Meecebrook Rail Study

Feasibility Report

V1.0 **July 2022**

Contents

Appendix A – Demand Modelling and Economic Analysis by SYSTRA

Appendix B – Train Service Planning Report by Rail Aspects Ltd

Appendix C – Engineering Feasibility Report and Cost Estimates by SLC Rail

Abbreviations

Abbreviation	Description
AFC	Anticipated Final Cost
BCR	Benefit-Cost Ratio
BGS	British Geological Society
DfT	Department for Transport
EA	Environment Agency
GSM-R	Global System for Mobile Communications – Railways (radio)
LOC	Location Case/Cabinet
MVP	Minimum Viable Product
NR	Network Rail
OBC	Outline Business Case
OHLE	Overhead Line Electrification
OS	Ordnance Survey
PRM-NTSN	Persons with Reduced Mobility (PRM) National Technical Specification Notice (NTSN)
RRAP	Road-Rail Access Point
SBC	Stafford Borough Council
S&C	Switches & Crossings
SOBC	Strategic Outline Business Case
SSSI	Site of Special Scientific Interest
TOC	Train Operating Company
WCML	West Coast Main Line

Executive Summary

Our approach for this feasibility study has been to build on the work undertaken at pre-feasibility stage and continue the aspirations of creating value for money train service connectivity at Meecebrook. At this feasibility stage our focus has been on:

- Developing the appraisal of the viability of the proposal with a DfT compliant demand forecast and cost-benefit analysis.
- making a more detailed study of the engineering constraints and opportunities of the various possible station location and updating the costs estimates.

This feasibility assessment indicates that:

- Based on the passenger demand forecasts and the updated cost estimates for a station at the 'north option' (see Section 4 for details), SYSTRA has assessed that once Meecebrook is fully built there is a prospect of station revenue generating a medium level of value for money (BCR 1.58).
- There is a reasonable prospect of achieving a train frequency of two trains per hour at the station (although the HS2 scheme introduces a level of complexity in developing a future train plan specification which is discussed in more detail in the document).
- That several locations within the site boundary (as currently defined) are viable in engineering terms; at least one with levels of cost estimated to represent medium level value for money.

The table below indicates the current feasibility status along with some of the principal risks and an indication of the further work which will be required in the next stage of developing the project viability.

Topic		Current Status	Main Risks	Next Steps
Demand Modelling	✓	Forecast levels of demand are sufficient to achieve a medium business case.	Demand dependant on build-out rate of the Garden Community.	Complete the economic case to strategic outline business case level.
Train Service Planning	✓	Technically possible to accommodate 2 train-per-hour station calls, based on current known data	Delays to existing services. Objections from rail industry & HS2 integration.	Timetable performance modelling.
Station Location	✓	A potentially viable location has been identified	Adverse ground conditions Impact on signalling	Detailed requirements capture.
Value-for-money	✓	A good prospect of obtaining an acceptable BCR	Increase in capital costs	Updated costs estimated. BCR updated.
Strategic Case		A proposed methodology to make the strategic case is defined.	Main assessment still to be undertaken.	Full stakeholder engagement. Policy review.

1. Introduction

Stafford Borough Council (SBC) are developing a concept for Meecebrook, a new Garden Community near Yarnfield (Staffs) and have commissioned SLC Rail to investigate the viability of building a new station on the West Coast Main Line (WCML) to serve it. This feasibility study builds on the outcomes of SLC Rail's pre-feasibility work, which confirmed that 'there would appear to be a good prospect of a scheme of medium value for money which would deliver an acceptable BCR'.

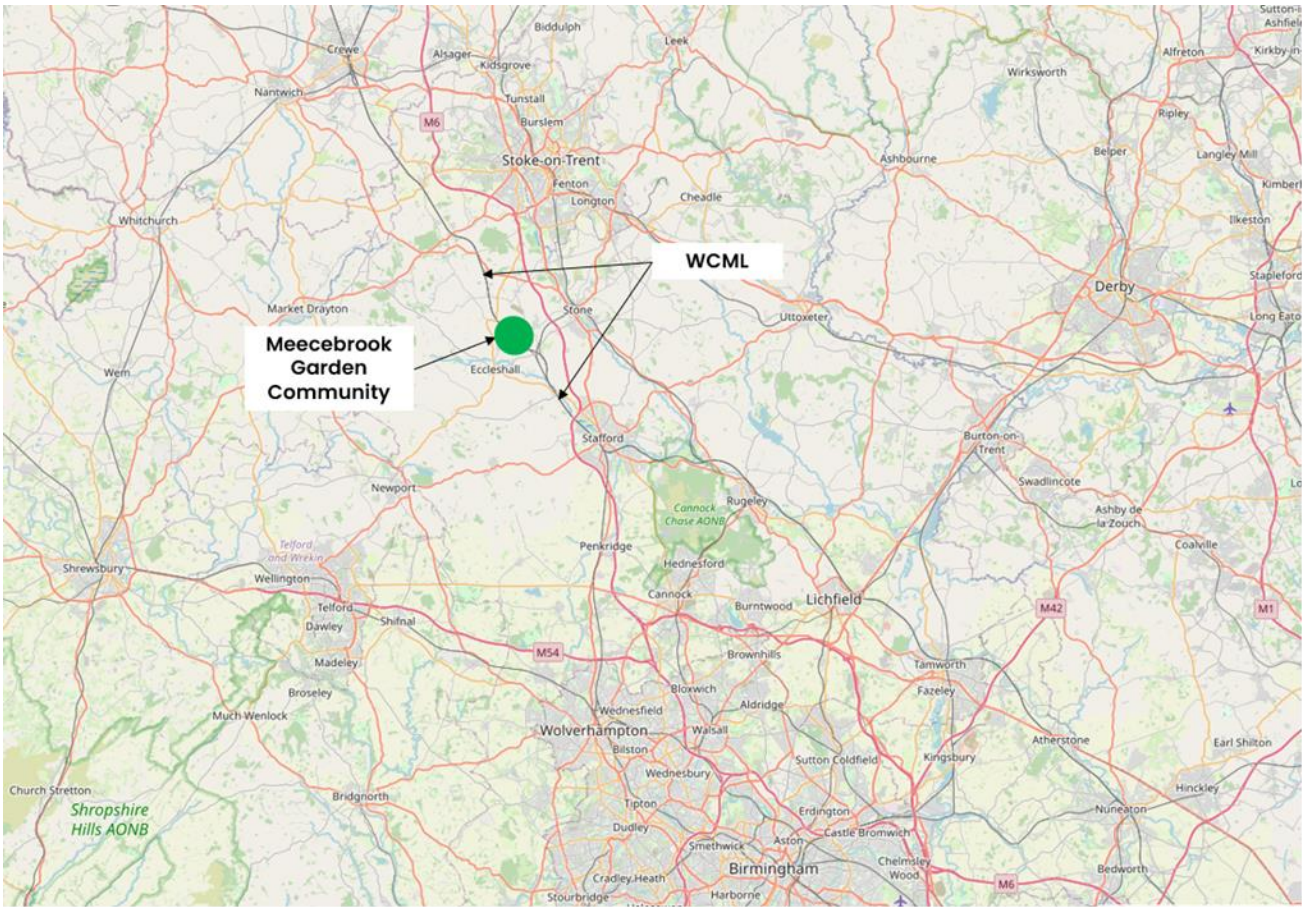

Figure 1 - Meecebrook Garden Community location (map source OpenStreetMap)

This feasibility study reviews the possible sites and the adjacent WCML infrastructure in more detail to establish potential locations for the proposed station, highlighting key engineering implications and risks associated with each potential location, and forming the basis for a more robust cost-benefit analysis to be undertaken. The outputs of this feasibility study will help SBC to decide on whether to proceed with building the new station, and which location to select for it. This feasibility study does not cover detailed timetable performance modelling to confirm what potential stopping patterns could be accommodated at the station. However, a high-level timetable review was carried out as part of the pre-feasibility study, which confirmed that the station could likely be accommodated with the existing WCML services, but that platforms to all four lines would be required.

2. Demand Forecast and Economic Appraisal

2.1. Background

At the pre-feasibility stage an assessment of the viability for a new station to serve the proposed garden settlement of Meecebrook was undertaken. This used the indicative costs and an estimate of the number of passengers required to deliver low, medium, and high value for money. It was determined that there was a good prospect of generating a positive business case and that the proposed station should be considered for further detailed examination.

Based on the above a more detailed assessment has been carried out to explore the economic case for the new station. The approach adopted in undertaking this work was:

- Forecasting the demand generated by the new station within the local catchment area and the development of the new garden community.
- An appraisal of the economic viability of providing a new station, compliant with current DfT guidance. This analyses the demand forecast and other benefits generated by the station against the updated costs of providing it, to produce a benefit-cost ratio (BCR).

The methodology and results are summarised below, and the fully detailed report is contained in Appendix A.

2.2. Demand Forecasting

The demand forecast was developed using the following data:

- **Local catchment demand** – demand generated by the population and employment currently within 5km of the station. This relatively small catchment (see Figure 1) was chosen given the aspiration to provide a sustainable transport solution for the local area rather than attracting passengers from father afield, for example by the provision of a large park-and-ride facility.
- **New development demand** – demand generated by proposed development within the local catchment of the station, principally new housing.
- **Lost passengers** – passengers currently travelling on services which pass through the Meecebrook station site who would no longer travel because of the additional journey time imposed by a new station call.

