered.

3.1.18 Finally the operational aspect of the tramway system has to be considered. At the outline design stage the full effects of integrating the proposed new tram service into the overall system may not have been considered in all respects. Typically business cases have been based on assumed steady state operations, whereas in recent years – as outlined in detail above – the operating environment has been affected by a series of radical developments as new extensions, new technology, new vehicles and new alignments have been introduced. This incremental approach to appraisal is consistent with DfT Guidance which seeks to identify the transport case for each scheme discretely. The practical effect of this approach is that it will be some time before the Metrolink network reaches what can be considered a "steady state" of operations.

3.1.19 Changes to the operating schedule have presented, and are presenting, opportunities to tighten schedules to come closer to the run times assumed in the various scheme business cases. Further opportunities will arise once the network reaches a steady state of operations.

3.1.20 Fares are broadly in line with those envisaged at the business case development stage.

3.1.21 In summary, while the alignments have been delivered in terms of stops, there have been some significant unforeseen deviations from the original delivery programme, resulting in a delay to the arrival of a "steady state" situation. However, patronage has nonetheless continued to increase and business case frequencies will come on stream as the Second City Crossing becomes operational and as patronage requires. Opportunities for reducing run times are being actively explored through an ongoing process.

3.2 How much additional public transport capacity to the city centre has been created by Metrolink?

3.2.1 This question was addressed as part of the monitoring and evaluation plan in order to put the scale of change brought about by Metrolink Phase 3 into context. This enables the scale of transportation and wider impacts to be considered in this regard.

3.2.2 One measure of the scale of the impact of Metrolink is the extent to which public transport capacity entering the city centre has increased. Capacity here is taken as the combined seating and standing capacity of Metrolink, trains and buses. Passenger carrying capacity per hour was calculated for the am peak period from 0730-0930 and for an interpeak period that covered 1000-1600.

3.2.3 In the case of Metrolink, capacity of the M5000 trams was taken as 198 people seated plus standing. Timetabled services were extracted from data held in the Tram Management System and matched with the type of tram scheduled. Calculations were made for the Phase 1 and 2 networks and for the Phase 3 network. The timetable snapshot was taken during March 2015, at a time when all Bury-Altrincham services were operating as double trams. The base figure also includes services from MediaCityUK, so the increase in Metrolink capacity takes account of this increased base.

3.2.4 For bus, observations from a February/ March 2014 cordon count of vehicles inbound to the city centre were multiplied by a bus capacity of 87.3 passengers per vehicle. This capacity figure was based on vehicle records combined with roadside observations. The high figure reflects the dominance of double decker buses operating into the city centre. In the absence of any evidence of bus service reductions having occurred as a result of Metrolink's introduction, it has been assumed that the with and without Phase 3 capacity for buses into the city centre is unchanged.

3.2.5 Lastly, for rail, timetable observations from in 2013 for the am peak were matched with the type of rolling stock scheduled to be deployed on different services. To assess capacity in the interpeak, train formations with fewer carriages were assumed. To simulate the existence of Oldham Loop heavy rail services in the without-Phase 3 calculations, the timetable for these services was combined with the rolling stock class that was typically deployed prior to conversion from heavy rail.

3.2.6 Table 3.2 provides a summary of the calculations set out above.

Table 3.2: Public Transport Seating plus Standing Capacity into the City Centre

Mode	Without Metrolink Phase 3	With Metrolink Phase 3	Change
Typical hour within am peak (0730-0930):			
Metrolink	5,900	9,900	+68%
Rail	23,400	23,100	-1%
Bus	38,300	38,300	0%
All PT modes	**67,700**	**71,300**	**+5%**
Typical hour within the interpeak period (1000-1600):			
Metrolink	5,900	9,900	+68%
Rail	17,600	17,300	-2%
Bus	38,100	38,100	0%
All PT modes	**61,700**	**65,300**	**+6%**

Note: this is not a "before" versus "after" comparison. For this reason, and because no major effect of Metrolink on bus services has been identified at this time, the bus figure for with and without Metrolink situation is unchanged.

3.2.7 The table indicates that provision of Metrolink Phase 3 has resulted in overall public transport capacity into the city centre increasing by 5%, with Metrolink capacity into the city centre increasing by 68%. These figures will be significantly boosted once the Second City Crossing is open and service frequencies increase.

3.3 How have cost estimates developed over time and in relation to the scope of the scheme?

3.3.1 An important part of the cost effectiveness of the provision of Metrolink Phase 3 is the resource invested both locally and by the DfT in the programme. Therefore, capital costs were examined in relation to the intended level of investment in the programme.

3.3.2 Capital cost analysis has been carried out separately for:

- Metrolink Phase 3A - namely, extensions to St Werburgh's Road, Oldham and Rochdale excluding town centres, and Droylsden extensions; and

- Metrolink Phase 3B Accelerated Works - Droylsden to Ashton and St Werburgh's Road to East Didsbury extensions.

3.3.3 The analysis was carried out in September 2014 and therefore reflects the position at that time.

3.3.4 The approved budget for Phase 3A was £575 million. Overall forecast programme expenditure to financial close is within budget[3], but with some variances in the 'mix' of cost types compared to budget (i.e. escalations in some activities, offset by savings and the utilisation of risk allowances within the £575 million).

3.3.5 Table 3.3 provides a summary of variances in the mix of forecast costs compared to budget. These changes are expressed as a proportion of the overall budget - rather than the individual budgets headings for the individual categories of expenditures. A positive variance indicates an increase in costs relative to that anticipated, while a negative figure indicates a cost saving.

3.3.6 It should be noted that a risk and contingency allowance was established in order to provide coverage of costs associated with the design and construction element of capital costs – the main capital cost category.

Table 3.3: Phase 3A Cost Variances

Cost category	Variance as % of overall budget	Reason for variance
Light rail vehicles	-1.5% to -1%	Stronger UK£/Euro exchange rate and favourable contractual indexation
Ticket vending machines	-0.5% to 0%	No major change
Tram management system	1% to 1.5%	Increase in scope and complexity
Utilities	-0.5% to 0%	No major change

[3] Additional local and third party funding contributions of the order of £1.5 million have funded additional works as part of this programme. The analysis presented in this section considers the original programme scope.

Cost category	Variance as % of overall budget	Reason for variance
Design and Construction	8.5% to 9.0%	Prolongation costs primarily associated with utility diversions and changes in structure scope. Structure re-measure/ risk share items, primarily on the Oldham & Rochdale Line. Signalling interface issues.
Other network items	-1% to -0.5%	Close cost control monitoring and scale benefits from taking forward wider Phase 3 capital investment programme
Network Rail	0.5% to 1%	Some utilisation of risk provision within cost reimbursable General Works Agreement with Network Rail
Project management and technical	-1.5% to -1%	Tight budgetary monitoring
Risk and contingency	-7% to -6.5%	Deployment as part of programme
Overall	No change	No overall change

3.3.7 As can be seen in Table 3.3, risk and contingency was deployed to offset cost variations relating to the design and construction component of capital costs.

3.3.8 The form of the Phase 3A Design, Construct and Maintain contract was a bespoke agreement - with various risk share mechanisms, with incentivisation, where scope definition was limited. Signalling system design, testing and commissioning was procured separately – as well as rolling stock, ticket machines, stop shelters and utility diversions. The Phase 3A Design, Construct and Maintain contract scope included the lines previously mentioned, plus a new depot at Trafford.

3.3.9 As noted previously, the overall Phase 3A programme costs are within budget; the Design, Construct and Maintain cost variance to budget was allowed for within the overall programme budget through the best practice budgeting and management of risk as a Quantified Risk Assessment (QRA) which took account of the risk allocation in the Design, Construct and Maintain contract, and through the delivery of offsetting savings.

3.3.10 The approved budget for Phase 3B Ashton and Didsbury was £189 million. As with Phase 3A, overall forecast programme expenditure to financial close is within budget[4], but with some variances in the 'mix' of cost types compared to budget (i.e. escalations in some activities, offset by savings and the utilisation of risk allowances).

3.3.11 Table 3.4 provides a summary of variances in the mix of forecast costs compared to budget. These changes are expressed as a proportion of the overall budget.

3.3.12 As with Phase 3A, it should be noted that a risk and contingency allowance was established in order to provide coverage of costs associated with the design and construction element of capital costs – the main capital cost category.

Table 3.4: Phase 3B Ashton and Didsbury Cost Variances

Cost category	Variance as % of overall budget	Reason for variance
Light rail vehicles	-2% to -1.5%	Stronger UK£/Euro exchange rate and favourable contractual indexation
Ticket vending machines	0% to 0.5%	No significant change
Tram management system	0% to 0.5%	No significant change
Utilities	0.5% to 1.0%	Development of the detailed measures considered necessary following intrusive site investigation by the utility companies
Design, Construct & Maintain	8.5% to 9%	Prolongation due to utilities diversion and on-street tramway design change (Ashton Line). Major civils contract re-measure/ risk-share items. Prolongation due to signalling issues.
Staffing, land	0.5% to 1.0%	Additional staff time related to signalling. Land-related matters

[4] Additional local and third party funding contributions of the order of £1 million have funded additional works as part of this programme. The analysis presented in this section considers the original programme scope.

Cost category	Variance as % of overall budget	Reason for variance
Testing and commissioning	-2.5% to -2%	Benefits of agreeing a network-wide testing and commissioning approach with the Metrolink operator and efficient integration of all parties
Risk and contingency	-7.5% to -7%	Deployment as part of programme
Overall	No change	No overall change

3.3.13 Again, and as noted previously, the overall Phase 3B Accelerated programme costs are within budget. The Design, Construct and Maintain cost variance to budget was allowed for within the overall programme budget through the best practice budgeting and management of risk as a Quantified Risk Assessment (QRA), which took account of the risk allocation in the Design, Construct and Maintain contract, and through the delivery of offsetting savings.

4 Lessons Learnt

4.1 What lessons can be learnt about the scheme build process and the effectiveness of delivery?

Context for the review of lessons learnt

4.1.1 To support the effective delivery of the Phase 3 programme in accordance with DfT and internal project governance processes, Ernst Young were appointed as Assurance Partner following a competitive tendering exercise. Ernst Young engaged in a wide range of assurance activities throughout delivery of the programme but chiefly conducted work to advise TfGM management on:

- key risks and issues facing the programme and potential remedial action required;
- compliance of project teams with key governance processes and procedures;
- effectiveness of various project governance procedures, including Gateway reviews; and
- continuous assessment of which projects require greatest management control / intervention and those which require a "lighter" touch.

4.1.2 Assurance services contributed to the successful delivery of the programme and the strengthening of TfGM project governance processes and project management methodology.

4.1.3 A review of successes and lessons learnt about the delivery of Metrolink Phase 3 was carried out by Atkins. The review was carried out for the benefit of TfGM and for the wider audience that this report is intended for.

4.1.4 This review consisted of 18 in-depth interviews with delivery staff from a range of seniorities and specialisms. The interviews were carried out in late 2014 and early 2015. Additional lessons learnt have been added by TfGM in relation to the Tram Management System.

Phase 3 programme context

4.1.5 In order to augment the resources of TfGM, the decision was made to appoint a delivery partner from the private sector in order to form an

overall Integrated Delivery Team (IDT). Parsons Brinckerhoff was selected as the delivery partner.

4.1.6 In terms of delivery strategy, to allow design details and improvements to the system that were still being developed to be finalised, TfGM decided to procure the construction of the main Phase 3 infrastructure expansion as a Design, Construct, and Maintain form of contract. Separate contracts were awarded for the delivery of other programme elements, such as the trams and signalling system.

Lessons learnt – delivery process and contracts

4.1.7 The scale of the expansion that Phase 3 involved and the need to integrate with an existing network resulted in one of the most complex light rail projects to be delivered in the UK. The decision to appoint a delivery partner and create an integrated delivery team was identified as a major benefit in providing appropriate resources to be deployed to meet programme needs. It allowed the appropriate mix of public and private sector skills to be assembled and allowed the team to be rapidly expanded, and later contracted, to suit programme requirements.

4.1.8 In relation to the delivery of a programme requiring multiple contracts, where specialist services are required consideration should be given to including the specialist contractor/ supplier as a named sub-contractor or include a condition for them to be novated to the main contractor.

4.1.9 Where this is not practical, the form of contract used for specialist service delivery should be chosen to provide for integrated contractual controls to allow clear identification of responsibility, commissioning requirements and handover procedures of equipment to the main contractor. It should be understood as part of the contracting strategy and subsequent project planning and delivery that while specialist contractor/ suppliers may be a small proportion of an overall programme of works in cost terms, the impact of such a project can have extensive implications for the overall programme's cost and schedule.

4.1.10 The adoption of a ‘level 2’ programme linking key delivery dates in each contract and the key project dates for the overall delivery of the Phase 3 expansion was a major lesson learnt. An overall project programme should be used to ensure that completion dates specified in each contract are compatible.

4.1.11 The release of funding in a number of stages for the programme meant that it was delivered in a number of phases. This phasing was found to

have major benefits to the successful delivery of the scheme. It allowed for lessons learnt in the construction of one section to be taken forward into the next section's development.

Lessons learnt – design

4.1.12 One lesson learnt at the design stage was the need for a comprehensive record of all correspondence to be logged and treated as a possible third party agreement. Records were stored using a standard file structure that was adopted and repeated for each corridor. This filing structure mirrored the geographical split of the work on site and was therefore more intuitive to use.

4.1.13 A further lesson learnt in relation to records was that, where there is a long gap between obtaining third party details and the award of the construction contract, a review/ audit of land records, power and orders should be undertaken to identify any changes.

4.1.14 One success was in relation to a joint approach between the IDT and DCM contractor, where necessary for third party agreements and planning requirements to be fulfilled. A common planning and third party requirements register was created and maintained to track completion of third party agreements.

4.1.15 Planning authorities were heavily involved by the IDT in all stages of design development. This meant that confirmation of the satisfaction of all planning requirements was a formality, as agreement was reached during the design development. Phased construction also allowed for standards procedures to be agreed with planning authorities, which helped speed up the planning approval process.

4.1.16 In tandem with planning liaison, TfGM and local authorities formed a Highways Design Reference Group to secure prior agreement on a range of technical issues across district boundaries.

