

WANTAGE & GROVE DEMAND & APPRAISAL SUMMARY

SUMMARY NOTE

IDENTIFICATION TABLE	
Client/Project owner	SLC Rail
Project	Wantage & Grove Demand & Appraisal Summary
Title of Document	Summary Note
Type of Document	Info Note
Date	13/08/2018
Reference number	105874
Number of pages	18

TABLE OF CONTENTS

1.	INTRODUCTION	3
2.	METHODOLOGY	4
2.2	DATA SOURCES	4
2.3	ASSUMPTIONS	4
2.4	MODELLING WORK	5
3.	DEMAND FORECASTING RESULTS	8
3.2	KEY DESTINATIONS	10
3.3	REVENUE	11
4.	STATION COSTS	13
4.2	CAPITAL COSTS	13
4.3	STATION OPERATING COSTS	13
4.4	TRAIN OPERATING COSTS	13
5.	SCHEME APPRASIAL	15
5.2	SOURCES OF BENEFIT	15
5.3	SCHEME APPRAISAL	15

5.4	SENSITIVITY TESTS	16
5.5	SUMMARY	17



1. INTRODUCTION

- 1.1.1 In May 2017 SYSTRA Ltd were commissioned by SLC Rail on behalf of Oxfordshire County Council and Vale of White Horse District Council to conduct a demand forecasting and appraisal study for the development of a new station, known as Wantage & Grove, to be located adjacent to the village of Grove and close to the town of Wantage in the Vale of White Horse District of Oxfordshire. In August 2018 SYSTRA Ltd was asked to update the study to revise the opening date and update Webtag values, and this note presents the findings of the study.
- 1.1.2 The development of a station at this site would improve the accessibility to the rail network for both Grove and Wantage, which together have a population of 18,505 (2011 Census), but also the surrounding rural hinterland in the Vale of White Horse. Currently the nearest station to the area is Didcot Parkway, around 9 miles from Wantage.
- 1.1.3 The station, as currently proposed, would be located close to the point where the A438 road linking Wantage with Oxford crosses the Great Western Mainline running from Didcot to Swindon. The station would be around 2.6 miles north of the centre of Wantage and 1 mile north of the centre of Grove.
- 1.1.4 Located on the Great Western Mainline the proposed site is passed by a substantial number of long distance high speed services linking London with Bristol and South Wales. However it is not proposed that these services would call at Wantage & Grove as the time penalty would be too great. Instead it has been assumed that a new service linking Bristol with Oxford would call at the station, along with proposed new stations at Royal Wootton Bassett and Corsham. This service could ultimately be linked to East-West Rail services with the potential to operate through to Cambridge. It will be noted that this service option would require passengers for Reading and London to change at Didcot Parkway.
- 1.1.5 The main findings of the study were that the scheme would be viable with a Benefit Cost Ratio (BCR) of up to 2.48, with net passengers trips of up to 912,000 and forecast net revenue of around £10 million per annum by 2030.



2. METHODOLOGY

2.1.1 This section sets out the data sources used and the methodology employed to estimate demand for the station.

2.2 Data Sources

2.2.1 The two main data sources for this project were National Rail Travel Survey (NRTS) data and LENNON ticket sales data.

2.2.2 NRTS data provides a very detailed source of information on the trips patterns of rail users, and includes data on the following variables of relevance to this study:

- Origin and Destination Station of passengers
- Expansion factors to inflate survey sample to annual trips
- Five digit postcode origin and destination for all trips
- Access and Egress mode to and from rail stations

2.2.3 It can be seen that the data provides a rich source of information on the true origins and destinations of rail trips. For this study data was obtained for Didcot Parkway station, and was used to provide an understanding of the way in which trip rates for stations in the area varied with distance.