The three main sources of data for the demand forecasting element of this work are:

- National Rail Travel Survey (NRTS) data.
- West Midlands Rail Executive (WMRE) MOIRA data.
- Census data.

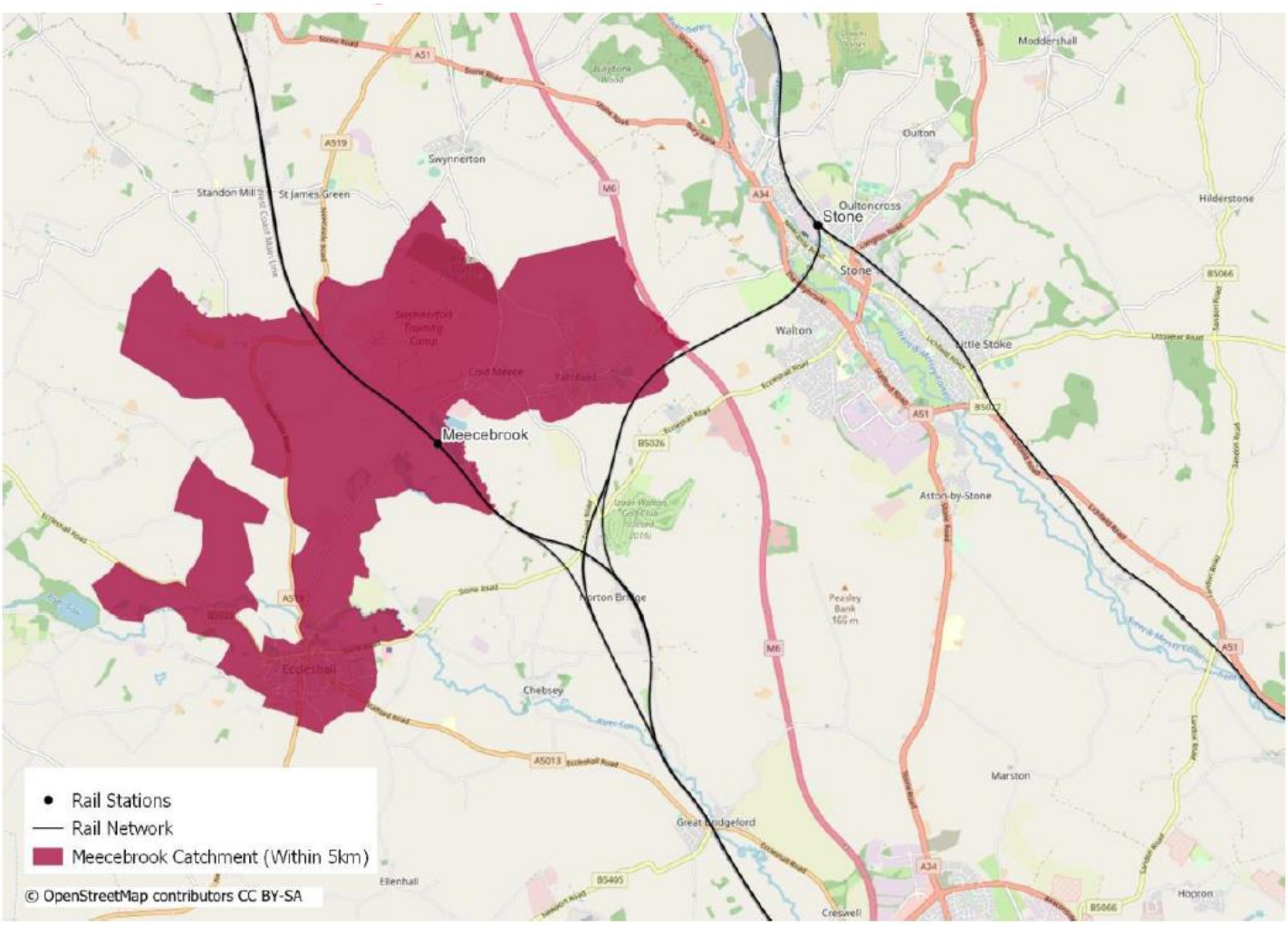

Figure 2 - Meecebrook Catchment Area

2.3. Demand Forecasting Results

The table below shows the results of the demand forecasting. By 2040, the station is predicted to generate a substantial number of trips with over 80% of these trips predicted to be generated by the new development. The level of abstraction from other stations is very low reflecting the constrained catchment area used in the modelling, and the rural nature of the catchment.

Table 1 - Forecast Demand

	2026	2030	2040
Local catchment	16,866	34,993	37,672
Abstracted	4,423	9,194	9,936
Garden Village	23,546	133,281	355,417
TOTAL	**44,835**	**177,469**	**403,026**

The table below shows that just over a third of trips from Meecebrook in 2040 are expected to be to / from Birmingham with just over 20% to / from Stafford. The distribution of trips to / from Birmingham and London is something that will need to be explored in more detail during the next phase of work for the station.

Table 2 - Trip Destinations

Station	Trips	%
Birmingham	143,071	35%
Stafford	90,405	22%
London BR	41,969	20%
Manchester BR	41,834	10%
Wolverhampton	20,547	5%
All other destinations	65,199	16%
Total	**403,026**	**100%**

2.4. Economic Appraisal

Using the demand forecasting results it was possible to conduct an appraisal following the principles set out in DfT guidance. The appraisal was conducted over a 60-year period with an assumed opening year of 2026.

The DfT has suggested 'sensitivity tests' are carried out of three scenarios for COVID recovery: a high recovery (best case), a medium recovery and a low (worst case). The DfT medium case for West Midlands Trains has been used in the core scenario for this appraisal

The table below presents a summary of the scheme appraisal, which indicates that, in the core scenario, the scheme is predicted to generate medium value for money with a BCR value of 1.58.

Table 3 - Benefit to Cost Ratio

	Core Scenario	Low COVID recovery	High COVID recovery
BCR	1.58	1.33	1.72
Value for Money Category	Medium	Low	Medium

2.5. Summary

The analysis indicates that delivering a station at Meecebrook is predicted to deliver **medium** value for money, giving a good level of confidence at this stage that the proposal is viable and can proceed to the next stage of development.

The following steps are recommended during next stage of the economic analysis:

- Assumptions regarding the build out rate for development will need to be refined.
- Trip distribution, particularly trips towards Birmingham and London will need to be considered in more detail and benchmarked against other similar stations.
- Engagement with DfT.
- Further sensitivity testing.
- Development of detailed station operating costs.

3. Train Service Planning

3.1. Feasibility Stage Update

A high-level operational review was carried out at pre-feasibility stage by specialist sub-contractor Rail Aspects Ltd. For completeness the findings are summarised in section 3.2 below, and the full report included as Appendix B.

This was based on a December 2019 (pre-COVID) service specification. However, the timetable that was considered in the operational feasibility review is different to the timetable in operation today. The principal difference is that the previous Liverpool – London Euston service currently only operates between Liverpool and Birmingham.

This feasibility report has therefore assumed a service level of:

- 1 train-per-hour Liverpool – Birmingham
- 1 train-per-hour Trent Valley – Euston

This retains the principle from the Rail Aspects report of two trains per hour being able to call in each direction but uses the services currently available.

3.2. Summary of the Rail Aspects Ltd Report

The area of the West Coast Mainline between Stafford and Crewe where the proposed Meecebrook station will be sited is a heavily utilised strategic high-speed section of railway, conveying inter-city, regional and, local trains as well as a considerable and growing number of freight services.

The introduction of new stations on such a heavily used section of railway can often be problematic as the additional journey time of the stopping train has an impact on the capacity and efficiency of the whole railway line. For this reason, there is often opposition to the creation of new stations along such an important rail corridor.

Nevertheless, the work carried out by Rail Aspects Limited, and based upon the pre-COVID timetable indicates that it is at least technically possible for the necessary station calls to be included. Although, the inclusion is not without some operational challenges, including the requirement to re-time some service around Liverpool, it is considered that it would be possible to overcome them.

An added complication, though, is that HS2 will have a considerable impact on the capacity of this aspect of the West Coast Mainline and of future train service provision. This can be considered both an opportunity and a constraint. The first stage of HS2 will see HS2 trains running on the existing West Coast Mainline railway past the Meecebrook site. When the HS2 extension to Crewe is completed sometime in the 2026-2031 period the HS2 trains will shift off the existing line.

Until the HS2 line extension is completed it will be difficult, and may be impossible, to achieve capacity for additional calls at Meecebrook.

After the extension phase opens there will be released capacity which will increase the prospect of introducing additional station calls. The matter is further complicated, by the fact the Post HS2 conventional network railway timetable has not yet been developed.

In short, the current assumptions are based upon a train timetable which will not be in existence once HS2 (with Crewe extension) is completed. Whilst it appears possible to include additional calls at Meecebrook within the current timetable, it would require a significant amount of work to do so in both technical train planning but also in lobbying rail stakeholders (DfT, NR, Train Operators) for support. In any case, if the new station is not likely to open until after the HS2 extension, then the issue of the current timetable will be somewhat academic.

However, since it is not yet possible to lobby the rail industry for inclusion of Meecebrook within a post-HS2 rail timetable because it does not exist, there is a requirement to use the existing timetable as a proxy.