4.1.17 In relation to Traffic Regulation Orders, the successful delivery of these was identified as being as a result of close working between the design team and orders team, and rigorous checking to ensure that all required traffic regulations were identified for both the construction period and the final scheme – and the necessary powers obtained.

4.1.18 Members of the IDT were seconded into the utility companies to ensure that their proposed diversion designs were compatible with the Phase 3 design. This sped up significantly the agreement of utility diversion works. It also allowed for the amount of diversion works to be reduced

by identifying changes to the Metrolink design that allowed utility requirements to be changed to in-situ protection.

4.1.19 Throughout the design stage and into delivery and commissioning the formation of a Disability Design Reference Group, comprising individuals with different disabilities, was found to offer major benefits. The creation of a joint group enabled the consultation to be accelerated and ensured that one set of comments was received for each design review.

Lessons learnt – construction

4.1.20 The construction stage introduced a whole new area of consultations and approvals required to mitigate the impact of construction works on local communities and businesses.

4.1.21 A close working relationship was developed between the IDT and the construction team, by means of the IDT's early decision to mirror the structure of the contractor's team. This allowed for close working relationships to be developed between counterparts in each team. It also made it easier for IDT staff to monitor construction progress, local public issues and to co-ordinate works specific to their geographic area of responsibility.

4.1.22 At the start of the construction period, local authorities were contacted as part of the required traffic management and construction consultation. This consultation identified proposed local authority highway improvement and major maintenance works that would disrupt the running of the tram system. To prevent this, the IDT reached agreement with the local authority and the Phase 3 contractor to carry out works as part of the Phase 3 contract. One future improvement would be the identification and inclusion of proposed highway works that would affect the operation of the tram system, so that the works can be incorporated in tender documentation and be competitively priced.

4.1.23 A proactive approach to public consultation at the construction stage was believed to have improved public confidence in the consultation process, with local presentations and walk-in clinics making the process more accessible to the public.

4.1.24 The involvement of the contractor in public and third party consultations was also felt to have bolstered public confidence in the consultation process, therefore helping speed up the agreement process. Future contracts should bear this prospective involvement in the consultation

process in mind, seeking evidence of capability in the areas of public consultation and engagement.

4.1.25 The formation of a joint utilities group, co-located with the IDT and the contractor, allowed for closer working and greater flexibility. This was demonstrated by the adoption of shared utility trenches and of global traffic management (the use of one traffic management contractor for the provision of all traffic management for sections of the works). It also reduced the time for identification of unknown or abandoned services from two weeks down to 48 hours.

4.1.26 A countdown process was introduced that was designed in-house by TfGM as the construction works were nearing completion, in order to assist agreement of handover to the Metrolink operator. This go live readiness process identified the outstanding items of work, provided regular updates on progress of these items and identified areas that required closer monitoring to ensure that completion was achieved on time. It also provided greater certainty of the completion date for each section.

4.1.27 The volume of information provided to the TfGM programme boards was considerable, due to the size of the programme and the speed of developments. To tackle this issue, a more user friendly chart system was provided that provided 'at a glance' summaries of construction progress, scheme outturn cost and areas where issues were arising.

Lessons learnt – tram management

4.1.28 The design and delivery of the tram management system was undertaken with a specialist contractor. The use of a specialist contractor allowed for a separate selection of provider, independent of the selection of the construction team. As referred to at Paragraph 4.1.9, this requires integrated contractual controls to ensure the interface between TMS and main contractors is managed appropriately.

4.1.29 The complexity of signalling projects should not be under-estimated in the planning and delivery of heavy or light rail systems. Signalling works at the interface between the latest technology, heavy engineering and, in the case of Phase 3, the replacement of legacy signalling systems. For these reasons, the scale of the challenge involved in delivering signalling systems should be met with strong clients and supplier side complement of resources.

4.1.30 As far as possible any tram management system should utilise "off the shelf" assets to provide for ease of support following installation. Appropriate specialist support for non-standard items should be secured as part of the initial procurement.

Lessons learnt - system operation and maintenance

4.1.31 Issues arose in relation to areas of land that were made use of during the construction period but where there was no clear hand-back procedure to highways authorities for future maintenance, since the land was not needed for the operation of tram services. These areas related to street-running parts of the system. In the future, it would be helpful if clear protocols for hand-back were agreed with the affected local authorities.

4.1.32 An aspect of preparations for entry into service concerned taking a proactive approach in terms of collecting documentation that safety procedures had been completed. This allowed any outstanding issues to be actively tracked and closed off, with evidence readily available to the safety review committee and the Office of Rail Regulation.

4.1.33 A 'go live' procedure was developed and funded by TfGM to ensure that all necessary measures had been scheduled and completed in the run up to the extensions opening for public service. This included checklists relating to activities including construction completion, testing and commissioning, driver training, tram scheduling, advertising and publicity, and ticketing.

4.1.34 Traditionally, driver training had focused on desk-based training and actual experience of driving each route; drivers initially trained on the route would then accompany other drivers in route familiarisation. This was very time intensive and tied up experienced drivers in the training of other drivers. The development of 3D visualisation enabled driver training to be halved in time. A simulator package, with a replica of the tram joystick control, was created for each route and could be run on any computer.

4.1.35 Other issues where some progress was made but also where future development could be considered were:

- specification of minimum requirements in design requirements, rather than just specifying that sufficient quantities should be provided;
- linkage of 'as-built details' and maintenance documentation to milestone payments to ensure timely deliver and accuracy;

- checking to ensure compliance with contract drawings and specifications should involve a client side role, rather than just relying on contractor's compliance checks, and should be linked to milestone payments that are also tied to any remedial works necessary; and
- factory testing in the UK prior to installation of equipment, as well as in its country of origin, to ensure that testing and commissioning of all stop and communications equipment once installed was largely fault-free.

Considerations for future projects

4.1.36 The go live and countdown approaches outlined above are in the process of being embedded into TfGM standard practice, within programme and project management systems.

4.1.37 Some issues in relation to project strategy that have been raised by the ongoing construction of the 2nd City Crossing are:

- the opportunity reduce the amount of utility diversion works by allowing infrastructure access arrangements to be provided for;
- future proofing infrastructure provision so that later extensions can be more readily accommodated in operational terms as part of future expansion programmes; and
- sectional opening of extensions so that all parts of the delivery team area able to learn their own lessons and build relationships.

5 Impacts on Accessibility

5.1 What change in public transport network accessibility has been achieved through the system's expansion?

5.1.1 This section provides an overview of the impacts on network accessibility of Metrolink Phase 3. The scale of accessibility change is a key factor influencing eventual outcomes and impacts and has thus been subject to scrutiny.

5.1.2 In order to provide this in reasonably concise format, the numeric findings of this analysis are presented at a network-wide level rather than for individual extensions. The figures included in this section show how accessibility change varies across the extensions.

5.1.3 The approach used to determine changes in door-to-door accessibility by means of public transport made use of a generalised cost framework, i.e. the full set of time and cost components of a journey, weighted to take account of their relative importance to passengers. Therefore, walk access, wait time, fares, time spent in the vehicle, any transfer penalty and walk egress were all taken into consideration.

5.1.4 An alternative approach, making use of timetable data in the DfT's Accession model, was explored. This does not, however, account fully for wait time, one of the main accessibility changes that Metrolink brings about. Furthermore, journey time components are not weighted in this approach, so that the relative discomfort or dislike of different aspects of travel would not be reflected. For these reasons, a generalised cost framework was adopted.

5.1.5 The analysis was based on outputs from the Greater Manchester Public Transport Model. Two scenarios were run:

- one with the Phase 3 network as depicted in Figure 2.1, taking the network as at November 2014 but with service patterns as if the Victoria redevelopment works were not in place[5]; and
- one without the Phase 3 network but assuming that in the absence of Metrolink, heavy rail services would have run on the alignment via Oldham to Rochdale.

[5] I.e. with services running from Ashton to Bury, rather than the arrangement during the Victoria works of Ashton to Eccles and some Bury services curtailed before Victoria.

5.1.6 Section 5.2 provides evidence that bus service levels have not been affected by Metrolink's expansion at this time. For this reason, bus services were left unchanged between the two scenarios.

5.1.7 Two factors affect the results of the accessibility analyses. The first is that the public transport model has a weighting on rail and Metrolink in-vehicle time of 0.71 and 0.79 respectively, whereas bus in-vehicle time is not weighted in this way. This reflects the relative preference for rail-based modes observed in Greater Manchester and has been built into the public transport model to enable satisfactory representation of actual travel behaviour.

5.1.8 The second factor is that, in advance of the Second City Crossing's completion and prior to further build-up of patronage, services on new lines are operating at 12-minute headways.

5.1.9 Reflecting the business case objective of greater network accessibility to key destination types, accessibility changes were assessed for:

- healthcare, i.e. major hospitals – for the population as a whole;
- employment – for those aged 16-70; and
- colleges of further education – for 16-19 year olds.

5.1.10 The business cases for the extensions also contain an objective to better serve areas that are more deprived. Therefore the analysis also built in levels of deprivation by means of the 2010 Index of Multiple Deprivation.

5.1.11 Zones in the public transport model were linked to 2011 Census output areas. The approach used to estimate accessibility made use of a Hansen index, which, for any given origin, takes account of the opportunities in the destination zones and their 'distance' in generalised cost terms. Improvements in accessibility are reflected in an increase in the accessibility index.

5.1.12 Figures 5.1 to 5.3 provide maps for changes in accessibility at output area level. Healthcare (Figure 5.1) accessibility change is shown for the interpeak time period, because much of the travel to medical appointments occurs outside of the morning and evening peaks, whereas the other destination types are shown for the morning peak period.

5.1.13 The results are broadly in line with expectations, with the areas showing the greatest changes in accessibility being geographically close to the Metrolink extensions.

5.1.14 The results for the different attractor types are similar, although improvements in access to education and healthcare opportunities are more widespread, with small increases in in the numbers of areas showing changes in accessibility in the 5-10% category (coloured light green). This reflects the spatial distribution of colleges and hospitals in Greater Manchester, which are less dispersed compared to employment opportunities, and which tend to be located in areas that are close to public transport hubs.

5.1.15 No areas experience a reduction in accessibility. This is true even for areas adjacent to the former heavy rail service in Oldham and Rochdale. In this area, heavy rail has been replaced by a more frequent Metrolink service and this frequency effect appears to be the dominant cause of the increase in accessibility.

5.1.16 The results for healthcare are shown in Table 5.1. The table shows modelled changes in accessibility weighted by population for the whole of Greater Manchester, and for the ten percent most deprived areas of the county. The columns headed 'Change in Index Value' show the modelled percentage change in the accessibility index, ranging from a change of less than 1% to more than 30%. The columns headed 'Percentage' show the percentage of the population in each of the index-change categories (1% to 5%, 5% to 10% etc.). The columns headed 'Cumulative Percentage' show cumulative percentage totals summed from the top.

Table 5.1: Changes in Public Transport Accessibility to Healthcare in the Interpeak – Greater Manchester Level

Change in Index Value	All of Greater Manchester			10% Most Deprived Areas		
	Popul-ation	%	Cumul-ative %	Popul-ation	%	Cumul-ative %
More than 30%	29,615	1.1%	1.1%	0	0.0%	0.0%
20% to 30%	45,289	1.7%	2.8%	12,537	4.4%	4.4%
10% to 20%	151,712	5.7%	8.4%	33,130	11.5%	15.9%
5% to 10%	207,501	7.7%	16.2%	25,538	8.9%	24.8%
1% to 5%	1,159,029	43.2%	59.4%	115,876	40.3%	65.1%
Less than 1%	1,089,382	40.6%	100.0%	100,306	34.9%	100.0%
All	2,682,528	100%		287,387	100.0%	

5.1.18 The figures indicate that access to healthcare by public transport has improved by more than 10% for approximately 8% of the population in Greater Manchester (two hundred and twenty seven thousand people), compared to 16% of the population of the ten percent most deprived areas (forty six thousand people).

5.1.19 Data for the Metrolink corridors for the change in public transport accessibility to healthcare in the interpeak is shown in Table 5.2. This looks at the change in public transport accessibility for a 1 km buffer around the Phase 3 lines.

Table 5.2: Changes in Public Transport Accessibility to Healthcare in the Interpeak – Phase 3 Corridors

Change in Index Value	All of Phase 3 Corridors			10% Most Deprived Areas within Phase 3 Corridors		
	Popul-ation	%	Cumul-ative %	Popul-ation	%	Cumul-ative %
More than 30%	28,549	7.7	7.7	0	0.0	0.0
20% to 30%	39,544	10.7	18.4	12,537	16.1	16.1
10% to 20%	111,620	30.2	48.5	28,143	36.1	52.2
5% to 10%	73,144	19.8	68.3	12,000	15.4	67.7
1% to 5%	105,235	28.4	96.7	22,486	28.9	96.5
Less than 1%	12,110	3.3	100.0	2,700	3.5	100.0
All	370,202	100		77,866	100	

5.1.21 As expected, the scale of change when the Metrolink corridors are the focus of attention is more marked. Almost half of residents (49%) within 1 km of the Phase 3 lines experience a change in public transport accessibility to healthcare of 10% or more.