2.2.4 There are however a number of limitations to the data which need to be considered within the context of the results of this study:

- The data is now very old with surveys taking place between 2001 and 2005 depending on location. This means that the distribution of trips cannot take account of any changes to rail services that have taken place since this time or any changes in station access mode choice that have taken place.
- The “true” origin and destination data obtained from Postcodes is influenced by the size and shape of Postcode areas. These may have unusual boundaries (especially in urban areas) or be very large (especially in rural areas). In the case of the latter a postcode centroid maybe some distance from the main centre of population, or alternatively may cover the catchment area of more than one station.

2.2.5 The NRTS data was used to support LENNON ticket sales data which was obtained courtesy of GWR, the main train operator at Didcot Parkway. The LENNON data was used to provide information on current origin – destination flows from Didcot Parkway and also to provide information on average revenue from Didcot for individual flows.

2.3 Assumptions

2.3.1 The following sets out a number of the key assumptions in the modelling work.

Simplifying the O-D Matrix

2.3.2 The LENNON data provided a very detailed data set giving origin-destination flows across the UK To make this dataset more manageable a grouping process was employed where destination stations a long way from the study area were allocated to a small number of other stations across the rail network. One station was identified for each government

office region across England, Wales and Scotland. This simplifying assumption allowed all stations to be included without significantly increasing the level of analysis required.

Origin & Destination Trips

- 2.3.3 The LENNON data for Didcot Parkway was divided into “origin” and “destination” trips depending on whether a ticket had been issued at Didcot Parkway or another station on the network. Both origin and destination trips were used in the analysis as whilst Didcot is a parkway station and therefore has a greater focus on outbound trips it also directly serves the adjacent town, and is therefore a potential destination in its own right.

Revenue Estimation

- 2.3.4 Revenue was calculated based on the average revenue generated for each flow provided as part of the LENNON data. To estimate revenue for Wantage & Grove an adjustment was made to revenue for Didcot based on the difference in distance travelled.

Proposed Housing Development

- 2.3.5 Proposed housing developments in the areas around Wantage & Grove were included in the demand assessment. This included the following large developments:

- Grove Airfield – 2,500 dwellings assumed to be delivered between 2022 and 2031
- Crab Hill – 1,500 dwellings assumed to be delivered between 2021 and 2031
- Monks Farm – A total of 824 dwellings delivered over four phases the first of which has already begun.

- 2.3.6 With the exception of Crab Hill where detailed phasing was available the rate of delivery was interpolated from anticipated start dates and the completion of the present Vale of White Horse Local Plan.

Opening Year

- 2.3.7 For the purposes of this assessment it has been assumed that the station would open in 2025.

2.4 Modelling Work

- 2.4.1 To understand the overall impact on demand of the proposed station it was necessary to understand the impact of three key market segments:

- Level of demand abstracted from existing rail stations
- Level of newly generated demand for the station
- Impact of proposed development in the catchment area

- 2.4.2 In the case of this station there was no need to estimate the impact of additional journey times on existing passengers, incurred due to the dwell time at the new station, as it is assumed that the station will be served by an entirely new service.

- 2.4.3 The approach to estimating demand for Wantage & Grove was based around a detailed assessment of the demand that exists at the nearby station of Didcot Parkway.

- 2.4.4 The approach was based on the following steps:

1. Trips rates for Didcot Parkway were identified for each postcode area and destination station combination (within its catchment) using NRTS data.

Destination stations were aggregated depending on their location and distance from Didcot.