Despite these timetable uncertainties, it will be important at the next stage to engage with the wider railway industry and carry out further timetable, punctuality, and performance work assurance. While some of this work might prove abortive because of the likely changes to timetables, it is an important part of the process of gaining acceptance across the rail industry of the benefits of the new station.

4. Station Location

4.1. Introduction

This is a summary of the full engineering feasibility study, which is contained in Appendix C. It builds on the outcomes of the pre-feasibility work, which compared three possible locations for a new station within the boundaries of the Meecebrook site (as known at time of writing) and were assessed both in terms of the topography and the compatibility with existing railway infrastructure. The location naming has been adopted to keep consistency with the pre-feasibility study which covered the North and Central and South options. Two additional options are included as part of this feasibility study, so in total, five location options for a new station have been considered within the site, as shown in Figure 2:

- Swynnerton Option – station located immediately north of the existing Swynnerton Rd overbridge;
- North Option – station located between Swynnerton Rd and Baden Hall Fisheries access road;
- Central Option – station located between existing signals south of Baden Hall Fisheries access road;
- South Option – station located adjacent to Grove Estate Vineyard;
- Junction Option – station located at the start of Norton Bridge North Junction.

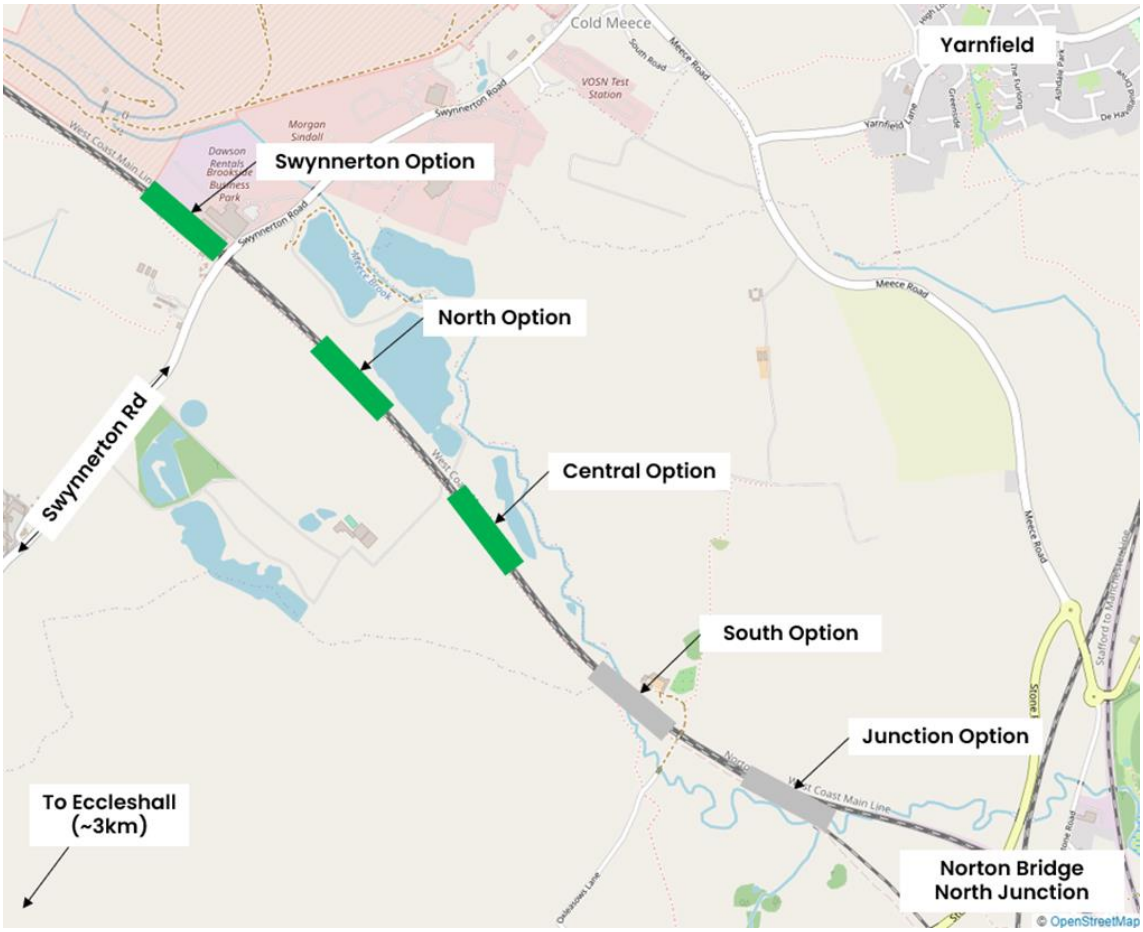

Figure 3 - Map showing station location options considered (map source OpenStreetMap)

4.2. Swynnerton Option

- To make space for platforms the tracks would need to be moved into land currently occupied by NR buildings and other infrastructure.
- A communications mast and signal relay room would need to be moved at significant cost.
- The Swynnerton Road bridge would need to be re-constructed to make it wider.
- The opportunity to reduce platform lengths could be explored in the next stage to remove the need to re-construct the bridge.
- The surrounding land is relatively flat and level with the railway.

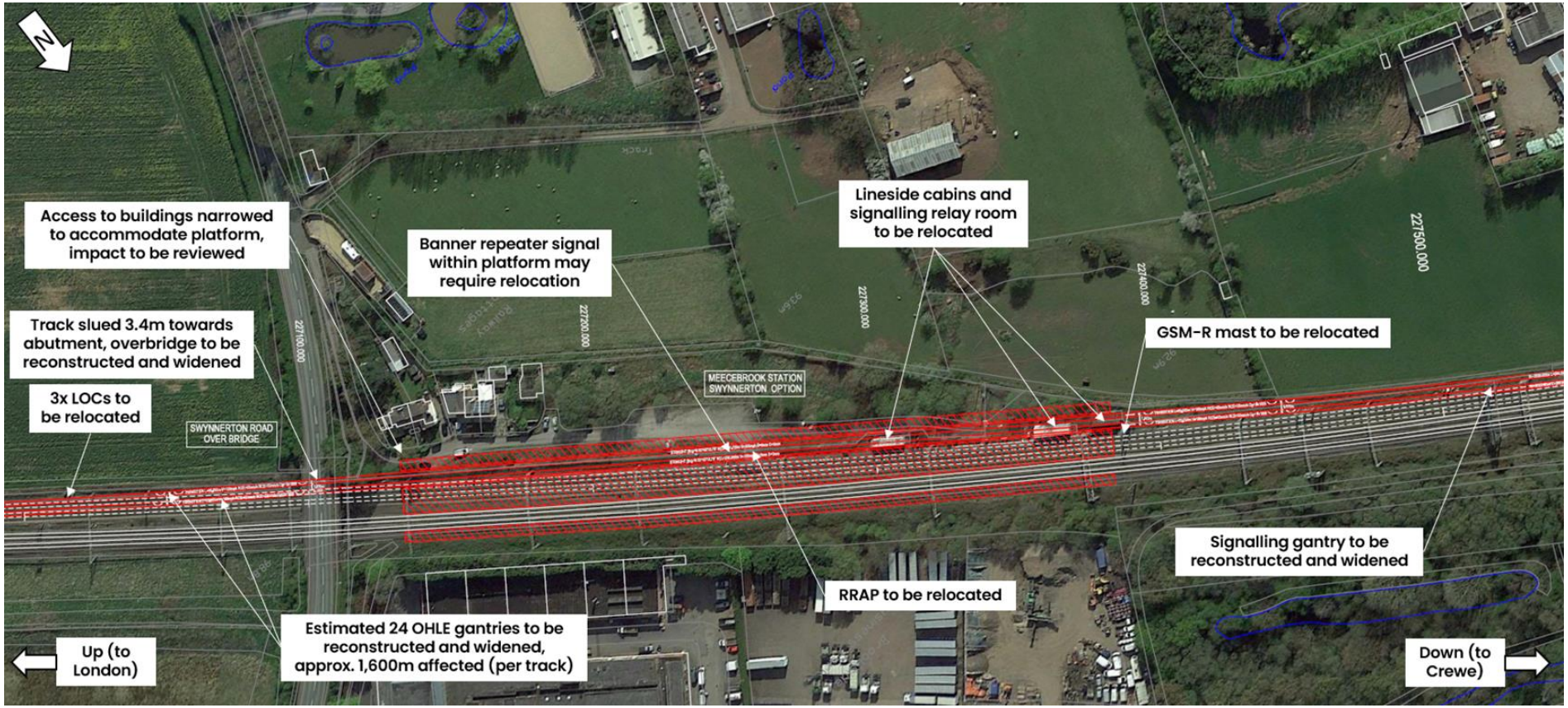

Figure 4 - Swynnerton option track layout and impact assessment

4.3. North Option

- To make space for platforms, the tracks would need to be moved into agricultural land to the side of the railway.
- Within the limits of this high-level design, it appears neither Swynnerton Road nor Baden Hall Fisheries bridge would need to be re-constructed.
- No existing signals would be affected.
- Ample space for construction access and compounds – a significant advantage.
- The surrounding land is relatively flat and level with the railway.