Figure 5.1: Changes in Public Transport Accessibility to Healthcare in the Interpeak Period due to Metrolink Phase 3

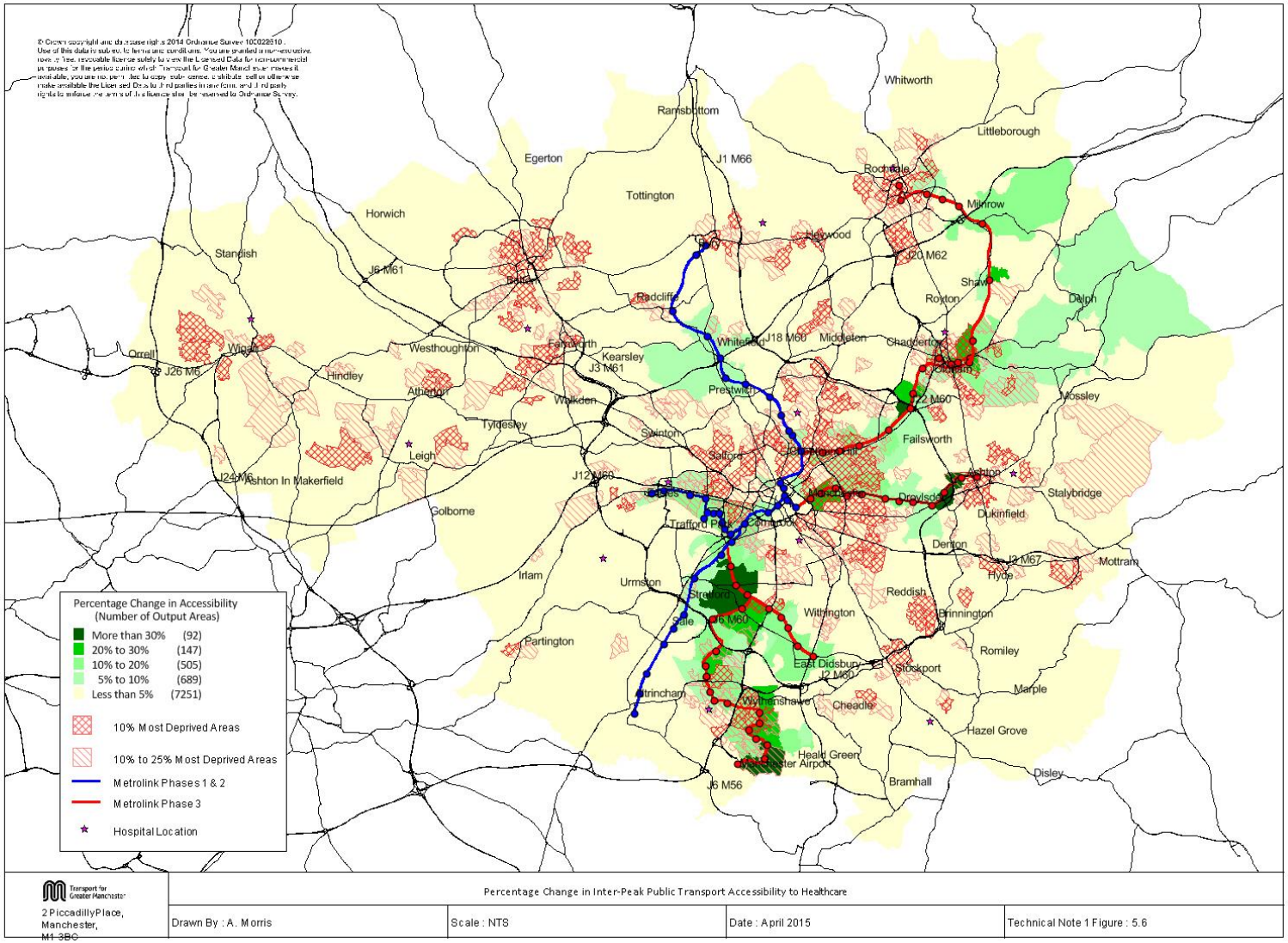


Figure 5.2: Changes in Public Transport Accessibility to Employment in the Morning Peak due to Metrolink Phase 3

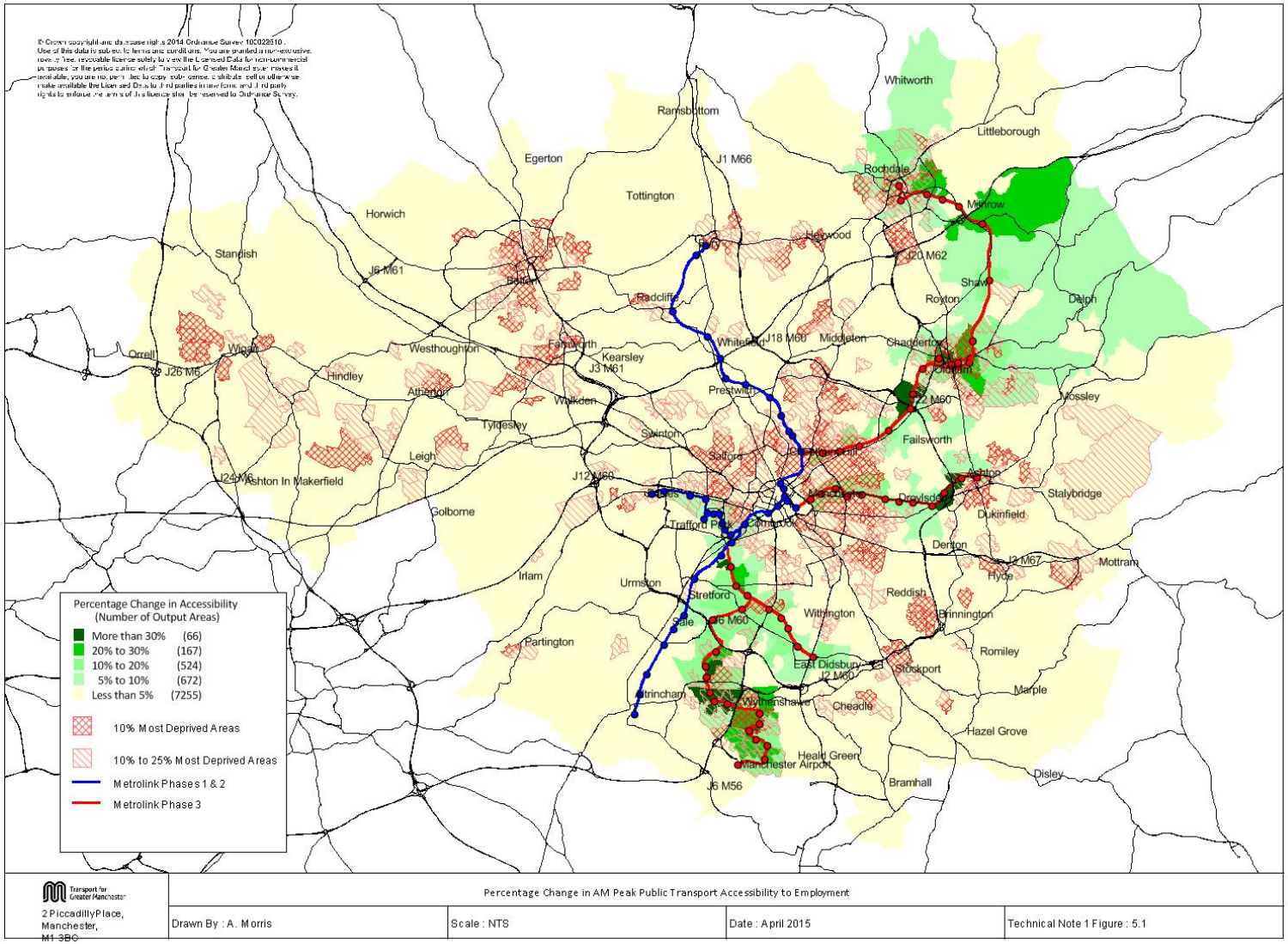
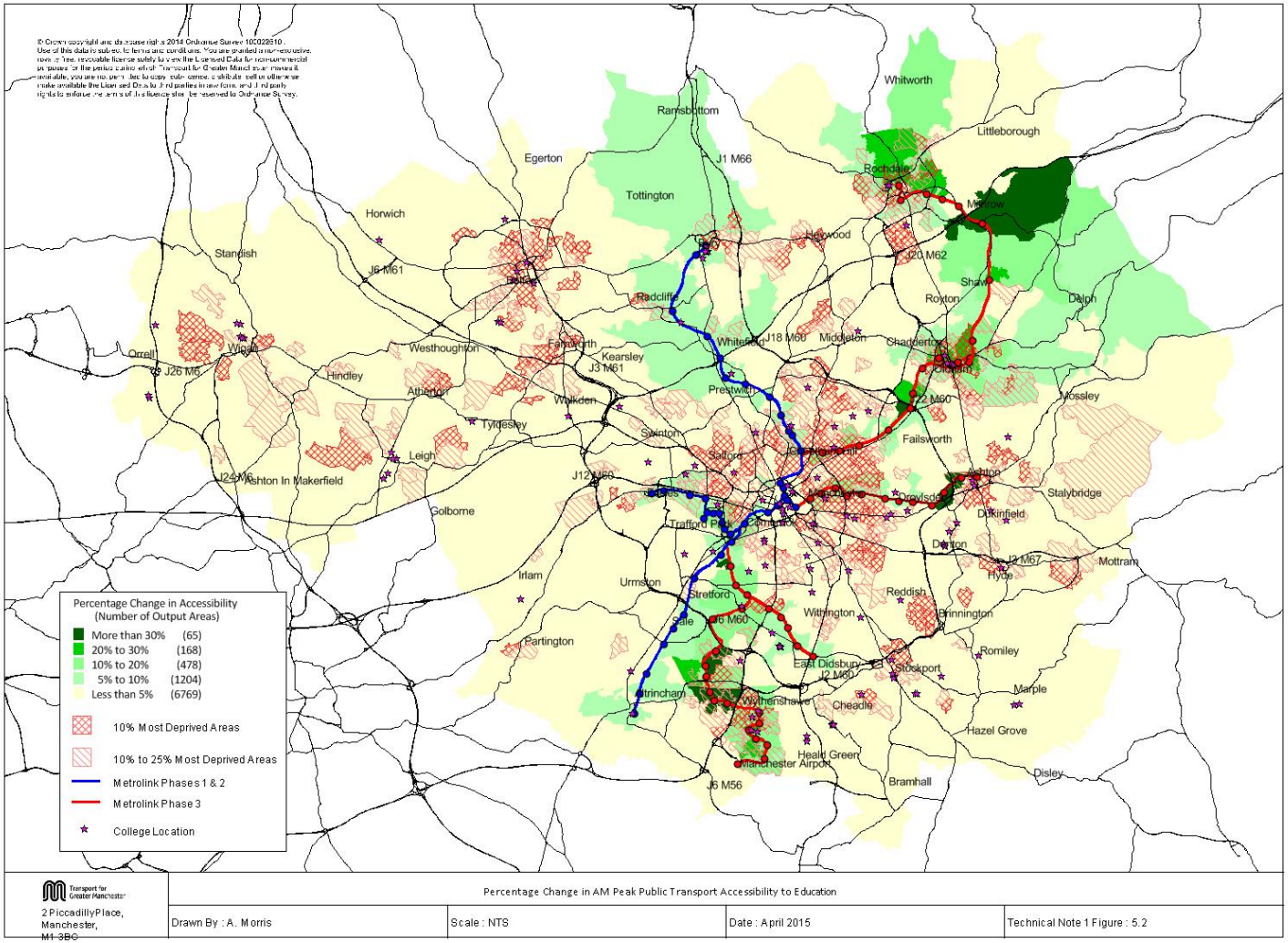


Figure 5.3: Changes in Public Transport Accessibility to Further Education in the Morning Peak due to Metrolink Phase 3



5.1.22 The results for employment are presented in Table 5.3.

Table 5.3: Changes in Public Transport Accessibility to Employment in the Morning Peak – Greater Manchester Level

Change in Index Value	All of Greater Manchester			10% Most Deprived Areas		
	Popul-ation	%	Cumul-ative %	Popul-ation	%	Cumul-ative %
More than 30%	14,076	0.7	0.7	657	0.3	0.3
20% to 30%	37,608	2.0	2.7	11,942	6.1	6.4
10% to 20%	115,950	6.1	8.9	27,229	13.9	20.3
5% to 10%	143,730	7.6	16.4	11,161	5.7	26.0
1% to 5%	733,924	38.8	55.2	63,248	32.2	58.2
Less than 1%	848,575	44.8	100.0	81,921	41.8	100.0
All	1,893,863	100.0		196,158	100.0	

5.1.24 The figures indicate that access to employment for 16-70 year olds has improved by more than 10% for some 9% of the population in the county (which equates to one hundred and sixty-eight thousand people), compared to 20% of the population of the 10% most deprived areas (forty thousand people).

5.1.25 Data for the Metrolink corridors for the change in public transport accessibility to employment for 16-70 year olds in the morning peak is shown in Table 5.4. This looks at the change in public transport accessibility for a 1 km buffer around the Phase 3 lines.

Table 5.4: Changes in Public Transport Accessibility to Employment in the Morning Peak – Phase 3 Corridors

Change in Index Value	All of Phase 3 Corridors			10% Most Deprived Areas within Phase 3 Corridors		
	Popul-ation	%	Cumul-ative %	Popul-ation	%	Cumul-ative %
More than 30%	12,060	4.5	4.5	657	1.2	1.2
20% to 30%	30,038	11.3	15.9	9,332	17.3	18.6
10% to 20%	89,178	33.6	49.5	22,432	41.7	60.3
5% to 10%	51,049	19.3	68.8	2,785	5.2	65.4
1% to 5%	66,279	25.0	93.8	14,272	26.5	92.0
Less than 1%	16,488	6.2	100.0	4,316	8.0	100.0
All	265,092	100		53,794	100	

5.1.27 The scale of change when the Metrolink corridors are the focus of attention is more marked. Approximately half of 16-70 year olds within 1 km of the Phase 3 lines experience a change in public transport

accessibility to employment of 10% or more. This rises to 60% among people living in the ten percent most deprived wards in the corridors.

5.1.28 The results for access to colleges of further education are presented in Table 5.5.

Table 5.5: Changes in Public Transport Accessibility to Further Education in the Morning Peak – Greater Manchester Level

Change in Index Value	All of Greater Manchester			10% Most Deprived Areas		
	Popul-ation	%	Cumul-ative %	Popul-ation	%	Cumul-ative %
More than 30%	991	0.7	0.7	0	0.0	0.0
20% to 30%	2,937	2.1	2.8	795	4.9	4.9
10% to 20%	6,990	4.9	7.7	1,984	12.2	17.1
5% to 10%	18,065	12.7	20.4	1,776	11.0	28.1
1% to 5%	47,792	33.6	53.9	5,737	35.4	63.5
Less than 1%	65,585	46.1	100.0	5,918	36.5	100.0
All	142,360	100.0		16,210	100.0	

5.1.30 The figures indicate that access to further education for 16-19 year olds has improved by more than 10% for approximately 8% of the population in Greater Manchester (eleven thousand people), compared to 17% of the population of the 10% most deprived areas (three thousand people).