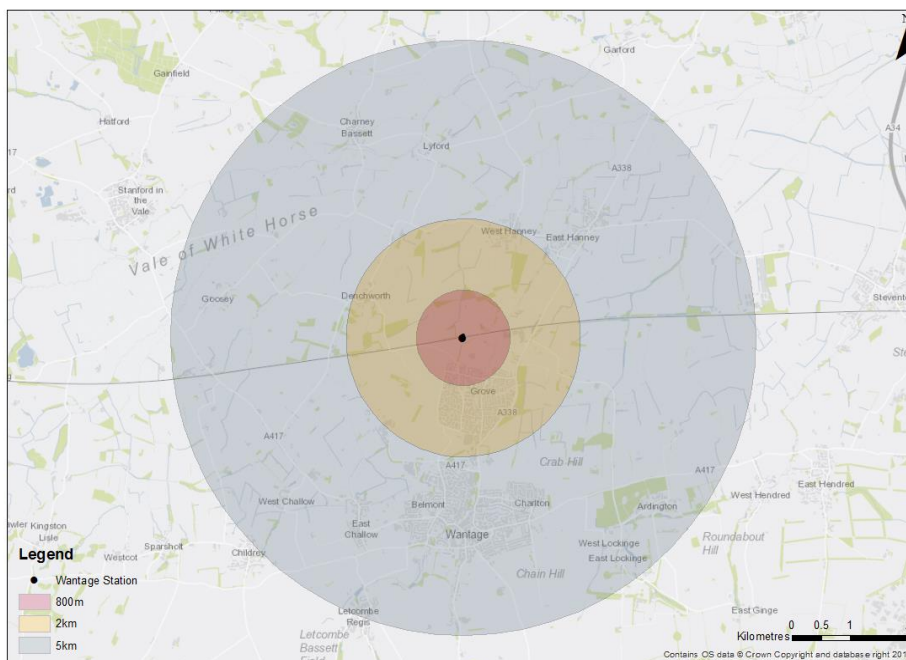
2. An average trip rate for each destination group was identified for three catchment bands – 0-800m, 800m-2km and 2km-5km
3. The trips rates for each flows were adjusted using 2016-17 LENNON ticket sales data to reflect the current pattern of trip making. This relied on an assumption that any relationship between origin station catchment and destination station had remained constant between the NRTS surveys being conducted and the date of the latest LENNON data.
4. To deal with the differing service levels at Didcot Parkway and Wantage & Grove Generalised Journey Times (GJT) were calculated for all flows from Didcot Parkway to all destination stations and from Wantage & Grove to all destination station groups. Changes in the trip rate were then estimated using appropriate GJT elasticities. The calculation of GJTs and the GJT elasticities were taken from the Rail Delivery Group, Passenger Demand Forecasting Handbook.
5. The resulting trips rates were then applied to the population within the Wantage & Grove catchment, based on the catchment bands described above.

2.4.5 The approach above was also applied to trips which had Didcot as a destination rather than an origin, allowing destination as well as origin trip rates to be estimated.

2.4.6 Using the approach described above it was possible to estimate both the newly generated demand form the existing population, but also the demand associated with new development. Furthermore, using the information available from Didcot Parkway it was possible to estimate the level of abstracted demand, based on those parts of the Didcot Parkway catchment that overlapped with the Wantage & Grove catchment.

2.4.7 The figure below shows the catchment area modelled for Wantage & Grove.

Figure 1. Station Catchment Area



2.4.8 The table below presents the split in demand by catchment band for the core scenario of 1tph with a direct link to Cambridge via the East West Rail route. This is presented for newly generated trips and abstracted trips. It is not easy to present these for development trips as they vary by year depending on the build out rate of the developments.

Table 1. Demand Splits (%)

CATCHMENT BAND	ABSTRACTED TRIPS (%)	NEWLY GENERATED TRIPS (%)
0-800m	3%	3%
800m-2km	21%	18%
2km-5km	77%	79%

2.4.9

The split in demand between the catchment bands reflects the location of the station in relation to the settlements of Wantage and Grove. Without infill development between Grove and the Great Western Mainline there is relatively little demand in the area immediately surrounding the station, in contrast the 800m-2km band has a larger proportion of demand reflecting the size of Grove, whilst the vast majority of demand is coming from the town of Wantage, the centre of which is around 4km from the station.