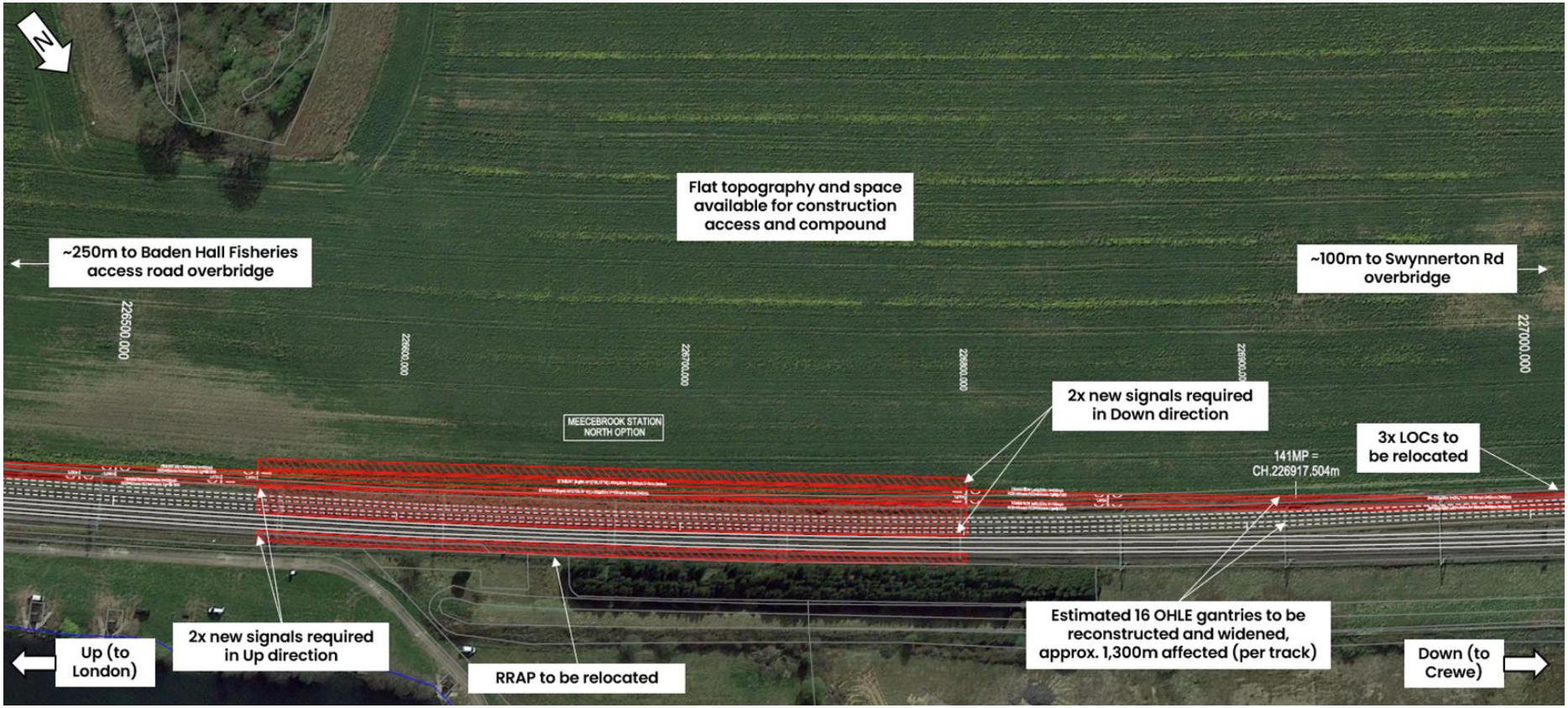

Figure 5 - North option track layout and impact assessment

4.4. Central Option

- A curve on the approach means more widening of the railway would be required to achieve straight platforms.
- The railway is in a cutting (lower than the surrounding land) meaning more excavation is required to construct the station.
- The cutting would be required to be widened to make room for the platforms.
- Meece Brook bridge and Baden Hall Fisheries bridge would need to be widened and re-constructed.
- An advantage of this options is that there are no signals in the area.

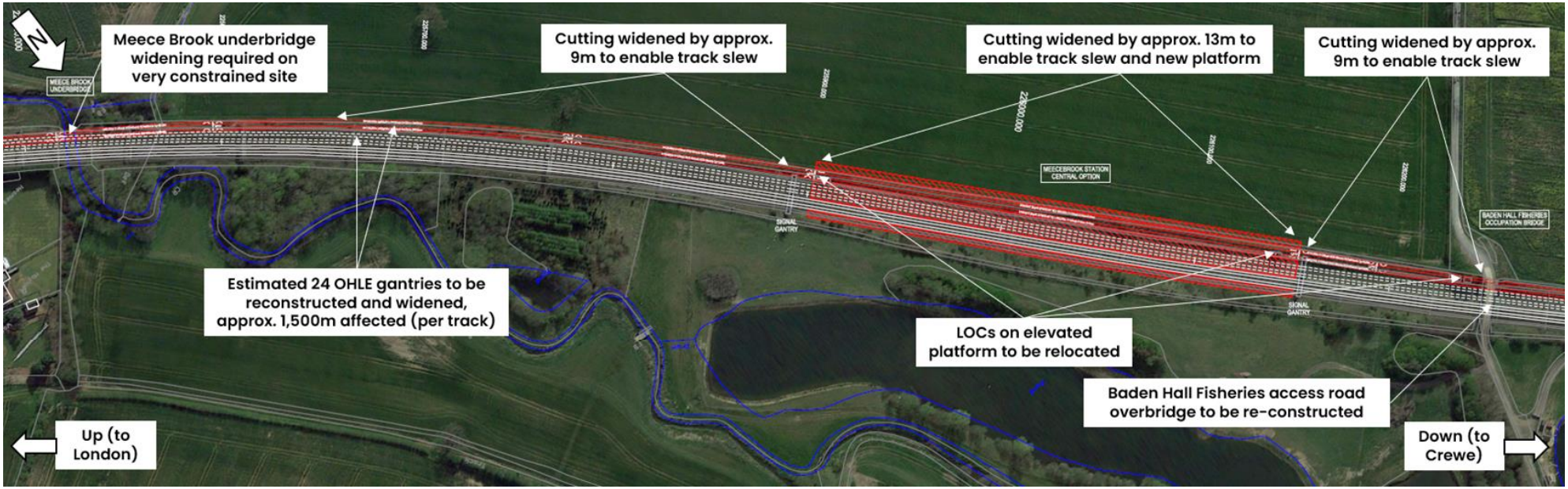

Figure 6 - Central option track layout and impact assessment

4.5. Discounted Options

The South Option (adjacent to the vineyard) effectively magnifies the key issues associated with the Central Option. Due to a tight curve at the South location and being closer to Meece Brook underbridge, the extents of widening of the underbridge would be greater than for the Central Option. In addition, the existing curve would need to be straightened out to make room for the platforms with more land take being required to the north of the proposed station, to tie back into the existing railway.

The Junction Option (in the 'vee' of the Norton Bridge North Junction) will require re-modelling of the junction for the new platforms, and it is against good practice to locate new stations near to existing junctions. Constructability of platforms will be very difficult due to the complex track layout at the start of the junction, with a high risk of gaps between the platform edge and the train (a safety-critical issue).

4.6. Summary

Table 4 - Summary of the Risk and Opportunities for Station Locations in the Feasibility Study

Site	Swynnerton Option	North Option	Central Option
Development Context	Beyond masterplan outline	At centre of masterplan	On edge of masterplan
Topographical	Flat, at grade	Flat, at grade	In cutting (2.5-3.0m deep), significant civils earthworks
Surrounding Buildings	Various properties south, business park north	None	None
Geotechnical	Within river terrace deposits (adequate for foundations)	Within river terrace deposits (adequate for foundations)	Alluvium near Meece Brook (worse for foundations)
Flooding	Low risk (Flood Zone 1)	Low risk (Flood Zone 1)	Low risk (Flood Zone 1)
Environment	No constraints identified	No constraints identified	No constraints identified
Structures	Likely requires re-building Swynnerton Rd overbridge	Unlikely to have an impact on structures	Re-building fishery access road overbridge, widening Meece Brook underbridge.
Track	Wide 10-foot near Swynnerton Rd overbridge, on gentle curve	Wide 10-foot near Swynnerton Rd overbridge, on gentle reverse curve	Near tight curve adjacent to vineyard, long tie-ins due to high line speed
Drainage	Evidence of existing track drainage (constraint for track slews, opportunity for platform drainage)	No existing track drainage (no constraint for track slews, no pre-existing outfall for platform drainage)	No existing track drainage (no constraint for track slews, no outfall for platform drainage)
Signalling	Requires widening of existing gantry and relocation of relay room	Likely to require additional signals in both directions	Least impact on existing, station between gantries
OHLE	Risk of reduced clearances and alterations due to proximity to overbridge	Not constrained by existing structures	Not constrained assuming fisheries access road overbridge is re-built
Lineside Equipment	Relocation of RRAP, GSM-R mast, lineside cabins	Relocation of RRAP and three LOCs at ground level	Relocation of four sets of LOCs on elevated platforms
Access to Platforms	New footbridge and lifts, opportunity to incorporate re-constructed Swynnerton Rd overbridge into SME	New footbridge and lifts	Opportunity to incorporate re-constructed fisheries access road into step-free route between platforms

The recommended preferred option based on this analysis is the **North Option.**

5. Cost Estimates

5.1. Introduction

Updated cost estimate has been produced for the Swynnerton, North and central options described in Section 4, based on benchmarked costs from other similar projects.