5.1.31 Data for the Metrolink corridors for the change in public transport accessibility to further education for 16-19 year olds in the morning peak is set out in Table 5.6. This looks at the change in public transport accessibility for a 1 km buffer around the Phase 3 lines.

Table 5.6: Changes in Public Transport Accessibility to Further Education in the Morning Peak – Phase 3 Corridors

Change in Index Value	All of Phase 3 Corridors			10% Most Deprived Areas within Phase 3 Corridors		
	Popul-ation	%	Cumul-ative %	Popul-ation	%	Cumul-ative %
More than 30%	873	4.4	4.4	0	0.0	0.0
20% to 30%	1,537	7.8	12.2	473	10.9	10.9
10% to 20%	4,760	24.2	36.4	1,477	34.2	45.1
5% to 10%	4,478	22.8	59.2	1,021	23.6	68.8
1% to 5%	6,111	31.1	90.2	948	21.9	90.7
Less than 1%	1,919	9.8	100.0	401	9.3	100.0
All	19,678	100		4,320	100	

5.1.33 The scale of change when the Metrolink corridors are the focus of attention is more marked. Over a third (36%) of 16-19 year olds within 1 km of the Phase 3 lines experiences a change in public transport accessibility to further education of 10% or more. This rises to 45% among people living in the ten percent most deprived wards in the corridors.

5.1.34 In summary, for each of the key destination types, Metrolink Phase 3 results in a significant increase in public transport accessibility at a Greater Manchester level. These changes are of a far greater magnitude in the Metrolink Phase 3 corridors. Furthermore, and again for each of the three key destination types, this improvement in accessibility is greater for people living in the most deprived communities in Greater Manchester – in the corridors themselves, approximately a half of people living in deprived communities experience a 10% or greater increase in public transport accessibility to key destinations.

5.2 How have bus services adapted following the introduction of Metrolink?

5.2.1 An important aspect of the overall impact of Metrolink on the transport network is the degree to which bus services have adapted. A significant share of Metrolink passengers tend to be drawn from the bus market and bus operators may have chosen to respond in a number of ways to Metrolink's expansion. Hence, this question was included in order to understand the overall impact on the transport system of Metrolink's expansion.

5.2.2 In order to assess bus service changes, TfGM bus service planners undertook an inspection of adaptations to commercial and tendered services in the corridors now served by Metrolink. This assessment included: changes in frequency,; changes in route; fare changes; and, the quality of the vehicles being operated. The record of changes is summarised in Table 5.7.

5.2.3 In the case of the Oldham and Rochdale Line, the dominant operator in the area, First Bus, had chosen to strengthen commercial bus services in the corridor at the point where the heavy rail service was discontinued. The analysis carried out isolated out this strengthening in service as the likely without-Metrolink scenario would have been the continuation of heavy rail services instead. This strengthening of services was reversed after the introduction of Metrolink.

Table 5.7: Changes in Bus Services in Metrolink Corridors

Service	Frequency pre-Metrolink	Type & operator	Change	Attribution to Metrolink?
East Didsbury Line				
84 Manchester – Chorlton – Withington – East Didsbury - Reddish	30 min daytime, 60 min Sun evening, 60 min Mon-Sat eve	Mainly commercial with some subsidised provision – Stagecoach	Following a review of subsidised services in the area, due to low usage the Mon-Sat evening service was withdrawn in Apr 2015 (this was a subsidised service)	Very low usage pre-dates Metrolink's introduction in the area, therefore the change cannot be attributed to Metrolink.
85 Manchester-Alexandra Park-Chorlton	At least every 10 mins, Mon-Sat daytime, 30 min eve, 20 min Sun	Commercial-Stagecoach	Some fluctuation in frequency observed, but remains a frequent service (to Jul 2015)	Not applicable
86 Manchester-Whalley Range-Chorlton	At least every 10 min, Mon-Sat daytime, 10 mins eve/Sun	Commercial-Stagecoach	Some fluctuation in frequency observed, but remains a frequent service (to July 2015)	Not applicable
Oldham and Rochdale Line				
24 Rochdale–Royton–Chadderton-Manchester	60 min daytime, Mon-Sat	Commercial - First	Sep 2013, increased to half-hourly. Sep 2014, reduced to hourly. Jul 2015, amended to operate half-hourly Manchester-Thornham with weekday peak services extending to Rochdale.	Limited overall change.
181 Rochdale –Shaw – Royton – Manchester	30 min daytime, Mon-Sat, 60 min eves/Sun	Commercial – First	Service curtailed to Shaw-Manchester – Sep 2013 (partly offset by changes to 24).	Limited net impact.

Service	Frequency pre-Metrolink	Type & operator	Change	Attribution to Metrolink?
182 Rochdale-Shaw-Royton-Manchester	30 min daytime, Mon-Sat, 60 min Sun	Commercial - First	No change	Not applicable
58 Rochdale-Shaw-Oldham-Middleton	15 min, daytime, Mon-Sat	Commercial - First	Jan 2015, 58/59 reduced to provide combined 10 min frequency on common sections of route (was every 7/8 min).	No, the primary driver is understood to have been the desire to improve service punctuality.
59 Rushcroft-Shaw-Oldham-Middleton-Manchester	15 min, daytime, Mon-Sat, 30 min eve/Sun	Commercial - First	See above	As above
X82 Milnrow – Shaw – Royton – Manchester	4 buses am peak, 5 buses pm peak journeys, Mon-Fri	Commercial – First	Service withdrawn – September 2013	This was introduced when the heavy rail service was closed, so there was no pre-heavy rail service and this change cannot be attributed to the without-Metrolink situation
83 Sholver-Oldham-Manchester	7 min, daytime, Mon-Sat, 15 min eve/Sun	Commercial - First	No change	Not applicable
180 Greenfield – Oldham – Manchester	60 mins, Mon-Sun incl evenings	Commercial – First	Jan 14 - Mon-Sat daytime frequency increased to every 30 mins on Greenfield-Oldham section only. Sep 14 – Mon-Sat daytime replaced by limited stop X80 service.	The operator responded to consultations in the Saddleworth area. It was not related to the introduction of Metrolink.
184 Huddersfield/Uppermill-Oldham-Manchester	12 min, daytime, Mon-Sat, 60 min eve/Sun	Commercial – First	No change	Not applicable
X84 Carrcote-Uppermill-Manchester	30 min, peak, Mon-Fri	Commercial - First	No change	Not applicable

Service	Frequency pre-Metrolink	Type & operator	Change	Attribution to Metrolink?
Ashton Line				
216 Manchester-Droylsden-Ashton	At least every 10 mins daytime, 15 min eves/Sun	Commercial – Stagecoach	No change observed	Not applicable
217 and 218 Manchester-Droylsden-Mossley/Stalybridge/Ashton	Each 60 mins Mon-Sat daytime	Tendered – Stagecoach	In April 2014, Manchester-Droylsden-Ashton replaced by revised, hourly 217 service (S&S Travel); and Stalybridge-Dukinfield-Droylsden replaced by extension of 408 (First) April 2015, subsequent curtailment of 408.	More related to review of the local subsidised bus network, with removal of duplicated sections (with commercial 348 and 350), and reduced frequency on lightly used sections. Opportunity taken for 408 to connect into Metrolink at Droylsden, as opposed to continuing into Manchester, but curtailed later due to very low usage.
231 Manchester-Clayton-Littlemoss-Broadoak-Tameside General-Ashton	15 min Mon-Sat Manchester-Littlemoss, 30 min Mon-Sat extended to Ashton, 60 min Eve Manchester-Littlemoss, 30 min Sun	Commercial daytime; Evenings/Sun – tendered; - Stagecoach	No change observed	Not applicable.

Service	Frequency pre-Metrolink	Type & operator	Change	Attribution to Metrolink?
Airport Line				
18 Altrincham-Manchester Airport-Wythenshawe-Sale-Stretford-Trafford Centre	30 min daytime, 60 min eve	Mainly commercial – Arriva North West; some subsidised-Manchester Community Transport	Reduced to every 60 minutes between Altrincham and Manchester Airport	Commercial services appear to have been partly affected by Metrolink's introduction
19 Altrincham-Sale West-Sale-Wythenshawe-Manchester Airport	15 min daytime, 60 min eve	Mainly commercial – Arriva North West; some subsidised-Stagecoach	Reduced to every 30 minutes between Sale and Manchester Airport	Commercial services appear to have been partly affected by Metrolink's introduction
101 Manchester-Northenden-Benchill-Wythenshawe	10 min Mon-Sat daytime, 20 min Sun, 30 min eve	Commercial – Stagecoach	No change	Not applicable
104 Manchester-Northenden-Benchill-Wythenshawe	30 min Mon-Sat, 60 min eve/Sun	Mainly commercial – Stagecoach	No change	Not applicable
105 Manchester-Northenden-Benchill-Wythenshawe-Manchester Airport	30 min Mon-Sat, 60 min eve/Sun	Mainly commercial – Stagecoach	No change	Not applicable

5.2.4 Across the three of the lines analysed - East Didsbury, Oldham and Rochdale, and Ashton – there were no significant changes in service frequencies or routes that could be attributed to the introduction of Metrolink on those corridors. This is even the case on the Ashton corridor, where three commercial services parallel significant sections of the Metrolink alignment.

5.2.5 The situation for the Airport Line appears to differ to some degree. Here some reduction of service levels is apparent for two routes paralleling Metrolink's alignment.

5.2.6 Some other changes were observed that are relevant to bus's position relative to Metrolink. These include the introduction of modern buses on some corridors, network-wide fare reductions in the case of First (relevant to the Oldham and Rochdale Line corridor) and deep discounts to bus fares limited to a small number of routes (e.g. First's 42 service that runs between East Didsbury and the city centre, with a £1 adult single). These changes, however, do not seem to be directly associated with Metrolink's introduction and appear to be more closely linked to general bus network developments in Greater Manchester.

5.2.7 In overall terms, therefore, the business case assumption that changes to bus services would be limited appears to have been borne out from the evidence to date of bus operators' responses and the adaptation of the tendered bus network.

5.3 To what degree is the expanded system accessible to disabled people?

5.3.1 A key feature of Metrolink is the degree to which it serves disabled people effectively. This section sets out how the delivery team put in place measures to enhance the accessibility of the expanded network to disabled people, ensuring fully accessibility stops.

5.3.2 In expanding the Metrolink network, TfGM sought to ensure that accessibility was increased for disabled people, above and beyond statutory requirements. The organisation believed that as well as benefiting disabled users, there would be wider community benefits as a result of this increased accessibility.

5.3.3 In order to accomplish this aim, a Disability Design Reference Group was formed, comprising 16 members representing a range of impairments. Examples of the types of impairment represented included:

- electric / manual wheelchair users;
- mobility impairments;
- mental health impairments;
- sensory impairments; and
- people with learning difficulties.

5.3.4 Breakthrough UK Ltd was appointed through a competitive tender process to recruit, train and manage the reference group.

5.3.5 The reference group was involved in the vast majority of design activities relating to infrastructure that would be put into passenger service. It was embedded in the full delivery process and was involved by means of regular meetings, presentations, practical demonstrations, workshops and site visits:

- at the initial concept stage;
- at the detailed design stage; and
- at the stage of going into operational service.

5.3.6 Project managers for the contractor and TfGM have noted that the early involvement of the reference group has provided opportunities to develop more accessible solutions in a very cost effective manner - as opposed to addressing issues later in the project lifecycle in a way that would be more expensive. The reference group has also been able to guide project managers when differing views from group members with different impairments were expressed, assisting in coming to a consensus over design issues. First-hand experience of disabled people's perspectives has also encouraged project managers to bring accessibility issues to the forefront.

5.3.7 Table 5.8 illustrates the nature of involvement of the reference group in the development of the new lines. To date, the group has influenced the design of the 57 new stops included in the expansion programme, designs for 10 new park and ride facilities, upgrades to all 39 stops on the existing network and modifications to seating arrangements on the M5000 trams.

Table 5.8: Metrics by Line for Involvement of the Disability Design Reference Group

Line	Consultation commenced	Most recent consultation	Agenda items at meetings	Site visits	Total consultations
South Manchester Line	05/02/2009	14/07/2014	9	3	12
East Manchester Line	14/11/2008	15/05/2014	15	6	21
Oldham & Rochdale Line	09/09/2008	12/06/2014	31	9	40
Airport Line	16/06/2011	21/10/2014	5	4	9

Note: "most recent consultation" is as at November 2014.

5.3.8 Examples of the improvements in accessibility that the reference group has brought about include:

- additional railings and posts to assist cane users;
- greater colour contrast of stop features;
- practical feedback on seating configurations when additional seating capacity was provided on the new trams; and
- bollard design at the rear of accessible parking bays in Metrolink Park and Rides.

5.3.9 The work of the reference group was documented by means of minutes of meetings and the recording of comments made by the group during site visits. Action points were then distilled into an action tracker that contained over 3,400 records of actions.

5.3.10 The work of the reference group has also been cited as a model of best practice in the involvement of disabled users in the development of transport infrastructure by the Equality and Human Rights Commission. In 2012, the work of the Disability Design Reference Group was also recognised, through an award for 'best customer initiative' by the light rail industry, and was also awarded a 'National Independent Living Award' from Breakthrough UK Ltd for 'Public Sector Engagement'.

5.3.11 The effectiveness of the approach used for the Phase 3 Metrolink programme has been reflected in the wider use of the Disability Design Reference Group

6 Impacts on Travel Patterns

6.1 What travel patterns are being fulfilled using the new extensions in the early period of their operation?

6.1.1 As this is a one-year-after report, this section reports the findings of passenger surveys carried out at an early stage of the build-up of demand for the new lines. The fact that the lines are some way off reaching maturity needs to be borne in mind when considering the findings presented here. The results in relation to the question considered here provide an understanding of the nature of the impacts to date of the system's expansion.