3. DEMAND FORECASTING RESULTS

3.1.1 The following sections set out the modelled results for the stations. In carrying out the analysis four different service options were tested:

- Option A Bristol – Oxford (1tph & 2tph)
- Option B Bristol – Cambridge (1tph & 2tph)

3.1.2 These four tests were designed to examine both the impact of service frequencies of 1tph and 2tph and also the impact of a direct service to Cambridge via EWR. It will be noted that whilst the new station would have a direct service to Oxford, Didcot, Swindon and Bristol there would be no direct service along the Thames Valley to Reading and London, with interchange at Didcot being required to achieve this. In combination with the service frequency from Wantage & Grove this may prove a limitation in terms of generating new trips.

3.1.3 The tables below presents the volume of trips (at 2025 levels) for the four options assessed. It should be noted that there is a ramp up in demand over the first four years of operations (based on guidance in PDFH) to reflect the build-up of passengers over time based on changes in behaviour and these therefore represent the lowest level of demand.

Table 2. Option A Forecast Demand at 2025 (single trips)

	1TPH	2TPH
Abstracted Trips	79,185	85,238
Newly Generated Trips	417,839	455,034
Development Trips	129,286	141,445
<i>Total Trips at Station</i>	<i>626,310</i>	<i>681,718</i>
Net Trips (exc Abstraction)	547,125	596,480

Table 3. Option B Forecast Demand at 2025 (single trips)

	1TPH	2TPH
Abstracted Trips	79,193	85,246
Newly Generated Trips	418,212	455,439
Development Trips	129,422	141,594
<i>Total Trips at Station</i>	<i>626,827</i>	<i>682,280</i>
Net Trips (exc Abstraction)	547,634	597,033

3.1.4 It can be seen that in the assumed first full year of operation the station would generate a substantial volume of trips, with the vast majority being newly generated. It is also clear that whilst a 2tph option has a moderate impact on the total demand, with an increase of around 9% in trip making, the impact of EWR is negligible. In part this is because the base level of trip making from Didcot Parkway to EWR destinations is currently very low and it is difficult to stimulate demand for transformational changes such as new routes within

the constraints of the methodology. It is suggested this issue is examined in more detail if the station proposal is developed further.

- 3.1.5 Over time the volume of trips increases helped in part by the level of development planned for the surrounding area, as well as the completion of the ramp up in demand from opening. The table below presents levels of demand for 2030.

Table 4. Option A Forecast Demand at 2030 (single trips)

	1TPH	2TPH
Abstracted Trips	118,909	127,997
Newly Generated Trips	628,000	683,903
Development Trips	284,854	311,645
<i>Total Trips at Station</i>	<i>1,031,762</i>	<i>1,123,544</i>
Net Trips (excluding Abstraction)	912,853	995,547

Table 5. Option B Forecast Demand at 2030 (single trips)

	1TPH	2TPH
Abstracted Trips	118,921	128,010
Newly Generated Trips	628,566	684,518
Development Trips	285,155	311,972
<i>Total Trips at Station</i>	<i>1,032,641</i>	<i>1,124,499</i>
Net Trips (excluding Abstraction)	913,721	996,489

- 3.1.6 It can be seen in 2025 (Option A 1TPH) 21% of trips from the station come from new developments in the area, by 2035, when all developments are built out the figure rises to 29% of all trips.

Benchmarking the Results

- 3.1.7 To provide some context to the results a benchmarking exercise has taken place comparing the results for Wantage with other station. Wantage & Grove has a catchment population (within 5km) of 23,380 which when demand for the station has built up in 2025 and excluding trips associated with future development in the area) give a total of 29 single trips per person per annum.
- 3.1.8 The table below compares this with ORR Station Usage Data for 2015-16 for a number of stations on the Barks & Hants route between Reading and Newbury. These stations do have a direct service to London (which Wantage will lack), however a comparison is being made here between actual data for 2015-16 and a forecast for Wantage for 2025 by which point the demand at the stations below will also have increased.