5.2. Assumed Design Requirements

The following high-level requirements have been used to determine the concept layouts of the station and resulting cost estimates.

Table 5 - High-level requirements

Requirement	Description	Source e.g. client, site constraint, standard, PRM NTSN, TOC etc.
Number of platforms	The new station is to serve all four lines, i.e. four platforms will be required (two facing platforms and one island platform)	The train service planning review identified the need for all four lines to be served, to provide sufficient operational resilience
Length of platforms	All platforms to be 185m long in order to accommodate 8-car rolling stock	Deemed to be MVP ahead of engagement with NR and TOCs
Location of station	The station is to be located within or adjacent to the boundaries of the Meecebrook Garden Community site (as per Vision Statement, June 2021)	Client requirement
Accessibility	Station to be fully compliant to current accessibility standards, including step-free access to all platforms	DfT, PRM-NTSN

Additional site-specific requirement assumptions for the three options are detailed in the full cost estimate contained in Appendix C.

5.3. Cost Estimate Results

Table 6 - Cost Estimate Results

Item	Swynnerton Option	North Option	Central Option
Base Cost Estimate	£43,797,006	£34,114,489	£45,080,451
60% Risk Allowance	£26,278,203	£20,468,694	£27,048,271
AFC (excluding inflation)	**£70,075,2009**	**£54,583,183**	**£72,128,722**

The above costs are based on 2Q22 rates, 60% risk allowance (in line with DfT guidance) and 185m long platforms to accommodate 8-car trains. Land acquisition and car park costs are excluded. It is noted that the direct cost rates for platforms have increased significantly compared to the pre-feasibility study estimates (from circa £800-1,200/m2 to circa £2,400-3,500/m2). This is based on recent cost data received from for several platform project tenders

undertaken since the Meecebrook pre-feasibility study and is reflective of the significant cost increases currently seen within the construction industry.

6. Strategic Case

6.1. Introduction

The purpose of this section is to explain the process for developing a strategic case for a new railway station at Meecebrook suitable for inclusion in a future Strategic Outline Business Case (SOBC).

This advice reflects current best practice in the production of strategic cases. The document will evolve as the Meecebrook project develops and new direction from NR and the DfT is received.

This section is intended as an explanatory 'start point' upon which to:

- emphasise the various requirements for the next stage.
- stress the importance of collaborative workstreams between the promoters and their consultants to develop and enrich the future SOBC document.

6.2. Aspects of the Strategic Case

There are 6 main elements to the proposed draft Strategic Case shown as shown in the table below. This table is split into two parts:

- Part I: Development of strategic options to preferred option.
- Part II: Preferred strategic options to project option.

Part I takes the reader to the point whereby the decision is made to develop a new station at Meecebrook. At the pre-SOBC and SOBC stage of business case development, showing the flow of logic is an important aspect of the whole business case process. There is a requirement to demonstrate clear and logical reasoning as to why the chosen option has been selected. For this reason, the remainder of this note will largely focus upon Part I.

Part II, when completed as part of the SOBC, will extend the reader's journey through several tests which will demonstrate that the Meecebrook strategic option is compliant with broader objectives and is, ultimately, deliverable.

A high degree of maturity is required for Part I of the Strategic Case at SOBC level. Part II, though, will continue to be refined as the project progresses to OBC level and beyond. Essentially, the compelling logic for the Strategic Case (Part I) needs to be completed by the SOBC stage.

Table 7 - Aspects of Strategic Case

Part I **Development of strategic options to preferred option**	**DETERMINE**	The strategic situation.
		The Problem Statements derived from the Strategic Situation.
		Transport Objectives.
	MAPPING	Mapping Problem Statements to Transport Objectives.
		Mapping Transport Objectives against strategic options leading to selection of preferred strategic option: Meecebrook new railway station.
Part II **Developing the preferred option**	**TEST**	Description of Meecebrook station.
		Test preferred option with DfT Priorities and 'Criteria Matrix'.
		Test preferred option with NR strategic Fit.
		Test preferred option with local and regional objectives.
	MODEL	Rail timetabling and performance modelling.
		Meecebrook catchment and demand model overview.
	ASPECTS OF DESIGN	Scope.
		Constraints.
		Interdependencies.
	ENGAGEMENT	Stakeholders.

6.3. Summary

A convincing Strategic Case is usually a gateway to wider consideration of the project by NR and DfT. A project is unlikely to progress if the Strategic Case is weak or poorly conceived even if it has an otherwise strong business case.

The DfT expectation is that applicants 'show their working' in relation to how they have reached a decision that their preferred option is the right option. The purpose of this brief note has been to explain the various workstreams that will be required to create a strong narrative that explains a logic from the initial 'problem' to how contributing to transport objectives will help overcome the problems and then to explain why the solution selected is the best option to do so.

7. Conclusion and Next Steps

Embarking on the process to deliver a new railway station onto the network is far from easy or straight-forward. The process is long and can be difficult. Successful schemes require not only a good business case, but also the energy, focus and determination of the promotor and a strong political champion to see the project through to fruition.

Fundamentally, though, there needs to be both a strong business case and the approval and acceptance of key stakeholders, notably the DfT and NR, that the new station is the right solution in providing the forecast benefits and outcomes any infrastructure intervention is intended to deliver.

Our further assessments have looked at demand modelling, economic case, station construction, costs and strategic fit and has determined that in each case the prospects appear positive and that based upon the assumptions there would appear to be a good prospect of a scheme of medium value for money which would deliver an acceptable BCR.

The next stage will be focussed on continuing to build momentum and set the conditions for success:

- Strong Governance – A Project Board (or equivalent) to set the direction, provide support and facilitate timely strategic decision making (this will require the interface with Meecebrook project's existing governance to be defined).
- Stakeholder management (in particular DfT and NR).
- Co-ordination – promoters and consultants working together to build a strong and coherent strategic case.
- Funding options - develop thinking and relationships early, conscious some opportunities can be lost if not addressed early in a project. This may also be relevant to determining the funding model for scheme development

Recommended priority activities for the next stage:

- Create a guiding coalition with sound governance and stakeholder involvement.
- Agreed funding strategy for development of the new railway station.
- Develop operational performance modelling in consultation with rail industry stakeholders.
- Requirements capture – location and facilities – with developer and other. stakeholders (NR, TOC etc).
- Identify key opportunities and constraints – land availability, access requirements and interface with the overall transport strategy.
- Detailed site surveys – topographic, GI, environmental data, etc.
- Identify key risks (with stakeholders) and determine appropriate mitigations to reduce risks and increase certainty of delivery.
- Develop a DfT complaint '5-case' business case through SOBC and towards OBC – carefully building a strong and coherent strategic case.

Report: 20/07/2022

Meecebrook Station

Reference: GB01T21E91

Meecebrook Station Demand Forecasting and Economic Appraisal

SYSTRA

Meecebrook station

Meecebrook Station Demand Forecasting and Economic Appraisal

Identification Table

Client/Project owner	SLC Rail
Project	Meecebrook Station
Study	Meecebrook Station Demand Forecasting and Economic Appraisal
Type of document	Report
Date	20/07/2022
Reference number	GB01T21E91

Approval – Version 1

	Name	Position	Date	Modifications
Author	K Woodward	Consultant	15/07/2022	
Checked by	O Hockney	Principal Consultant	19/07/2022	
Approved by	J Jackson	Associate Director	20/07/2022	

Table of contents

List of figures

List of tables

1. Introduction

1.1.1 In February 2022, SYSTRA completed a pre-feasibility assessment of the viability for a new station to serve the proposed garden settlement of Meecebrook in Staffordshire, to be located on the West Coast Mainline between Stafford and Crewe stations. Using indicative costs provided by SLC Rail, SYSTRA were able to estimate the number of passengers required to deliver low, medium and high value for money. From this, SYSTRA were able to recommend that the proposed station should be considered for further detailed examination.

1.1.2 Based on the above a more detailed assessment has been commissioned to explore the economic case for the new station. This note sets out our approach to undertaking this work and the results of the analysis.

1.1.3 In the following sections we present the demand forecasting and appraisal methodology and the findings of our analysis, considering the value for money of the proposal as well as presenting evidence around the likely demand for the station and revenue forecasts.

1.1.4 Our analysis has shown that that station is predicted to generate **medium** value for money. However, this is entirely dependent on the delivery of development surrounding the station.