6.1.2 The surveys of passengers making use of new lines were carried out in May 2014. These were conducted on Tuesdays, Wednesdays and Thursdays outside of bank and school holiday periods, between 0630 and 1900. To avoid surveying passengers twice about the same journey, the surveys were handed out to passengers travelling inbound towards the city centre.

6.1.3 At the same time as surveys were handed out, counts of boarding and alighting passengers were carried out. These enable the survey findings to be expanded. 28,600 passenger boarding trams in the direction of the city centre were counted, 15,080 accepted a self-completion survey at the Metrolink stop and 2,914 surveys forms with a reasonable degree of completion were returned. The number of completed forms represents 7.7% of passengers counted, or 14.5% of passengers handed a form.

6.1.4 As well as the three new lines open in May 2014, the Altrincham line was also surveyed. Data from this line provides the opportunity to compare and contrast the evidence from newly-opened lines with that from a more mature line.

6.1.5 In the following tables, results are reported in order of approximate opening date of the individual lines, i.e. after Altrincham, results are reported for the East Didsbury line (opened as far as St Werburgh's Road in 2011), Oldham and Rochdale Line (opened as far as Oldham Mumps in 2012), and the Ashton Line (opened as far as Droylsden in 2013). Sample sizes by line are also noted.

6.1.6 The analysis shown in Table 6.1 gives an indication of the age bands of Metrolink passengers. The tendency of older age groups to be over-represented in self-completion surveys and younger age groups, particularly children in this case, to be under-represented should,

however, be borne in mind. This is counteracted to some degree by the expansion by time period process, based on count data. Notable within these findings is the variation across lines in the proportion of over 60s.

Table 6.1: Age Profile

Line	Under 16	16 to 19	20 to 26	27 to 59	60 or Over	Total	Sample Size
Altrincham	0.4%	3.3%	11.0%	56.9%	28.3%	100.0%	904
East Didsbury	0.8%	1.1%	13.3%	61.1%	23.8%	100.0%	584
Oldham & Rochdale	1.8%	6.9%	12.7%	48.9%	29.6%	100.0%	438
Ashton	0.8%	1.4%	15.3%	46.0%	36.5%	100.0%	244
New Lines	1.3%	3.8%	13.4%	52.6%	29.0%	100.0%	1,267
All Surveyed	0.9%	3.6%	12.3%	54.6%	28.7%	100.0%	2,171

6.1.7 In terms of Census 2011 age profiles of the newly-served corridors, the Ashton Line has a greater proportion of over-60s (18.0% of the population within 800m of the line's stops), compared to the Oldham and Rochdale Line (16.3%) and the East Didsbury Line (14.1%). These differences in catchment populations by age group appear to be echoed in the differences in Table 6.1.

6.1.8 The gender split illustrated in Table 6.2 appears fairly uniform across lines, with the exception of the Ashton Line, where a higher proportion of female passengers is apparent. This is likely to be related to the older age profile on the line.

Table 6.2: Gender Split

Line	Female	Male	Total	Sample Size
Altrincham	52.7%	47.3%	100.0%	792
East Didsbury	51.4%	48.6%	100.0%	506
Oldham & Rochdale	51.6%	48.4%	100.0%	376
Ashton	59.2%	40.8%	100.0%	214
New Lines	53.1%	46.9%	100.0%	1,096
All Surveyed	52.9%	47.1%	100.0%	1,888

6.1.9 The variation in journey purpose noted in Table 6.3 reflects the diverse nature of the lines.

Table 6.3: Journey Purpose

Line	Comm-ute	Employer's Business	Education	Shopping	Leisure & Other	Total	Sample Size
Altrincham	56.9%	3.1%	3.4%	9.1%	27.5%	100.0%	918
East Didsbury	58.3%	0.8%	1.3%	7.9%	31.6%	100.0%	590
Oldham & Rochdale	44.6%	2.3%	7.9%	18.6%	26.6%	100.0%	440
Ashton	53.2%	2.2%	3.2%	21.4%	20.0%	100.0%	246
New Lines	51.2%	1.7%	4.7%	15.4%	27.0%	100.0%	1,276
Lines Surveyed	53.9%	2.4%	4.0%	12.5%	27.3%	100.0%	2,194

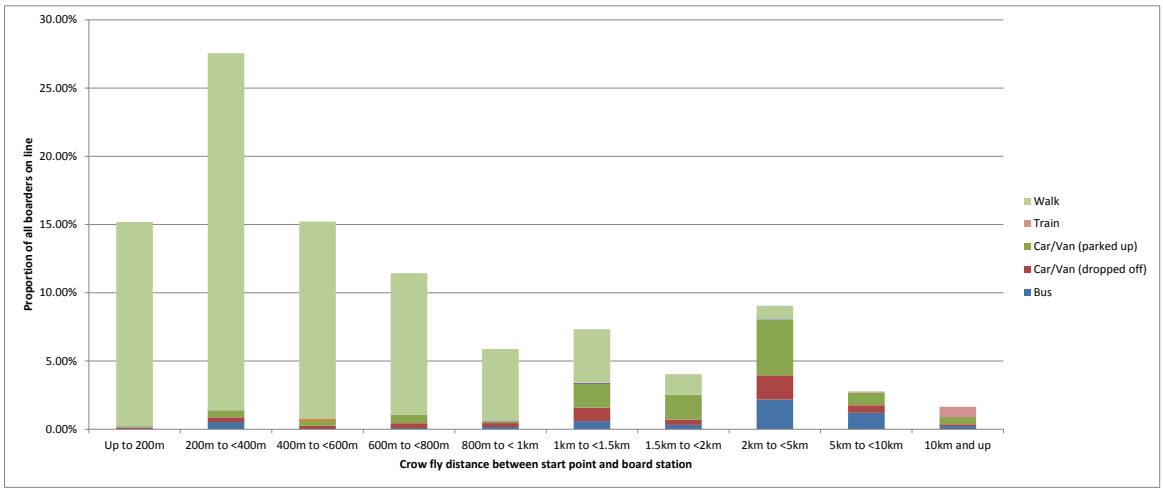
6.1.10 Table 6.4 highlights that walk is the dominant access mode for all lines, followed by car (as driver) and car (as passenger).

Table 6.4: Means of Access to the Metrolink Network

Line	Walk	Car/Van - Parked	Car/Van - Dropped Off	Bus	Train	Cycle	Taxi	Other	Total	Sample Size
Altrincham	77.3%	9.2%	6.4%	4.5%	1.5%	0.5%	0.6%	0.0%	100.0%	917
East Didsbury	83.0%	11.6%	3.2%	1.6%	0.1%	0.3%	0.0%	0.3%	100.0%	590
Oldham & Rochdale	69.4%	12.8%	7.8%	7.9%	1.7%	0.1%	0.3%	0.0%	100.0%	440
Ashton	85.8%	5.1%	3.0%	6.0%	0.0%	0.0%	0.0%	0.0%	100.0%	246
New Lines	77.5%	10.8%	5.2%	5.3%	0.8%	0.2%	0.1%	0.1%	100.0%	1,276
Lines Surveyed	77.4%	10.1%	5.8%	4.9%	1.1%	0.3%	0.3%	0.1%	100.0%	2,193

6.1.11 The distribution of access modes by straight line distance from the starting Metrolink stop is shown in Figure 6.1, for the new lines taken together.

Figure 6.1: Share of Access Mode by Distance from Metrolink Stop



6.1.12 Note that some access modes that are shown in Table 6.4 do not appear in Figure 6.1 due to the limited share they make up when disaggregated by distance band.

6.1.13 This chart reiterates that walk is the dominant access mode, up to 1.5 km straight-line distance from the stop.

6.1.14 Table 6.5 reports the proportion of Metrolink users within a 1km straight-line distance from the stop they start their journey at. This shows a fairly uniform concentration of catchments around stops, with the mature line, Altrincham, having a broader catchment.

Table 6.5: Proportion of Users within a 1km Catchment of Lines

Line	Proportion	Sample Size
Altrincham	67.6%	918
East Didsbury	78.9%	590
Oldham & Rochdale	69.9%	440
Ashton	80.4%	246
New Lines	75.2%	1,276
All Surveyed	71.6%	2,194

6.1.15 The proportion of concessionary pass or ticket travel shown in Table 6.6 is a reflection of the age profile shown earlier in this section, with the Ashton Line having a high proportion of concessions. The table also shows an encouraging share of season ticket usage on the new lines.

Table 6.6: Ticket Type Used

Line	Single	Return	Day Ticket	Season Ticket	Concess-ionary Pass/ Ticket	Total	Sample size
Altrincham	10.7%	21.2%	3.1%	37.2%	27.8%	100.0%	718
East Didsbury	15.0%	24.2%	3.3%	34.2%	23.3%	100.0%	586
Oldham & Rochdale	9.5%	25.4%	6.3%	25.3%	33.5%	100.0%	430
Ashton	8.7%	20.1%	1.7%	32.0%	37.5%	100.0%	246
New Lines	11.3%	23.9%	4.3%	29.8%	30.7%	100.0%	1,263
Lines Surveyed	11.0%	22.6%	3.8%	33.3%	29.4%	100.0%	1,981

6.1.16 Table 6.7 shows the part of the network that users of different lines alight at. As expected, the city zone dominates passenger destinations. The cells shaded grey in the table highlight intra-line movements, which are particularly strong on the Oldham and Rochdale Line due to the length of the line and the wide range of destinations served.

Table 6.7: Use of the Metrolink Network

Line	City Zone/ Cornbrook	Altrincham	Bury	Eccles	East Didsbury	Oldham & Rochdale	Ashton	Total	Sample Size
Altrincham	65.9%	17.9%	8.5%	4.4%	1.1%	1.6%	0.6%	100.0%	918
East Didsbury	72.8%	5.1%	4.0%	8.9%	5.6%	3.1%	0.5%	100.0%	590
Oldham & Rochdale	51.4%	3.0%	2.0%	2.3%	0.7%	39.7%	1.0%	100.0%	440
Ashton	58.0%	7.5%	6.0%	5.9%	2.4%	0.9%	19.2%	100.0%	246
New Lines	60.3%	4.7%	3.5%	5.3%	2.8%	18.9%	4.5%	100.0%	1,276
All Surveyed	62.9%	10.9%	5.9%	4.9%	2.0%	10.8%	2.7%	100.0%	3,470

6.1.17 The frequency of use distribution in Table 6.8 appears fairly uniform across lines. Notable for all lines, including the well-established Altrincham line, is the significant proportion of 'First time' users, indicating a fairly high level of churn in the travel market served by Metrolink.

Table 6.8: Frequency of Use of Metrolink

Line	5+ times a week	3-4 times a week	1-2 times a week	More than once a month	Less often	First time	Total	Sample size
Altrincham	40.6%	14.0%	15.3%	13.4%	11.3%	5.4%	100.0%	914
East Didsbury	36.2%	12.9%	18.4%	15.9%	8.5%	8.0%	100.0%	589
Oldham & Rochdale	40.9%	13.6%	22.1%	12.3%	6.2%	5.0%	100.0%	438
Ashton	46.1%	13.7%	14.0%	12.0%	10.1%	4.1%	100.0%	246
New Lines	40.3%	13.4%	19.2%	13.5%	7.8%	5.8%	100.0%	1,272
Grand total	40.5%	13.7%	17.3%	13.5%	9.4%	5.6%	100.0%	3,459

Note: question was "How often do you make this trip?"

6.1.18 Walk dominates the means of onward travel (egress) from Metrolink, as shown in Table 6.9. Public transport egress, by bus and train, is also significant.

Table 6.9: Means of Onward Travel from the Metrolink Network

Line	Walk	Car/Van - Parked	Car/Van - Lift	Bus	Train	Cycle	Taxi	Metro-shuttle	Other	Total	Sample Size
Altrincham	82.8%	1.3%	0.3%	6.6%	8.2%	0.2%	0.1%	0.5%	0.0%	100.0%	916
East Didsbury	88.4%	0.2%	0.7%	3.6%	5.8%	0.1%	0.2%	0.3%	0.7%	100.0%	366
Oldham & Rochdale	88.6%	0.0%	2.6%	4.4%	2.7%	0.1%	0.1%	0.9%	0.6%	100.0%	462
Ashton	81.5%	0.4%	1.7%	8.3%	4.4%	0.0%	0.0%	3.1%	0.6%	100.0%	209
New lines	87.1%	0.2%	1.8%	4.9%	4.1%	0.1%	0.1%	1.1%	0.7%	100.0%	1,037
All surveyed	85.1%	0.7%	1.1%	5.7%	6.0%	0.2%	0.1%	0.8%	0.3%	100.0%	1,953

6.1.19 Household car ownership among passengers, as shown in Table 6.10, does not provide a direct indication of modal shift. The fact that Metrolink appears to appeal to a wider range of household car owning and non-car owning situations, however, does highlight the attractiveness of the service to households with different travel options.

Table 6.10: Household Car Ownership of Users

Line	None	One	Two or More	Total	Sample Size
Altrincham	20.4%	49.2%	30.4%	100.0%	886
East Didsbury	21.2%	55.2%	23.5%	100.0%	573
Oldham & Rochdale	33.0%	46.8%	20.1%	100.0%	408
Ashton	39.8%	48.7%	11.4%	100.0%	231
New Lines	30.1%	50.3%	19.6%	100.0%	1,212
Lines Surveyed	25.5%	49.8%	24.7%	100.0%	2,098

6.1.20 According to Census 2011 figures, the proportion of households not owning a car or van is relatively low within an 800m catchment of the Altrincham and East Didsbury Lines, at 23% and 26% respectively. The situation differs for the Oldham and Rochdale Line and the Ashton Line, both with approximately 43% of households not owning a car or van. These figures are echoed in Table 6.10.

6.1.21 Passengers were also asked whether a car or van was available for use on the journey actually being made. Table 6.11 shows that approximately half of users reported that a car or van was available, with lower figures for the lower car ownership corridors (Oldham and Rochdale, and Ashton).

Table 6.11: Availability of a Car or Van for the Journey Being Made

Line	Car Available	No Car Available	Total	Sample Size
Altrincham	54.5%	45.5%	100.0%	892
East Didsbury	56.0%	44.0%	100.0%	577
Oldham & Rochdale	44.0%	56.0%	100.0%	413
Ashton	35.7%	64.3%	100.0%	243
New Lines	46.5%	53.5%	100.0%	1,234
Grand Total	50.3%	49.7%	100.0%	2,126

Notes: question wording was “Was a car/ van available for you to use for this journey?”; All passengers were asked to answer this question, even if they indicated that they had no car or van in their household.