Table 6. Benchmarking Stations based on existing demand

STATION	USAGE	POPULATION	ANNUAL PERSON TRIP RATE
Hungerford	344,156	5,767	59.67
Kintbury	93,092	2,534	36.73
Newbury	1,745,710	38,776	45.02
Thatcham	578,410	25,267	22.89
Aldermaston	81,968	1,015	80.75

3.1.9 It can be seen that all of these stations have trip rates that are similar or greater than those for Wantage. Whilst it is acknowledged that there may be complications relating to catchments in what are large rural areas, it is clear that the trip rates estimated for Wantage are plausible, although it is possible that the impact of not having a London service available may be underestimated.

3.2 Key Destinations

3.2.1 The table below presents the predicted top 5 destinations and the number of trips in 2025 for a 1tph service in Option B.

Table 7. Predicted Top 5 Destinations from Wantage & Grove at 2025

RANK	DESTINATION	NO. TRIPS	%
1	London BR	144,383	21%
2	Oxford	127,509	19%
3	Reading	63,196	9%
4	Reading Other	30,832	5%
5	Bath Spa	22,401	3%

3.2.2 It can be seen that London and Oxford are the most important destination stations from Wantage. This result is unsurprising given the size of London and proximity of Oxford. The results potentially represent a risk to the business case as the results are clearly very sensitive to these two locations. In the case of London, it is possible that demand may be overestimated as it may be more attractive for residents to continue to railhead at Didcot where there is a more frequent and direct service to London than would exist at Wantage & Grove. In the case of Oxford, demand would be very sensitive to the quality of the alternative modes to access Oxford. For example the journey times to Oxford by rail are similar to car journey times to Oxford, therefore the demand for rail travel will be very sensitive to issues such as the price of parking and the road based P+R offer in Oxford and levels of congestion in the future. It will also be sensitive to the response of bus operators in the area as Wantage already enjoys a half hourly bus service to Oxford for much of the day. This has a journey time of 53 minutes in the peak period and 43 minutes in the off peak period compared to the 32 minutes the train would take. However, the bus service operates from centre to centre whereas the rail service is on the edge of Wantage and the edge of Oxford City Centre and therefore the bus service journey time for centre to centre journeys would remain quite competitive. Further consideration of this issue is presented in the appraisal section of this note.

3.3 Revenue

3.3.1 The tables below presents the total revenue generated by the station for the four service options in the opening year of 2025.

Table 8. Forecast Revenue at 2025 Option A

	1TPH	2TPH
Abstracted Trips	£108,320	£115,130
Newly Generated Trips	£4,843,957	£5,176,473
Development Trips	£1,457,145	£1,566,791
<i>Total Revenue at Station</i>	<i>£6,409,422</i>	<i>£6,858,394</i>
Net Revenue (excluding Abstraction)	£6,301,102	£6,743,264

Table 9. Forecast Revenue at 2025 Option B

	1TPH	2TPH
Abstracted Trips	£108,336	£115,148
Newly Generated Trips	£4,857,818	£5,191,523
Development Trips	£1,462,254	£1,572,340
<i>Total Revenue at Station</i>	<i>£6,428,408</i>	<i>£6,879,011</i>
Net Revenue (excluding Abstraction)	£6,320,073	£6,763,863

3.3.2 It can be seen that in the opening year the station is forecast to generate a reasonable level of revenue, which would be sufficient to cover the operating costs of the station and the share of the costs of operating a Bristol – Oxford service that have been allocated to Wantage & Grove (see Section 4).

The tables below show the revenue position after the ramp up in demand is complete in 2030.