2. Demand Forecasting

2.1.1 Within this section we set out the data sources used and the methodology employed to estimate demand for the new station. There are two elements to the demand forecasts which are covered in this section:

- The patronage predicted to be generated by the new station (separated into trips generated by the existing population, trips abstracted from new stations and trips generated by new development)
- The patronage predicted to be lost from existing services as a result of the additional time penalty imposed by a call at Meecebrook

2.1.2 The sections below describe the approach to estimating this demand including key assumptions and data sources.

2.2 Train Service Scenarios

2.2.1 In March 2022, a high-level operational feasibility review was undertaken by Rail Aspects Ltd to identify where calls at a new station at Meecebrook could potentially be accommodated. This was based on a December 2019 (pre-COVID) service specification. This work identified that three West Midlands Trains services could call at Meecebrook in the up direction and two could call in the down direction, these are shown below:

Figure 1 - Summary from Rail Aspects timetabling report

2.2.2

Service Pattern	Direction	Origin-Destination	Approximate time at Meecebrook	RAG status
1GXX	Up	Liverpool-Euston	XX:35	G
2YXX	Up	Liverpool-Euston	XX:05	G
1UXX	Up	Crewe-Trent Valley-Euston	XX:46	G
1FXX	Down	Birmingham International-Liverpool	XX:15	R
1FXX	Down	Euston-Liverpool	XX:45	G
1UXX	Down	Euston-Trent Valley-Crewe	XX:41	G

2.2.3 However, the timetable that was considered in the operational feasibility review is different to the timetable in operation today. The main difference being that the previous Liverpool – London Euston service currently only operates between Liverpool and Birmingham. SYSTRA has therefore assumed a service level of:

- 1TPH Liverpool – Birmingham
- 1TPH Crewe – Trent Valley – Euston

2.2.4 This retains the principle from the Rail Aspects report of two trains per hour being able to call in each direction but uses the current services available.

2.3 Market Segments

2.3.1 SYSTRA has identified three market segments impacted by the new station, as set out below:

- **Local catchment demand** – demand generated by the population / employment currently within 5km of the station. A relatively constrained catchment of 5km was chosen given current uncertainty surrounding the level of parking provision / layout of access roads that may be provided at the station.
- **New development demand** – demand generated by proposed development within the local catchment of the station
- **Lost passengers** – passengers currently travelling on services which pass through the Meecebrook station site who would no longer travel as a result of the additional journey time imposed by a station call

2.3.2 The methodology for calculating the size of each market segment is set out in the following section.

2.4 Sources of Data

2.4.1 The three main sources of data for the demand forecasting element of this work are:

- National Rail Travel Survey (NRTS) data
- West Midlands Rail Executive (WMRE) MOIRA data
- Census data

National Rail Travel Survey

2.4.2 NRTS data provides a detailed source of information on the trip patterns of rail users. The data was provided for seventeen stations as listed below:

- Acton Bridge (Cheshire)
- Alsager
- Blythe Bridge
- Crewe
- Hartford (Cheshire)
- Kidsgrove
- Lichfield Trent Valley
- Longport
- Longton
- Nantwich
- Penkridge
- Rugeley Trent Valley
- Stafford
- Stoke-On-Trent
- Stone (Staffs)
- Whitchurch (Shropshire)
- Winsford

2.4.3 The following variables were used as part of this study.

- Origin and destination station of passengers
- Expansion factors to inflate survey to annual trips
- Five digit origin and destination postcode for trips
- Access and egress mode to and from stations
- Access and egress distance to and from stations

2.4.4 The data was used to understand the catchments of existing stations. This was used to inform the calculation of trip rates for all of the existing stations as well as understand potential abstraction to Meecebrook from existing stations.

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

- The data is now very old with surveys having taken place between 2001 and 2005 (depending on location). This means that the distribution of trips cannot account for any changes to rail services or station access mode choice that have taken place since this time
- The data cannot account for any changes in the distribution of passengers since the survey was undertaken, for example it cannot account for a housing site which has been built since the survey which may generate a substantial number of trips, although adjustments can be made to deal with this issue

WMRE MOIRA

2.4.6 A copy of the MOIRA1 programme was provided for the project by West Midlands Rail Executive. MOIRA is a software programme utilised by the rail industry to understand the impact of timetable changes on demand and revenue. The programme operationalises the guidance on demand forecasting, including demand elasticity values, found within the Rail Delivery Group (RDG) Passenger Demand Forecasting Handbook (PDFH) which is the rail industry's standard guidance on demand forecasting.

2.4.7 The version provided covered both trips and revenue and was used to understand trip distribution from existing stations and to estimate the potential revenue which could be generated by Meecebrook station.

2.4.8 As the MOIRA dataset was very detailed and provided flows across the UK, the trip distribution was simplified to make the dataset more manageable. Stations which were served directly were included as individual stations. All other stations were allocated to Government Office Regions with a proxy station allocated for each region. For example all flows to Yorkshire and the Humber were classified as Leeds.

Census Data

2.4.9 Census data was used to provide an understanding of demographics within station catchments. This was used to derive a trip rate for existing stations and to provide a basis for calculating the number of trips which may be generated by the new station. The following datasets were used:

- Population estimates - small area: 2020, Output Area (OA) level
- WP101EW – Population (workplace population): 2011, OA level

2.4.10 All data was analysed at OA level as this is the most spatially disaggregate scale available. Workplace population data was only available for 2011, therefore this data was inflated using growth factors for 2011-2020 for workers at MSOA level from TEMPro.

2.5 Local Catchment Demand

2.5.1 The local catchment demand includes trips which are predicted to be generated by those **currently** living or working within the station catchment (up to 5km). This has been calculated using a trip-rate based approach using National Rail Travel Survey (NRTS), ORR Station Usage and Census data. The approach is described below:

1. NRTS data was used to understand the proportion of trips generated by different catchment bands (0-800m, 800m-2km and 2-5kmat existing stations. These trips were split into 'producer' and 'attractor' trips to understand whether the trip was generated by the resident population or attracted to the station (for example for employment)
2. As NRTS data represents an average day in 2005, the data was inflated to the latest ORR Station Usage figures (2019-20)
3. TRACC software was used to allocate Census Output Areas (OAs) to their closest station, this allowed forecast Census population / employment figures to be assigned to station catchments. Two scenarios were run, one with and one without Meecebrook. The results of the Meecebrook catchment analysis are shown in Figure 1
4. The data derived in steps 1-3 was used to calculate producer trip rates (per usual resident) and attractor trip rates (per job) within the distance bands for each of the existing stations
5. The most appropriate trip rates in each distance band were selected to be used within the Meecebrook trip rate. This was to ensure that the trip rates were not reliant on one station. The Penkridge trip rate was used for less than 800m and an average of the Penkridge and Stafford trip rates were used for the 800m – 2km and 2 – 5km bands.
6. The trip rates were split proportionately across the trip distribution for each station to provide a trip rate per destination
7. These trip rates were adjusted based on the GJT for the existing station and for the Meecebrook using elasticities from the Passenger Demand Forecasting Handbook (PDFH). This meant that the trip rates were adjusted to account for differing service levels between station pairs
8. An average of the adjusted trip rates was applied to the Meecebrook population and employment forecasts to calculate the potential number of trips which could be generated by the station

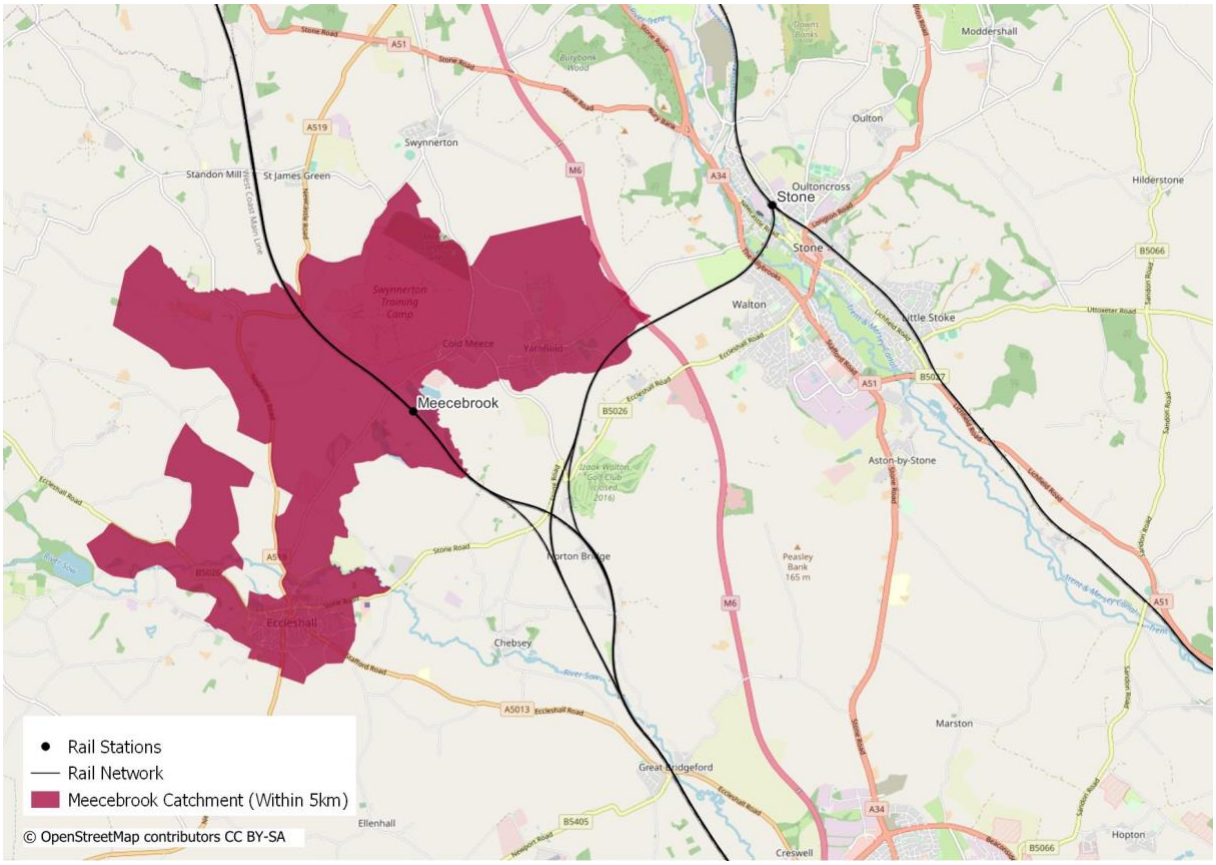

Figure 2 - Meecebrook Catchment

2.5.2 It should be noted that the catchment does not extend to the south east of the station because the shape / size of the Output Area covering this location means the centroid is further than 5km from Meecebrook.