6.2 What forms of transport would Metrolink passengers have used otherwise?

6.2.1 The behavioural response to Metrolink’s expansion is an important factor in understanding the full range of impacts brought about by Phase 3. A question on what passengers would do in the absence of Metrolink was therefore introduced into the surveys discussed in the last section in order to develop an understanding of behavioural responses.

6.2.2 Table 6.12 reports the responses to the survey question.

Table 6.12: Stated Response if Metrolink was Not Available

Line	Travelled by Alternative Means					Other Travel Behaviour		Total	Sample Size
	Bus	Car - as Driver	Car - as Passenger	Train	Walk/ Cycle/ Other	Travelled elsewhere	Not made journey		
Altrincham	42.3%	31.3%	6.2%	9.3%	0.3%	3.1%	7.5%	100.0%	832
East Didsbury	59.9%	24.8%	3.8%	7.1%	0.6%	0.4%	3.5%	100.0%	550
Oldham & Rochdale	59.1%	20.5%	7.6%	5.3%	0.2%	2.5%	4.8%	100.0%	412
Ashton	69.1%	12.8%	3.7%	7.2%	0.6%	2.1%	4.6%	100.0%	227
New Lines	61.4%	20.5%	5.5%	6.3%	0.4%	1.7%	4.3%	100.0%	1,188
All Surveyed	52.6%	25.5%	5.8%	7.7%	0.3%	2.3%	5.8%	100.0%	2,020

Note: Question wording was "If Metrolink was not available for the journey you were making today, what would you have done instead?"

6.2.3 While this question seeks to understand behaviour in the without-situation in the medium to long term, this is challenging to convey and survey respondents may have difficulty in interpreting the question and thinking through how they would respond. Therefore, the findings from this question should be treated with caution.

6.2.4 In particular, it is likely to be the case that some of the easier to contemplate immediate alternatives are overstated – specifically, travel by bus or train. In reality over the longer term, the absence of Metrolink would have lead households to revisit their car use decisions, home and work location decisions etc.

6.2.5 Another consideration is that some of the lines have opened relatively recently. In general, those adapting their behaviour early on in the lifetime of a scheme would be expected to be public transport users of other modes. This is another reason why the statistics contained in Table 6.12 are unlikely to reflect the long-term alternative options of Metrolink users, and may understate the degree of abstraction from car. The scale of change over the medium/ long term is likely to be greater.

6.3 How have travel patterns in different communities been affected by the introduction of Metrolink?

6.3.1 In order to explore travel pattern impacts in communities newly-served by Metrolink, TfGM's programme of household travel diaries was boosted in the catchment area of four Metrolink stops. Households were selected at random for inclusion in the survey, from among all residential addresses within the catchment of the stop in question.

6.3.2 One-day travel diaries were administered prior to the introduction of Metrolink and once Metrolink services had been running for at least a year. These were carried out among all members of some 135 households in the following four areas:

- Chorlton – on the East Didsbury Line;
- Failsworth and Shaw – on the Oldham and Rochdale Line; and
- Droylsden – on the Ashton Line.

6.3.3 The results of these surveys are summarised in Table 6.13. In this table, findings from the 'before' and 'after' travel diaries are expressed as the mode share of all trips made.

Table 6.13: Findings from Travel Diary Surveys

Main mode	Prior to Metrolink's Introduction					After Metrolink's Introduction				
	Chorlton	**Droylsden**	**Failsworth**	**Shaw**	**All areas**	**Chorlton**	**Droylsden**	**Failsworth**	**Shaw**	**All areas**
Car driver	34%	33%	37%	42%	36%	34%	32%	32%	33%	33%
Car passenger	8%	19%	17%	15%	15%	14%	21%	15%	20%	17%
Walk	41%	31%	32%	25%	33%	38%	31%	33%	32%	34%
Bus	8%	13%	11%	15%	12%	6%	10%	11%	9%	8%
Metrolink	1%	0%	0%	0%	0%	4%	4%	4%	4%	4%
Cycle	6%	0%	1%	0%	2%	3%	0%	2%	0%	1%
Other	1%	3%	3%	3%	3%	1%	2%	3%	2%	2%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
People surveyed	*270*	*354*	*303*	*245*	*1,172*	*396*	*364*	*338*	*325*	*1,423*

Note: 'Car' refers to car and van travel; 'Bus' also includes minibus and coach travel; some Metrolink travel is identified in the 'before' situation, which relates to travel on the pre-expanded network.

6.3.4 When considering the findings from the travel diary surveys it is important to bear in mind the fairly small sample sizes. Furthermore, the surveys were carried out at a fairly early stage of Metrolink's operation in the different areas. Bearing the small sample sizes in mind, the observations that may be drawn from the evidence presented are that:

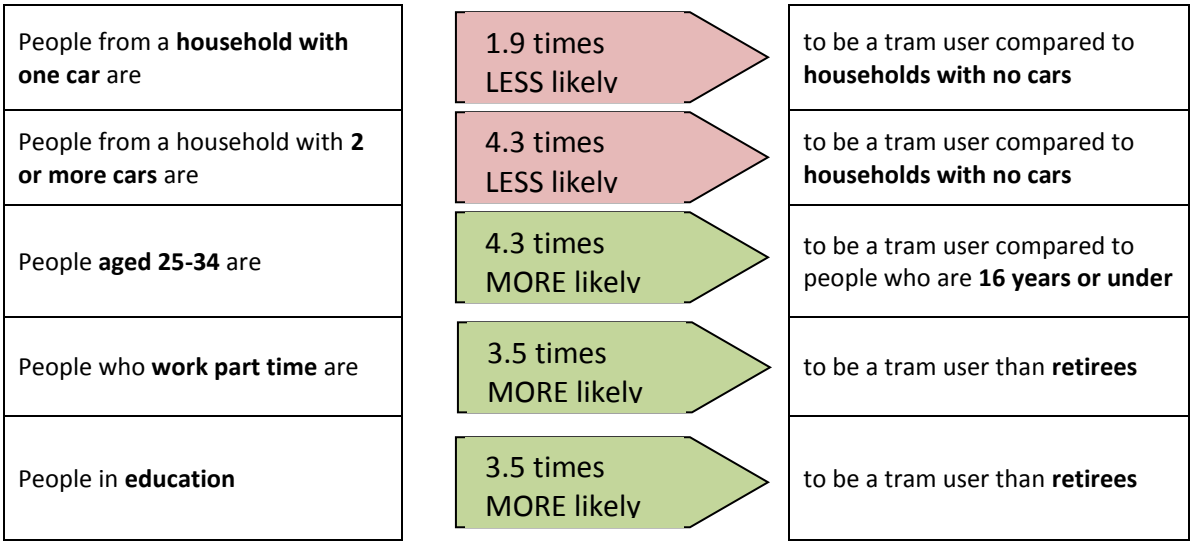
- Metrolink appears to have a consistent mode share of overall trips across the four areas surveyed, of approximately 4%; and
- potential sources of Metrolink travel may have been drawn from bus and from car (driver) travel, although there is some indication that car (passenger) travel has diminished.

6.3.5 Further exploratory research was carried out using the 'before' and 'after' travel diary datasets by AECOM. This took the form of logistic regression modelling and segmentation analysis. The logistic regression modelling examined the strength of the relationship between the likelihood of making a tram trip and factors such as gender, income, age, socio-economic group, ACORN neighbourhood classification, whether a concessionary pass was held, the number of cars in the household and working status.

6.3.6 Again, it should be emphasised that sample sizes are limited, with 57 households having 69 individuals using Metrolink across the four areas surveyed.

6.3.7 Figure 6.2 summarises some of the relationships found in the data (at the 5% level of significance).

Figure 6.2: Regression Modelling Results



6.3.8 Other, more tentative findings (at the 12% level of significance) are that:

- people aged between 17 and 24 are 2.5 times more likely to be a tram user than those who are 16 years or under;
- people who work full time are 2.6 times more likely to be a tram user than retired people; and
- people who hold a concessionary pass are 2.4 times more likely to be a tram user than those who do not.

6.3.9 The segmentation analysis took the form of cross tabulations of households using Metrolink with other household characteristics. In the following tables, some Metrolink data is contained in the 'before' data that relates to the pre-Phase 3 network.

6.3.10 As Table 6.14 indicates, there is a small difference in tram use between the survey years according to whether or not a household had a car.

Table 6.14: Tram Use by Car Ownership

	Household with car		**Household without car**	
	Before	**After**	**Before**	**After**
Households using tram	1%	9%	0%	11%

6.3.11 There was little difference between whether households had children or not in terms of whether they used the tram (Table 6.15).

Table 6.15: Tram Use by Children in Household

	Household without children		**Household with children**	
	Before	**After**	**Before**	**After**
Households using tram	0%	10%	1%	11%

6.3.12 There were increases in tram use by households from all ACORN groups, with Table 6.16 recording that the most notable increase was amongst the group labelled 'Urban prosperity'.

Table 6.16: Tram Use by ACORN Group

	Wealthy Achievers		**Urban Prosperity**		**Comfortably off**		**Moderate means**		**Hard pressed**	
	Before	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**
Households using tram	0%	9%	1%	15%	1%	11%	0%	7%	0%	8%

6.3.13 Table 6.17 shows that Metrolink use has increased more in households with fewer cars than adults, relative to households with at least as many cars as adults.

Table 6.17: Tram use by cars per adult

	Adults have at least one car		**More adults than cars**	
	Before	**After**	**Before**	**After**
Households using tram	0%	6%	1%	11%

6.3.14 In order to understand the nature of the impacts of Metrolink on people's lives in the four communities studied, qualitative research among a mix of passengers was commissioned from AECOM. This took the form of in-depth research at Metrolink stops in the four areas. The types of impact that were examined were for:

- someone who changed mode of travel to work: in same job as pre-Metrolink but now uses the tram to make this journey, could have made this trip previously by car or bus (6 individuals interviewed);
- someone who has got a job since the introduction of the tram: ideally someone who has got the job because of the introduction of Metrolink (6 individuals);
- someone for whom the tram has had a positive impact: for example, generally made it easier to travel around, get to places they want to go – broadened travel horizons (12 individuals); and,
- someone who has moved to the area because of the tram or who lived in the area and has moved house, but specifically chose that house because of its easy access to the tram (4 individuals).

6.3.15 In general, respondents who had changed their mode of travel for work as a result of the introduction of Metrolink had previously travelled by bus. One respondent had previously car shared and one had driven. Feedback from these tram users was:

- "I used to get the bus a lot but they are not reliable" (Failsworth)
- "I used to work near where I work now and I used to get the bus. I find it much easier to get the tram now. I don't drive so I need to use public transport" (Chorlton)

- "Used to car share with colleagues, but tram has meant that is not necessary anymore and is much more flexible. Allows flexibility to my working day that I didn't have before" (Shaw)

6.3.16 Several of those respondents who had changed their mode of travel to work and used the Metrolink stated their car usage had decreased substantially as a result, with one respondent now having got rid of their car completely:

- "I still have my car but use it rarely" (Droylsden)
- "I used to drive into work, but now I get the tram every day. I don't even have my car now. The tram is cheaper than the overall cost of running a car. I'd say the tram is as easy as driving to work" (Chorlton)

6.3.17 Respondents also noted the impact the introduction of Metrolink had had on other aspects of their life

- "My brother lives in Germany so he can just get on the train at the airport and get off at Chorlton. It's so easy and clear. I also have friends in Rochdale which I would now go and visit on the tram whereas before I would not have felt like I could get to them by public transport" (Chorlton)

6.3.18 Respondents who had changed their job as a result of Metrolink being introduced felt their journey to work was now more convenient:

- "It is a lot easier than getting the bus with my new job at the airport" (Chorlton)

6.3.19 However one respondent did note that although they had changed jobs with the intention that they could travel by Metrolink (as opposed to the train) as this would make it easier for them, now found it less convenient and so had bought a car and were subsequently planning to drive to work:

- "It's slower than the train used to be, takes 10 minutes extra. I used to get the train to Manchester Oxford Road and then walk [to university where was previously a student]…Now I work at the University and used train previously but now use the tram as it's the only realistic choice" (Shaw)

6.3.20 Respondents who felt Metrolink had broadened their travel horizons stated a wide variety of reasons for this:

- "The tram is easy to navigate with the pram as they're very spacious when they're not busy" (Droylsden)
- "I find it very easy if I miss a tram because I walk too slowly, the next isn't far behind" (Droylsden)
- "No car, walk everywhere. It's a pleasant walk down into town and not too bad going back. Much more preferable to waiting for a bus" (Shaw)

6.3.21 Two respondents interviewed in Droylsden also had disabilities which affected their capacity to travel and noted that the introduction of Metrolink had helped to improve their mobility, for example:

- "Generally use it during the off-peak to avoid crowds as I'm disabled…good to get to the train stations or airport" (Droylsden)

6.3.22 For some, the fact they were unable to drive or did not have access to a car meant Metrolink had now become a key mode of transport in their daily life:

- "I can't drive so I always get the tram/ bus" (Droylsden)

6.3.23 Overall, the majority now preferred to use the tram as opposed to any other mode of public transport:

- "I always use the tram whenever possible, even if it means paying for it [respondent had a free travel pass and was referring to usage before 9.30am]" (Shaw)
- "I still have my car but use it for weekends only" (Droylsden)

6.3.24 For respondents who had moved house or moved into the area as a result of Metrolink there were very positive perceptions towards the tram compared to other modes of public transport:

- "I'm partially sighted so driving is a bit of an issue…I have some trouble reading bus numbers, so I have ended up on the wrong bus occasionally…not much would sway me from using the tram. The service is too good! I moved to the area in order to be closer to the tram stop, so it's really helped my daily mobility" (Droylsden)

6.3.25 The access to Greater Manchester which the tram now gave them was perceived as a benefit, both workwise and socially:

- "It [the train] does not have as many stops as the Metrolink; I can get to more places since the tram was introduced in the area" (Failsworth)
- "Always used Metro since getting this job 6 months ago…I lived in Manchester and moved to Oldham because tram made it possible to get to work" (Shaw)

6.3.26 In summary, the travel diary analysis has indicated that Metrolink usage in the catchment area of the four stops studied has reached some 4% of total trips made, with tram usage drawn from bus and car. Further analysis demonstrated how the propensity to use Metrolink varies by household and person type, with qualitative evidence shedding some light on how Metrolink has affected people's lives in the study areas.