Table 10. Forecast Revenue at 2030 Option A (single trips)

	1TPH	2TPH
Abstracted Trips	£162,291	£172,483
Newly Generated Trips	£7,284,682	£7,784,196
Development Trips	£3,210,505	£3,452,086
<i>Total Revenue at Station</i>	<i>£10,657,478</i>	<i>£11,408,765</i>
Net Revenue (excluding Abstraction)	£10,495,187	£11,236,282

Table 11. Forecast Revenue at 2030 Option B (single trips)

	1TPH	2TPH
Abstracted Trips	£162,315	£172,510
Newly Generated Trips	£7,305,729	£7,807,048
Development Trips	£3,221,762	£3,464,313
<i>Total Revenue at Station</i>	<i>£10,689,806</i>	<i>£11,443,871</i>
Net Revenue (excluding Abstraction)	£10,527,491	£11,271,361



4. STATION COSTS

4.1.1 Within this initial assessment of the station three categories of costs have been included as set out below:

- Capital cost of constructing the station
- Station operating costs
- Cost of operating a dedicated Bristol – Oxford service

4.1.2 The following sections provide a brief summary of the costs associated with the different categories.

4.2 Capital Costs

4.2.1 Capital Costs for the station have been supplied by SLC Rail. It is estimated that the capital cost of constructing the station will be £18.23m. For the purposes of the appraisal a 51% allowance for Optimism Bias has been made which raises the theoretical capital cost in the appraisal to £27.5m.

4.3 Station Operating Costs

4.3.1 Operating costs for the station have been assumed to be £123,000 per annum; this may be an overestimate, however, in view of the early stage of scheme development.

4.4 Train Operating Costs

4.4.1 As the station will be served by a new dedicated Bristol – Oxford service it is necessary to add a proportion of the costs of operating such a service to the station at Wantage & Grove. It should be noted that for options where services are extended to Cambridge it is assumed that the Bristol – Oxford service is linked to an EWR service.

4.4.2 Operating costs have been calculated based on the use of a 3 coach 100mph DMU (Class 168 or equivalent) for service levels of both 1tph and 2tph. Based on the proposed journey times for the service it was estimated that the service would require four trains to operate an hourly service and seven trains to operate a half hourly service.

4.4.3 A summary of the key costs is presented in the table below.

Table 12. Estimated Operating Costs (£ pa)

COST TYPE	1 TRAIN PER HOUR	2 TRAINS PER HOUR
No. Units	4	7
Annual Mileage	855,894	1,711,788
Lease Costs & Maintenance	£2,210,305	£4,060,609
Fuel Costs	£1,771,701	£3,543,401
Variable Track Access Charge	£141,223	£282,445
Staff Costs	£1,170,000	£2,047,500
Total Operating Costs	£5,293,228	£9,933,955

- 4.4.4 It should be noted that these costs are estimates and clearly further work is required to refine them.
- 4.4.5 As the service is also designed to serve new stations at Corsham and Royal Wootton Bassett the cost of operating the service needs to be divided between the three stations. As a starting point this has been achieved by allocating costs to the three stations based on the forecast level of demand for the stations. Again this approach may need to be refined as the scheme develops, especially if Corsham or Royal Wootton Bassett were either not developed or were served by other services.
- 4.4.6 The cost allocated to Wantage & Grove at this stage is £3.74m per annum for the 1tph option and £7.01m per annum for the 2tph option. It should also be noted that Optimism Bias has been added to these costs at a rate of 41% within the appraisal, in line with DfT WebTag guidance.
- 4.4.7 In view of forthcoming changes to the Great Western mainline timetable it may be necessary to operate the service using trains with different performance characteristics and this may impact on train operating costs.



5. SCHEME APPRASIAL

5.1.1 Using the information above it was possible to conduct an initial appraisal of the station following the principals set out in DfT WebTag guidance. An appraisal was conducted over a 60 year period with an assumed opening date of 2025.

5.2 Sources of Benefit

5.2.1 There are a number of sources of benefit that have been included in the appraisal as listed below:

- Revenue generated by passengers
- Value of time changes for passengers
- Marginal External Congestion Costs as a result of the transfer of users from road to rail.