2.6 Abstracted Demand

2.6.1 Abstracted demand represents users that would transfer to Meecebrook who are currently using existing stations. NRTS data and GIS software was used to assess this, as set out below.

1. The NRTS trips were inflated to the most recent (pre-COVID) demand, assigned to Output Areas, and mapped using GIS software
2. The catchment bands for the new station were overlaid onto this NRTS data
3. Any existing trips within these catchment bands were assumed to have the potential to be abstracted from existing stations to the new station
4. Full generalised costs for the original station and the new station were calculated (access time, rail generalised journey time, and egress time)
5. The generalised costs calculated above were used in a logit model, using station choice parameters from the PLANET Framework Model (v7.1) (see table below)

Table 1 - Station Access Parameters for Logit Model (PLANET Framework model V7.1 page 59)

TRIP PURPOSE	STATION ACCESS PARAMETER (UTILS/MIN)
Business	0.0247
Commute	0.0359
Other	0.0156

6. The outcomes of the logit model were then used to estimate the total number of abstracted passengers

2.6.2 From this point, the total abstracted passengers calculated above were then appraised separately from the new demand in terms of revenue impacts and socio economic impacts.

2.7 Development Demand

2.7.1 The potential demand generated by new development was calculated following a trip rate based approach. The new development included in this analysis is that associated with the Meecebrook New Garden Settlement, a 6,000 dwelling development to be constructed adjacent to the new station site.

2.7.2 The development site was allocated to catchment bands (0-800m, and 800m-2km) and converted to population figures using national average household size. The development was phased across the local plan period to determine an

annual build out of the housing development. By the end of the local plan period, the development is forecast to result in a population of 14,400.

Trip Generation

2.7.3 The trip rates calculated in section 2.5 for the local catchment were applied to the additional population generated by each development to determine trip generation. This analysis indicated that in 2040, once the development has been assumed to be built out, the garden village could generate just over 300,000 trips.

2.8 Lost Passengers

2.8.1 The final element of demand assessed by SYSTRA was the potential impact on existing passengers of the additional journey time imposed by a stop at Meecebrook. As discussed in section 2.3.2, MOIRA was provided by West Midlands Rail Executive (WMRE). The model contained a copy of the May 2022 timetable along with demand and revenue for the 12 months up to September 2019.

2.8.2 In the modelled scenario, arrival and departure times from existing stations were adjusted to account for a stop at Meecebrook station (as new stations cannot be modelled directly in MOIRA). The difference in trips and revenue was then exported for use in the appraisal.

2.9 COVID impact

2.9.1 The DfT has suggested three scenarios for COVID recovery: a high recovery (best case), a medium recovery and a low (worst case) recovery, these are disaggregated to operator level. In the **core scenario**, the DfT **medium** case for West Midlands Trains has been used.

2.10 Growth

2.10.1 Background growth in patronage has been estimated using the outputs from the DfT's EDGE forecasting tool. This tool operationalises PDFH background growth methodology to forecast future demand changes.

3. Demand Forecasting Results

3.1.1 This section presents the results of the demand forecasting work for the core scenario.

3.2 Demand at the Station

3.2.1 The table below presents the volume of trips, broken down into four elements in three forecast years. The figures are presented for both the first year of full operation in 2026, and in 2030, as PDFH guidance requires a build-up of demand over four years as well as 2040 which is the end of the Local Plan period.

Table 2 - Forecast Demand at the Station

	2026	2030	2040
Local catchment	16,866	34,993	37,672
Abstracted	4,423	9,194	9,936
Garden Village	23,546	133,281	355,417
TOTAL	**44,835**	**177,469**	**403,026**

3.2.2 The table above indicates that, by 2040, the station is predicted to generate a substantial number of trips with over 80% of these trips predicted to be generated by the new development. The level of abstraction from other stations is very low reflecting the constrained catchment area used in the modelling, and the highly rural nature of the catchment. The low levels of local catchment and abstracted demand highlight the dependence that the station has on the garden village development.

3.2.3 The table below shows the forecast top 5 destinations in 2040.

Table 3 - Forecast Top 5 Destinations in 2040

STATION	TRIPS	%
Birmingham	143,071	35%
Stafford	90,405	22%
London BR	41,969	20%
Manchester BR	41,834	10%
Wolverhampton	20,547	5%
All other destinations	65,199	16%
Total	**403,026**	**100%**

3.2.4 The table above shows that just over a third of trips from Meecebrook in 2040 are expected to be to / from Birmingham with just over 20% to / from Stafford.

The distribution of trips to / from Birmingham and London is something that will need to be explored in more detail during the next phase of work for the station.

3.3 Impact on Existing Services

3.3.1 In addition to estimating the passengers that may be generated by the station, the impact on existing passengers as a result of the additional journey time imposed by the station call has been calculated. The demand impacts at three forecast years are shown below.

Table 4 - Impact on Existing Passengers

	2026	2030	2040
Impact on existing services	-14,024	-28,931	-31,197

3.3.2 The table above indicates that the number of passengers lost from existing services is fairly significant compared to station trip generation in 2026. However, by 2040, after full development build out this is far less significant.

3.4 Net Demand Impact

3.4.1 The table below combines the above demand elements to estimate the net impact of opening the new station at Meecebrook. In the table below the new demand at the station excludes trips abstracted from other stations.

Table 5 - Net Demand Impact

	2026	2030	2040
New demand at station	40,413	168,275	393,089
Impact on existing services	-14,024	-28,931	-31,197
Net impact	**26,389**	**139,344**	**361,892**

3.4.2 The table above demonstrates that the net trip generation at the new station is predicted to be higher than the patronage lost from existing services as a result of the station call.

4. Appraisal Methodology

4.1.1 This section sets out the approach to scheme appraisal for the various demand components. The appraisal methodology follows the most up to date DfT TAG guidance, that published in November 2021.

4.2 General Assumptions / Parameters

4.2.1 This section sets out the general assumptions and parameters that have guided the appraisal process.

Table 6 - Appraisal Parameters

PARAMETER	VALUE
First full year of operation	2026
Background growth cap	2042
Inflation cap	2042
Appraisal period	60 years

4.2.2 All costs and benefits were deflated and discounted to the department's base year (2010) in line with TAG. Demand lags were applied to the first four years of demand in line with PDFH guidance.

4.3 Sources of Benefit

4.3.1 The following benefits have been assessed as part of the appraisal.

- Revenue
- Travel time savings
- Marginal external cost
- Generalised cost savings for abstracted passengers

4.3.2 The following sections set out the approach to assessing these.

Revenue

4.3.3 To estimate revenue for trips generated to / from Meecebrook Full, Reduced and Season fares for single trips to / from Stafford for each of the origin – destination pairs in the model were extracted from MOIRA. An average fare per mile was then calculated for each origin – destination and ticket type for Stafford flows and then applied to Meecebrook mileages.

4.3.4 All values were inflated using values from TAG Table A5.3.1, then deflated to 2010 prices using the GDP deflator values from the TAG databook.

Marginal External Cost

4.3.5 To calculate the marginal external cost impact, diversion factors from car to rail were first acquired from TAG Table A5.4.5. Each OD pair was assigned one of the categories in the TAG table, for example a trip between Meecebrook and Crewe was categorised as 'Non-London Short Distance Non-PTE' with a diversion factor of 31%. Rail distances were used as a proxy for car distances to determine the total distance abstracted from car each year.

4.3.6 Marginal external cost values were acquired from TAG Table A5.4.2 *Marginal External Costs and Indirect Tax – core scenario.* A weighted average for all road types forecast to 2050 was applied.

Value of Time

4.3.7 Generalised journey times and passenger differences between the base and do something scenarios were extracted from the MOIRA output. TAG Table A5.3.2 Journey Purpose / Ticket Type Splits by Flow Category was then used to acquire a purpose split for each O-D pair and ticket type combination. A weighted value of time (based on the purpose split) was then applied to the journey time saving, incorporating forecast values of time from TAG Table A1.3.2.

Generalised cost savings

4.3.8 Generalised cost savings were calculated for passengers abstracted from existing stations, as described in section 2.5.2. These savings were inflated, deflated and discounted in line with TAG guidance.

4.4 Costs

Capital Costs

4.4.1 Capital costs for the station were provided by SLC Rail. The total **base cost** for the station, in 2022 prices, is £39.99m. In line with TAG unit A5.3 *Rail Appraisal* the base cost estimates were used as the basis for the appraisal. The table below shows how the costs were processed.