7 Effectiveness of Provision

7.1 How does patronage compare with forecast levels?

7.1.1 Patronage in this early stage of the operation of the extensions is an important indicator of progress towards achieving scheme objectives. For this reason, the question this section addresses has been included in monitoring and evaluation activity carried out at this early stage.

7.1.2 To set the scene, Greater Manchester now has the largest light rail system in the United Kingdom in patronage terms with 31.2 million passengers carried in 2014/15[6]. Anticipated further growth will take this figure up to 33.5 million for 2015 as a whole[7]. In recent years, Metrolink patronage growth has outpaced that of national heavy rail growth, e.g. by an additional figure of over 5% a year in the period 2010/11 to 2014/15[8].

7.1.3 In relation to past performance of the heavy rail line converted to the Oldham and Rochdale Metrolink line, patronage exceeded the last year of heavy rail patronage in the first year of the tram extension's operation. Furthermore, by 2014/15, use of the Oldham and Rochdale Metrolink Line had more than tripled in relation to the last full year of heavy rail operation of the Oldham Loop (Section 8.1 of this report provides further evidence on this).

7.1.4 A range of issues is assessed in the remainder of this section in relation to patronage levels. In general, the aim has been to quantify the impact of these issues on Phase 3 patronage. Some factors affecting patronage have not been fully quantified due to the number of aspects involved. An example of this is the major re-modelling of Manchester Victoria station. This required single line operation of Metrolink through a section from Victoria to Shudehill. Journey times were affected, the limited capacity also resulted in greater journey time variability and perceptions that potential users may have had about the degree to which Metrolink was 'open for business' in relation to routes passing through Victoria may also have been affected.

7.1.5 Another example of a factor that has not been quantified, but nonetheless has affected patronage, has arisen due to the network capacity constraints brought about by the closure of Metrolink route

[6] Source: DfT light rail statistics for Manchester Metrolink; TfL website for next closest London Tram, at 31 million for 2014/15.
[7] In the year to end-October 2015 the figure stood at 33 million.
[8] In comparison to ORR figures on total entries and exits for rail stations in Britain.

through St Peter's Square in Summer 2015 and the single line running through St Peter's Square in the remainder of 2015 and into 2016. While this report focuses on the 2014/15 patronage position, the restriction on capacity that these changes have resulted in has prevented extensive marketing campaigns for Phase 3 lines being carried out in the run up to this period of constraint.

7.1.6 In order to provide more context for the patronage comparison, two sets of factors have been examined. These reflect factors that are largely internal to Metrolink and those that relate to the external operating environment.

7.1.7 Section 3.1 has highlighted a number of variations in Metrolink Phase 3 service provision that are likely to have impacted on outturn patronage at this stage. To recap, the main internal aspects impacting on delayed patronage build-up vs. business case assumptions relate to:

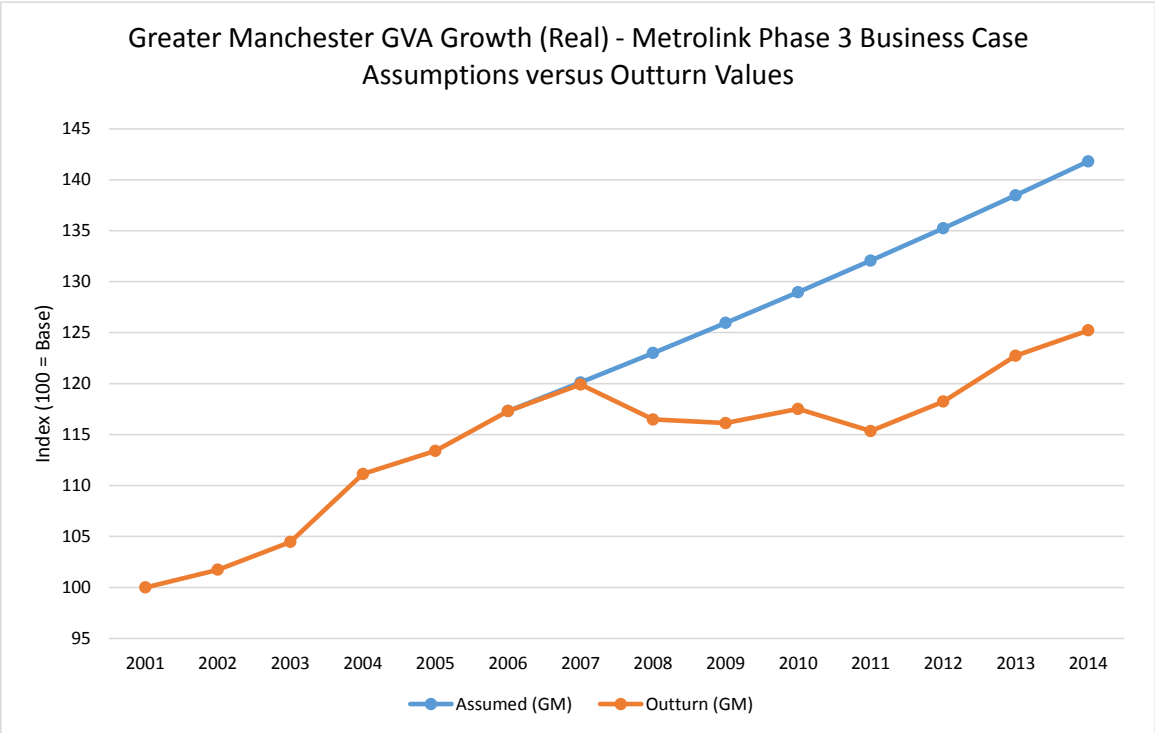
- frequency – which will be increased as the Second City Crossing becomes operational in 2017 and as demand requires; and,
- run times – reducing run times is the focus of ongoing attention and this attention will be ramped up as the network shifts to a 'steady state' on completion of the Second City Crossing.

7.1.8 Factors that were examined in respect of external influences included:

- the economy in general – to quantify the impact of suppression of GVA growth in Greater Manchester in recent years (the business cases were prepared from 2006 onwards);
- employment - relating to employment growth, specifically in Manchester city centre; and,
- major developments that have not being realised to date – this is specific to east Manchester and the Ashton Line and relates largely to the super casino that was cancelled due to a change in government policy (although other developments have occurred in the area in question, but the net impact appears to have reduced Metrolink patronage).

7.1.9 Figure 7.1 gives an example of the deviation a key factor from the figures assumed in the business cases, in this case real GVA for Greater Manchester.

Figure 7.1: Deviation of outturn GVA from assumed path



7.1.10 Table 7.1 presents the results of the calculations of explanations for the variation between Phase 3 actual patronage and the expected position in 2014/15. It should be noted that the demand figures for the Airport Line relate to a partial year of operation, from November 2014 to March 2015. While the figures have been factored up to represent a full year's demand, it should be emphasised that Airport Line figures only provide a very early snapshot of performance.

Table 7.1: Explanatory Demand Factors (millions of passengers p.a.)

Component	Oldham & Rochdale Line	Ashton Line	East Didsbury Line	Airport Line	Total
Actual Annual Demand	**3.60**	**2.05**	**3.43**	**1.49**	**10.58**
Future frequency increase	0.92	0.53	0.88	0.76	3.09
Potential run time reduction	0.62	0.18	0.49	0.16	1.46
Fares	0.07	0.04	0.07	0.03	0.22
Park and Ride	0.00	0.35	0.00	0.00	0.35
Economy	0.66	0.37	0.62	0.27	1.92
Employment	0.26	0.15	0.25	0.11	0.77
Developments	0.00	0.45	0.00	0.00	0.45
Under investigation	1.99	0.99	(0.48)	0.76	3.26
Expected Demand	**8.13**	**5.11**	**5.26**	**3.59**	**22.10**
Actual/ Expected	**44%**	**40%**	**65%**	**42%**	**48%**

Notes: 'Actual annual demand' is the calculation of trips from ticket issue data and from survey data relating to free concessionary travel; 'Expected Demand' is taken from the scheme business case forecasts – as the forecasts relate to 2016 or 2021 they are post build-up period, so the build-up after 2014/15 is removed from these figures, background growth is also removed to get a 2014/15 picture; 'Fares' takes account of Metrolink fares having risen slightly ahead of bus fares, thus dampening demand to a limited extent; 'Park and ride, Ashton Line' reflects the difference between forecasts based on a high level of occupancy of the spaces provided and actual demand making use of the two car parks at Ashton Moss and Ashton West; for the Airport Line, the figure for 'Future frequency increase' also includes other service level increase-related patronage, specifically that related to extension of the current service to run to Victoria.

7.1.11 Table 7.1 includes an 'Under investigation' category. This aspect is the subject of further research. The focus of this research will be to understand its constituent elements and then break the figures down in quantitative terms.

7.1.12 Issues to be covered in this further analysis will include:

- the use at the business case stage of generic, i.e. Greater Manchester-wide transport modelling assumptions. The issue here is that generic modelling assumptions may not account in full for issues such as the variations in passenger behaviour on differing corridors in Greater Manchester. These variations may relate to issues such as relative income or deprivation across corridors;

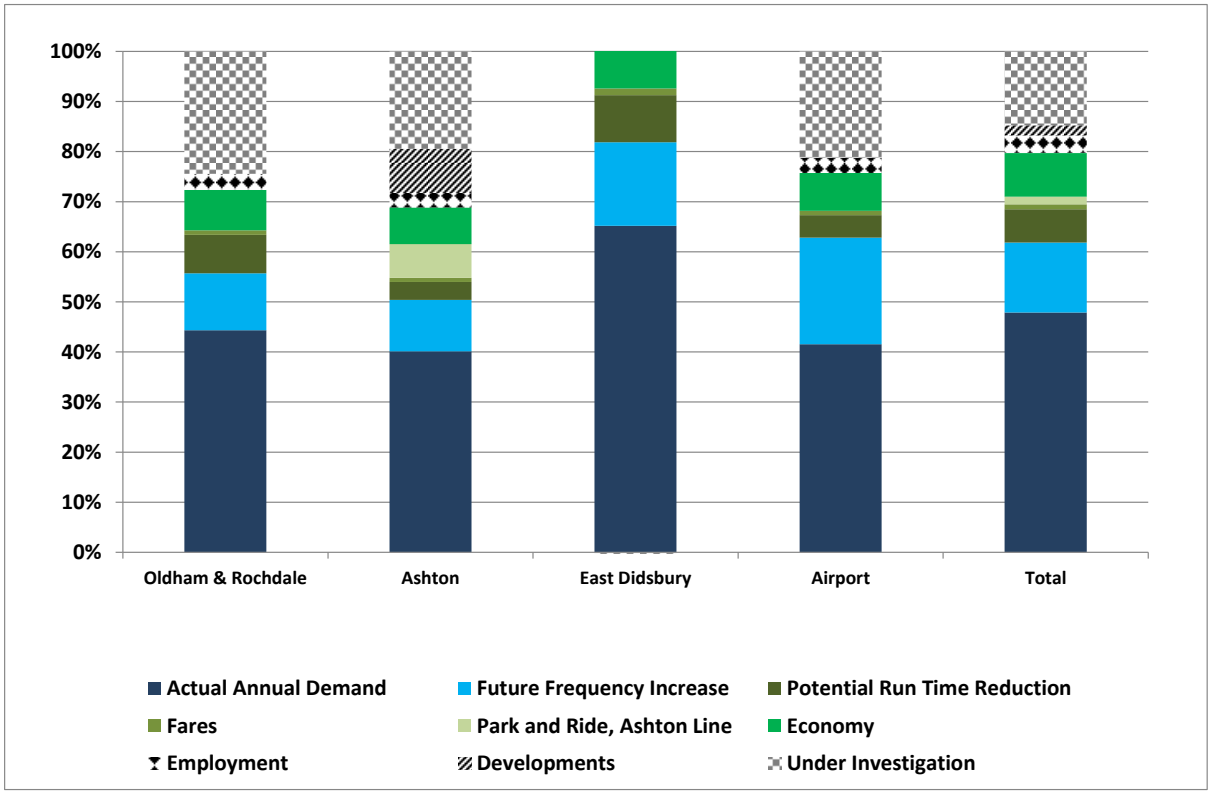
- variation in input assumptions across corridors, e.g. common bus fares were input without any variation to account for the dominant operators present in the different corridors, and hence variations in the competitive environment that Metrolink faces;

- variations in economic performance across corridors relative to the Greater Manchester average. Issues here include relative GVA growth and employment changes. Variations in economic performance across key locations newly served by Metrolink, such as the town centres on different routes, relative to the Greater Manchester average may also be a further explanatory factor;

- issues relating to possessions of the network in recent years, typically at weekends, required as part of the process of expanding the Metrolink system.

7.1.13 Figure 7.2 charts the data presented in Table 7.1, with 100% representing the expected patronage situation for 2014/15.

Figure 7.2: Explanatory factors that make up expected patronage



7.1.14 In overall terms, the internal (to Metrolink) and external explanatory factors explain the bulk of the difference between actual annual demand and budget forecast figures at this early stage.

7.1.15 Plans to accelerate patronage growth on the Phase 3 extensions, and in some cases for the network as a whole, in the near term and medium term include:

- frequency increases for services running on Phase 3 routes following the staged completion of the Second City Crossing and as demand requires (discussed further in Section 3.1);
- extension of the Airport Line service through the city centre to Victoria, again on completion of the Second City Crossing; and,
- run time reductions on Phase 3 lines, as the overall system enters a 'steady state' and focus can be applied to optimising run time performance (again, Section 3.1 discusses this issue); and,
- targeted marketing activity to highlight the benefits of travelling by Metrolink, particularly relative to travel by car.