5.3 Scheme Appraisal

5.3.1 The tables below present a summary of the scheme appraisal for the four different service options.

Table 13. Scheme Appraisal Discounted Values at 2010 prices Option A (appraised over 60 years)

	1TPH	2TPH
Present Value of Costs	£138m	£240m
Present Value of Benefits	£341m	£379m
Net Present Value	£203m	£139m
Benefit Cost Ratio	2.48	1.58

Table 14. Scheme Appraisal Discounted Values at 2010 prices Option B (appraised over 60 years)

	1TPH	2TPH
Present Value of Costs	£138m	£240m
Present Value of Benefits	£342m	£389m
Net Present Value	£204m	£149m
Benefit Cost Ratio	2.49	1.62

5.3.2 It should be noted that in this assessment revenue income has been treated as a benefit to provide a clearer understanding of the impacts. If the scheme were developed in more detail all revenue accruing after the conclusion of the existing franchise would accrue to central government and would therefore be treated as a negative cost and reduce the present value of costs rather than increase the level of benefits.

5.3.3 It can be seen that the inclusion of a direct service to Cambridge makes little difference to the overall results.

5.3.4 It will also be noted that increasing the service level to 2tph reduces the Benefit Cost Ratio. This is because the increase in demand associated with the frequency increase is insufficient to offset the significant additional costs associated with increasing the service frequency to 2tph.

5.4 Sensitivity Tests

5.4.1 Given concerns over the dominance of London and Oxford in the results a number of sensitivity tests have been conducted to understand the impact of a reduction in forecast demand to and from these locations. The tests were conducted on the Option A tests. The tests conducted were as follows:

- 50% reduction in trips to Oxford
- 50% reduction in trips to London

5.4.2 The tables below present and appraisal for a 50% reduction in trips to and from Oxford and to and from London.

Table 15. Scheme Appraisal Discounted Values at 2010 prices 50% reduction in Oxford trips (appraised over 60 years)

	1TPH	2TPH
Present Value of Costs	£138m	£240m
Present Value of Benefits	£317m	£350m
Net Present Value	£179m	£110m
Benefit Cost Ratio	2.30	1.50

Table 1. Scheme Appraisal Discounted Values at 2010 prices 50% reduction in London trips (appraised over 60 years)

	1TPH	2TPH
Present Value of Costs	£138m	£240m
Present Value of Benefits	£276m	£308m
Net Present Value	£138m	£68m
Benefit Cost Ratio	2.00	1.30

5.4.3 It can be seen that a 50% reduction in trips to either Oxford or London does not reduce the Benefit Cost Ratio below 2.00 in the 1TPH scenarios, which represents high value for money in Department for Transport guidance.. The loss of trips to Oxford has less of an impact as the reduction in trips is less than that for London and the average revenue per passenger is lower.



5.5 Summary

5.5.1 It can be seen that the opening of station at Wantage & Grove scheme has the potential to deliver high value money based on the demand and revenue forecasts developed here.

5.5.2 However it should be noted that there is the need for more detailed work for the case to be developed further. In particular further work is required on the following issues:

- The operating costs of the station need to be reviewed in more detail
- The timetable should be developed further with consideration given to the quality of connections to London at Didcot Parkway
- The allocation of train operating costs to the station should be considered in more detail, as the overall appraisal is very sensitive to operating costs.
- A more detailed assessment of the Wantage – Didcot flow should be made giving consideration to the attractiveness of both car and bus.



APPROVAL

Version	Name		Position	Date	Modifications
1	Author	James Jackson	Principal	31/08/2017	
	Checked by	Lee White	Market Director	31/08/2017	
	Approved by	Lee White	Market Director	31/08/2017	
2	Author	James Jackson/Olivia Hockney	Principal	16/01/2018	
	Checked by	James Jackson	Principal	16/01/2018	
	Approved by			DD/MM/YY	
3	Author	Olivia Hockney	Consultant	10/08/2018	
	Checked by	James Jackson	Associate	13/08/2018	
	Approved by	Lee White	Associate	13/08/2018	