7.1.16 Further activity to encourage additional patronage growth in the near to medium term relates to supporting economic growth in the corridors and across Greater Manchester in a number of ways. These include:

- high density residential and commercial development;
- boosts to economic activity across Greater Manchester as a result of initiatives that form part of the devolution agenda; and,
- increases in economic activity resulting from initiatives to strengthen the economy of the north of England.

7.1.17 Patronage growth will continue to be closely monitored as the network evolves and economic performance picks up pace. Further progress will be reported on in the 5-years-after monitoring and evaluation report.

7.2 Has park and ride provision been effective in securing reductions in car mileage?

7.2.1 A feature of the expanded system is the extent of provision for passengers accessing the system by car. As a key aim of park and ride provision was to reduce overall car mileage, and therefore increase Metrolink use, the effectiveness of this provision is explored in this section.

7.2.2 Forecasting and monitoring the impact of park and ride on car and public transport use is not straightforward. While park and ride leads to a reduction in people who would have travelled all the way by car, there are also other behavioural impacts to consider – such as people switching from travelling by bus all the way to driving to a Metrolink stop and then travelling by tram, or people accessing the Metrolink system by car when they previously would otherwise have reached the stop on foot.

7.2.3 The net impact on car mileage of park and ride provision is therefore a matter to be established through evidence on current and alternative travel behaviour. Evidence was collected through means of car parking counts and surveys carried out in October and November 2014 by TfGM's Service Assessment team. These were undertaken at seven Metrolink stops with significant park and ride provision[9]. Figure 7.3 shows the car parking capacity at the sites that were surveyed:

- East Didsbury – 302 spaces;
- Rochdale Railway Station – 217 spaces, rail users area also able to park here;
- Derker – 254 spaces;
- Oldham Mumps – 260 spaces;
- Hollinwood – 195 spaces;
- Ashton West – 194 spaces, joint use with leisure centre; and
- Ashton Moss – 200 spaces.

7.2.4 The car park counts were carried out on two weekdays between 0500 and 1400 and the maximum number of cars counted on each day is reported in Table 7.2.

[9] Surveys were carried out before the 300-space Sale Water Park facility came on stream with the opening of the Airport Line.

Figure 7.3: Metrolink Park and Ride Provision

Table 7.2: Car Park Usage

Car Park at Metrolink Stop	Spaces	Day 1 Count, Maximum	Day 2 Count, Maximum	Maximum Usage, Day 1	Maximum Usage, Day 2
East Didsbury	302	180	212	60%	70%
Rochdale Railway Station	217	85	98	39%	45%
Derker	254	176	172	69%	68%
Oldham Mumps	260	239	219	92%	84%
Hollinwood	195	79	83	41%	43%
Ashton West	194	17	18	9%	9%
Ashton Moss	200	74	90	37%	45%

7.2.5 The count data indicates a wide variation in the degree of usage of the different park and ride facilities, with opportunities for further marketing activity where capacity exists.

7.2.6 The surveys were administered while passengers were waiting on the platforms. After a screening question to check that the passenger had arrived by car and parked in the designated car park, passengers were asked about the journey being made (e.g. origin postcode or town/ village) and to state what they would have done had car parking not been available.

7.2.7 Of 699 full surveys that were completed across the seven locations, 536 gave the place name or postcode of where they started their journey. From this data the straight-line access distance to the stop was calculated and is reported in Table 7.3.

Table 7.3: Straight-Line Access Distance to Stop

Access Distance	Proportion
0 - 2km	32.5%
2 - 5km	44.6%
5-10km	17.7%
10-20km	2.2%
20-50km	2.4%
50km +	0.6%
All distances	100%

7.2.8 Table 7.4 reports the response to the survey question on what passengers would have done had the car park not been available. It shows a diverse range of responses by stop, and that in overall terms, “Drive all way” is the stated response of just over a quarter of all survey respondents.

Table 7.4: Travel Behaviour if Car Park not Available

Stated Alternative Behaviour	East Didsbury	Rochdale Railway Station	Derker	Oldham Mumps	Hollin-wood	Ashton West	Ashton Moss	All Stops
Bus all way	27.2%	0.0%	9.5%	7.1%	21.9%	0.0%	13.3%	15.2%
Drive all way	29.0%	14.3%	24.1%	34.7%	27.2%	10.5%	25.7%	26.6%
Go to another stop - not by car	2.5%	0.0%	3.2%	1.0%	0.0%	0.0%	8.0%	2.7%
Drive to another stop	4.9%	8.6%	46.8%	31.6%	12.3%	73.7%	25.7%	24.7%
Park elsewhere at same stop	9.9%	40.0%	6.3%	8.2%	25.4%	0.0%	1.8%	11.3%
Same stop different access mode	11.1%	37.1%	5.1%	5.1%	8.8%	5.3%	6.2%	8.9%
Travel by train from another location	9.3%	0.0%	3.2%	4.1%	1.8%	10.5%	15.0%	6.4%
Would not make trip	6.2%	0.0%	1.9%	8.2%	2.6%	0.0%	4.4%	4.1%
Sample size	162	35	158	98	114	19	113	699
Sum of max count, days 1 & 2	392	183	348	458	162	35	164	1742
Sample rate	41%	19%	45%	21%	70%	54%	69%	40%

7.2.9 These responses were used, in combination with the other journey details collected in the survey, to calculate the impact of each passenger's travel choice in terms net kilometres travelled by: car, Metrolink, rail, walk, cycle and bus. Where origin information was missing, e.g. the start town was not identified, the average in access distance for the stop at which the person was surveyed was used.

7.2.10 The results of these calculations are shown in Table 7.5. These are expressed as the annualised change in kilometres per space provided.

Table 7.5: Annualised Change in Distance per Space Provided

Alternative Travel Behaviour	Car km	Metrolink km	Cycle km	Walk km	Bus km	Rail km
Bus all way	151	593	0	-12	-586	5
Drive all way	-825	1,167	0	0	0	39
Go to another stop	29	12	0	-9	-3	-6
Park at same stop	0	0	0	0	0	0
Same stop different access mode	59	0	-10	-73	-12	-4
Train from another location	0	265	0	0	0	-318
Would not make trip	53	154	0	0	0	0
Grand Total	-533	2,191	-10	-95	-601	-284

7.2.11 The net change in car kilometres per space provided and per year by stop is shown in Table 7.6.

Table 7.6: Net Change in Car Km per Space Provided

Location	Car km change
East Didsbury	-348
Rochdale Rail Station	-315
Derker	-1,007
Oldham Mumps	-2,037
Hollinwood	-155
Ashton West	-49
Ashton Moss	-225
Overall	-533

7.2.12 In overall terms, while performance by locations varies considerably, for each location park and ride is successful in reducing car kilometres travelled.

8 Other Findings Relevant to the Evaluation

8.1 Introduction

8.1.1 This section contains findings that are additional to the evidence presented in relation to the research questions addressed in the above part of the report.

8.2 How has Usage of the Oldham and Rochdale Line changed relative to the former Heavy Rail Line?

8.2.1 A comparison has been made between the estimated number of trips on the Oldham Loop heavy rail service in its last full year of operation and recent data on the estimated number of trips carried by Metrolink on the Oldham and Rochdale Line.

8.2.2 The heavy rail service was discontinued in October 2009, so 2008/09 was the last full year of operation for which Office of Rail Regulation data on station usage was available. Data on estimated total station entries and exits were obtained for the stations between Manchester Victoria and Rochdale for the year 2008/09, i.e. not including Victoria and Rochdale. To avoid double counting of trips travelling within the Oldham Loop, trips travelling within the line were taken account of. These within-line trips were estimated at 15% of Oldham Loop trips, based on Automatic Passenger Count observations supplied by Northern Rail.

8.2.3 Based on these data sources and methods, it was estimated that 1,150,000 trips were carried on the Oldham Loop line in 2008/09.

8.2.4 Estimates of trips by Metrolink line were derived from the analysis of sales data from ticket vending machines (TVMs). The sales data was converted into trip data using factors on trips made by ticket type. The TVM-derived trips were then factored to take account of other sales of Metrolink tickets, such as season tickets with a duration of four weeks or more and multi-modal tickets sold at rail stations on buses. Further factors were applied to take account of free concessionary travel.

8.2.5 For 2014 as a whole, the results of these calculations were that 3,693,000 trips were made on the Oldham and Rochdale Metrolink Line. This represents an increase by a factor of 3.2 relative to 2008/09 use of the heavy rail service.

8.2.6 The more-than-trebling of the use of the alignment can be explained by the increase in service frequency, the longer period of service operation, the increased number of stops serving the corridor, and the better penetration of Oldham and Rochdale town centres as well as the city centre.

8.3 Impact of Proximity to Metrolink stops on House Prices in Greater Manchester

8.3.1 Nationwide has carried out statistical modelling of the relationship between house prices and proximity to railway stations or Metrolink stops in Greater Manchester[10].

8.3.2 The research examined how the proximity to a Metrolink stop or railway station impacted upon property prices in Greater Manchester after taking account of other property characteristics, such as property type, size and local neighbourhood type (ACORN type).

8.3.3 The econometric analysis made use of Nationwide's house price index dataset for Greater Manchester and focused on properties within 5km of a rail station or Metrolink stop in the county. The research did not separate out the impact of a Metrolink stop relative to a railway station.

8.3.4 The premium compared to a property located 1,500m from a stop or station was estimated at:

- 4.6% for a property located 500m from a stop or station, or £8,300 based on average prices that Nationwide determined in the area;
- 3.2% for a property located 750m from a stop or station;
- 2.0% for a property located 1,000m from a stop or station; and
- 0.9% for a property located 1,250m from a stop or station.

8.3.5 The report from Nationwide provides some detail on the approach taken:

> "The methodology correlates the price paid for a property against the set of property characteristics (including the property type, age, number of bedrooms, number of bathrooms, floor area and parking/garages), locality (local neighbourhood as described by ACORN) and distance from the nearest station. For each case in the sample, the straight line distance to the nearest station (National Rail or Manchester Metrolink) was calculated. Our research is based on the proximity to a station and does not take account of the service provision or indeed the typical travel time to central Manchester. However, Denton and Reddish South stations were excluded due to the exceptionally limited service provided. Only properties within 5km of a station were included."

[10] Tram and rail links in Greater Manchester attract premium among homebuyers, Nationwide, August 2014; http://www.nationwide.co.uk/~/media/MainSite/documents/about/house-price-index/greater-manchester-transport-special-2012.pdf - last accessed April 2015.

9 Conclusions

9.1 Early Findings from the Monitoring and Evaluation of Metrolink Phase 3

9.1.1 This report has presented the initial findings collected approximately one-year-after the last extension that the Department for Transport contributed towards was opened to the public.

9.1.2 The delivery of the infrastructure plans as envisaged has been noted, with the overall programme delivered on time and to budget. Frequency increases on Phase 3 lines are in the pipeline, once the Second City Crossing provides additional capacity in the regional centre.

9.1.3 Some of the main positive lessons learnt in relation to delivery of Phase 3, obtained through interviews of the delivery team, were that:

- the appointment of a contractor with an ability to extend services offered enabled the retention of knowledge for the benefit of efficiently delivering an expanding programme of works;
- the decision to appoint a delivery partner and create an integrated delivery team allowed for an effective mix of public and private sector resources, scaled to the phases of the programme, to be deployed;
- secondment of delivery team staff into utilities companies enabled accelerated agreement and delivery of utility diversion works;
- mirroring the structure of the contractors' team via the delivery team structure enhanced working relationships and the monitoring of progress;
- creation of a Disability Design Reference Group meant that opportunities to make the network fully accessible were exploited at all stages of design and delivery;
- development of go-live procedures to enable all necessary tasks to be completed assisted in the active management of the run-up to opening new sections; and
- development of a computer-based driver training simulator halved the time it took for drivers to become familiar with new routes.

9.1.4 Other lessons learnt observations that require further reflection were that:

- the impacts of suppressed economic growth and development activity have had a negative impact on outturn patronage performance in the initial period of operation, not anticipated at the business case stage; and
- success in securing funds for further expansion of the Metrolink network, beyond that taken account of in earlier-stage business cases, has meant that

the disruptive short-term operational impacts of further network expansion were again not anticipated in business cases prior to the Second City Crossing.

9.1.5 Significant increases in public transport capacity into the regional centre have been achieved alongside increases in door-to-door accessibility to key destinations, particularly for people living in the more deprived areas of the corridors now served by Metrolink.

9.1.6 The nature of travel needs being fulfilled in the newly-served corridors has been described, including the attractiveness of the service to both households with cars and those without cars. In tandem, an assessment has been made of progress in growing patronage on the Phase 3 corridors.

9.1.7 Recognising that many of the findings reported here are from the initial period of Metrolink's expansion, many of the issues explored will be re-visited as the system matures.

9.2 Additional Areas to be Examined in the 5-Years-On Report

9.2.1 The 5-years-on report will include all of the evidence covered in this report, suitably updated where fresh evidence is available, and augmented with evidence in relation to additional research questions. These additional research questions are set out in Table 9.1.

Table 9.1: Additional Research Questions to be Covered in the 5-Years-On Report

Area of Coverage	Research Question
Impact on the Economy	How have businesses on Metrolink corridors outside the city centre been affected?[11] How has business activity in the city centre been affected?[12]
Impacts on the Economy – *more depth*	What impact on communities in Wythenshawe has been observed?
Carbon	What impact has there been on changes in carbon emitted?
Accidents	What impact has there been on accident levels?
Delivered scheme	What difference did the scheme make to scheme outcomes, including progress towards achieving to prospective outcomes?
Outturn appraisal assumptions	Has the expansion of the system offered value for money to the extent anticipated?[13]

[11] A business impacts study has been awarded to AECOM that involves baseline, 1-year after and 3-years after survey data collection, with analysis and reporting once the full set of datasets has been completed.

[12] A scoping study has been completed by Imperial College London in relation to this work, looking at opportunities to isolate economic impacts using Government administered micro-datasets.

[13] In relation to decongestion benefits to be included in the value for money assessment, the figures in Table 6.12 (from passenger surveys) and Table 6.13 (from travel diaries) indicate that a range of sensitivities of decongestion benefits to modal switch estimates will need to be carried out.