Table 7 - Cost Appraisal

TYPE	COST
Cost estimate (2022)	£39.99m
Optimism bias (70%)	£67.98m
Market price conversion (1.19)	£80.89m
Inflation	£102.63m
GDP deflator to 2010 prices	£76.25m
Discounted to 2010	£46.30m

Operating Costs

4.4.2 SYSTRA has estimated the operating costs for the station based on previous station feasibility study work. The estimated cost for the station is £200,000 in 2022 prices. Optimism Bias of 41% was applied and then the values were converted to market prices, inflated, deflated and discounted for each year in the appraisal period in line with TAG guidance.

5. Appraisal Results

5.1.1 Using the demand forecasting results it was possible to conduct an appraisal following the principles set out in TAG guidance. The appraisal was conducted over a 60 year period with an assumed opening year of 2026.

5.2 Revenue Impacts

5.2.1 The table below summarises the revenue impacts of the demand forecasting work, broken down by demand element, in three forecast years.

Table 8 - Revenue Impact (2019 prices, £m)

	2026	2030	2040
Local catchment	£0.23	£0.48	£0.52
Garden Village	£0.28	£1.57	£4.2
Lost revenue	-£0.16	-£0.33	-£0.35
TOTAL	**£0.35**	**£1.72**	**£4.37**

5.2.2 In 2030 and 2040, the majority of revenue is predicted to be generated by the Garden Village development. The average yield for these passengers is £11.80, this is comparable to an anytime return ticket between Stafford and Birmingham (£20.00).

5.2.3 Revenue impacts will need to be revisited in more detail at the next phase of the analysis, especially with regard to fare differences between West Midlands Trains and Avanti West Coast services on flows that both operators serve such as Stafford – Euston.

5.3 Other Benefits

5.3.1 The table below presents a breakdown of benefits discounted over a 60 year period for revenue, value of time savings and marginal external cost savings.

Table 9 - Benefits Breakdown - Discounted Values Over 60 Years (£m)

BENEFIT TYPE	IMPACT (£M)
Rail revenue	£65.82
Value of time savings	-£7.16
Generalised cost savings	£0.7
MECC	£21.83
Present value of benefits (PVB)	**£81.2**

5.3.2 In terms of revenue, the benefits generated by the demand at Meecebrook station are large enough to offset the associated MOIRA disbenefits. Overall the scheme is predicted to generate a positive present value of benefits.

5.4 Appraisal Results

5.4.1 The table below presents a summary of the scheme appraisal. Two versions of the BCRs have been presented. The first 'conventional' scenario has the revenue presented as a benefit. The second presents revenue as a negative cost in line with DfT TAG guidance which requires all franchise revenues generated after the completion of the existing franchise to accrue to central government. In the case of the latter a Benefit Cost Ratio is not generated in many schemes as the revenues generated offset the capital and operating costs of the scheme, suggesting that the scheme is in principal commercially viable.

Table 10 - Appraisal Results (£m)

	CONVENTIONAL BCR	REVENUE AS NEGATIVE COST
PVB	£81.2	£15.38
PVC	£51.54	-£14.28
Net Present Value (NPV)	£29.66	£29.66
Benefit Cost Ratio	**1.58**	**N/A**
Value for Money Category	Medium	N/A

5.4.2 The table above indicates that the scheme is predicted to generate medium value for money when the conventional appraisal is used. When revenue is treated as a negative cost, the revenue generated by the scheme is predicted to offset the costs.

6. Sensitivity tests

6.1.1 This section presents the results of sensitivity tests on the specified service scenario. The following sensitivity tests have been conducted:

- Impact of COVID-19 upon demand
- Reduced London trip rate

6.2 COVID-19

6.2.1 As discussed previously, the core scenario appraisal has been based on the DfT's **medium** recovery scenario. The table below summarises the results for the low and high recovery scenarios.

Table 11 - COVID-19 Sensitivity Test (Conventional BCR) (£)

	CORE SCENARIO	LOW DEMAND	HIGH DEMAND
PVB	£81.2	£68.35	£88.74
PVC	£51.54	£51.54	£51.54
NPV	£29.66	£16.81	£37.2
BCR	**1.58**	**1.33**	**1.72**
Value for Money Category	Medium	Low	Medium

6.2.2 The table above indicates that, in the low demand recovery scenario the scheme is predicted to generate low value for money.

6.3 London

6.3.1 As referenced previously, the appraisal is moderately sensitive to long-distance trips particularly towards London. Therefore a sensitivity test has been undertaken examining the impact of halving the trip rate to / from London. The results are shown below.

Table 12 - London Sensitivity Test (Conventional BCR) (£)

	CORE SCENARIO	LONDON SENSITIVITY
PVB	£81.2	£73.59
PVC	£51.54	£51.54
NPV	£29.66	£22.05
BCR	**1.58**	**1.43**
Value for Money Category	Medium	Low

6.3.2 The table above indicates that even when the London trip rate is halved, the scheme is still predicted to generate low value for money. However, if revenue were treated as a negative cost then the revenue generated by the scheme would still be predicted to offset its costs.

7. Summary

7.1.1 This report indicates that delivering a station at Meecebrook is predicted to deliver Medium value for money. However, this is heavily dependent on the delivery of the adjacent Garden Village development. This report has also indicated that the following further work will be needed at the next stage of the analysis:

- Assumptions regarding the build out rate for development will need to be refined given the case is dependent on this demand
- Trip distribution, particularly trips towards Birmingham and London will need to be considered in more detail and benchmarked against other similar stations
- Engagement with DfT in relation to the dependence on development trips
- Sensitivity tests around average yield
- Development of detailed station operating costs

7.1.2 The uncertainty surrounding the second point has already been partly addressed through sensitivity testing which indicated that even when the London trip rate is halved the scheme is still predicted to generate medium value for money.

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21 February 2022

Issue 1.1

Dear Jeremy,

Rail Aspects Limited – Meecebrook Railway Station Timetable Review

SLC Rail has asked Rail Aspects Limited to conduct a high-level operational feasibility review, to support the proposed opening of a new station at Meecebrook, north west of Stafford.

The agreed scope of work is to review the current timetable and any known and committed forthcoming changes, and to review the local railway geography and local operating constraints, at a high level, and to identify risks and opportunities arising from inserting station calls at Meecebrook within the existing train service.

1 Executive Summary

Based on the analysis that has been conducted, and assuming a timetable baseline equivalent to the December 2019 (pre-COVID) service specification, station calls at Meecebrook could be accommodated in at least one of the two existing twice-hourly West Midlands Trains services between Liverpool Lime Street and Birmingham New Street/London Euston, by means of timing adjustments to these services and without undue consequences.

Station calls could also be inserted in the approximately-hourly West Midlands Trains services between Crewe and London Euston via the Trent Valley.

This approach would deliver approximately 24 Up (southbound) and 24 Down (northbound) calls at Meecebrook each day, providing direct through services to/from Birmingham, London and Liverpool, with the opportunity for to connect with other train services to reach a wider range of destinations or for faster journey times.

Insertion of calls in other passing services (predominantly Avanti West Coast high speed services) is likely to prove more problematic and has not been investigated in depth at this stage.

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Provision of station calls at Meecebrook is highly likely to require provision of a 4-platform station, i.e. platforms on the Fast Lines and on the Slow Lines. Although it would probably be possible to arrange for the majority of weekday stopping services to be timetabled on the Slow Lines, this would not be possible on Sundays owing to engineering access restrictions. It is also considered likely that services planned via the Slow Lines will be regularly run via the Fast Lines during periods of disrupted running, as a service recovery measure.

Introduction of the station calls within the existing service would likely have some performance implications, particularly in the form of risk of knock-on delays to other train services, as the route is congested, especially towards Liverpool, and towards Wolverhampton and Birmingham. These risks have not been quantified but are considered unlikely to be severe enough to prevent further development of the scheme at this stage.

The opening of HS2 Phase 2a, expected between 2029 and 2033, is likely to provide further opportunities for connectivity from Meecebrook. The Crewe Hub will allow interchange between conventional services and high speed services at Crewe, providing potentially-accelerated journey times to London and Birmingham. Also, with high speed services running predominantly via HS2 taking a share of long distance traffic, it may become viable to insert station calls at Meecebrook into other current long-distance services, e.g. those between London and Liverpool or between Birmingham and Scotland, which are likely to become more flexible in terms of journey time extensions.

2 Introduction

SLC Rail has been asked to conduct a feasibility study into the opening of a new railway station at Meecebrook, north west of Stafford and south east of Crewe. The railway station would serve new housing developments in the local area.

The feasibility study will investigate engineering considerations, the economic business case and the operational feasibility of stopping trains at the proposed station.

This report has been compiled by Rail Aspects Limited, in advance of the engineering and economic analyses, to provide SLC Rail with an initial view as to the railway operational feasibility.

2.1 Demand Considerations

Detailed demand estimates form part of the wider project, and are not yet available to inform this analysis. It is assumed for the purposes of this study that the principal markets would be to Birmingham, London, cities in the north west of England and other local population centres for the purposes of commuting, leisure and business travel, and to/from London, Birmingham, Manchester and Liverpool for business travel.

3 Proposed Scheme

It is assumed that the station will be located on the Stafford-Crewe section of the West Coast Main Line (WCML) (Line of Route code NW1001, Engineers' Line Reference LEC4), see Figure 1:

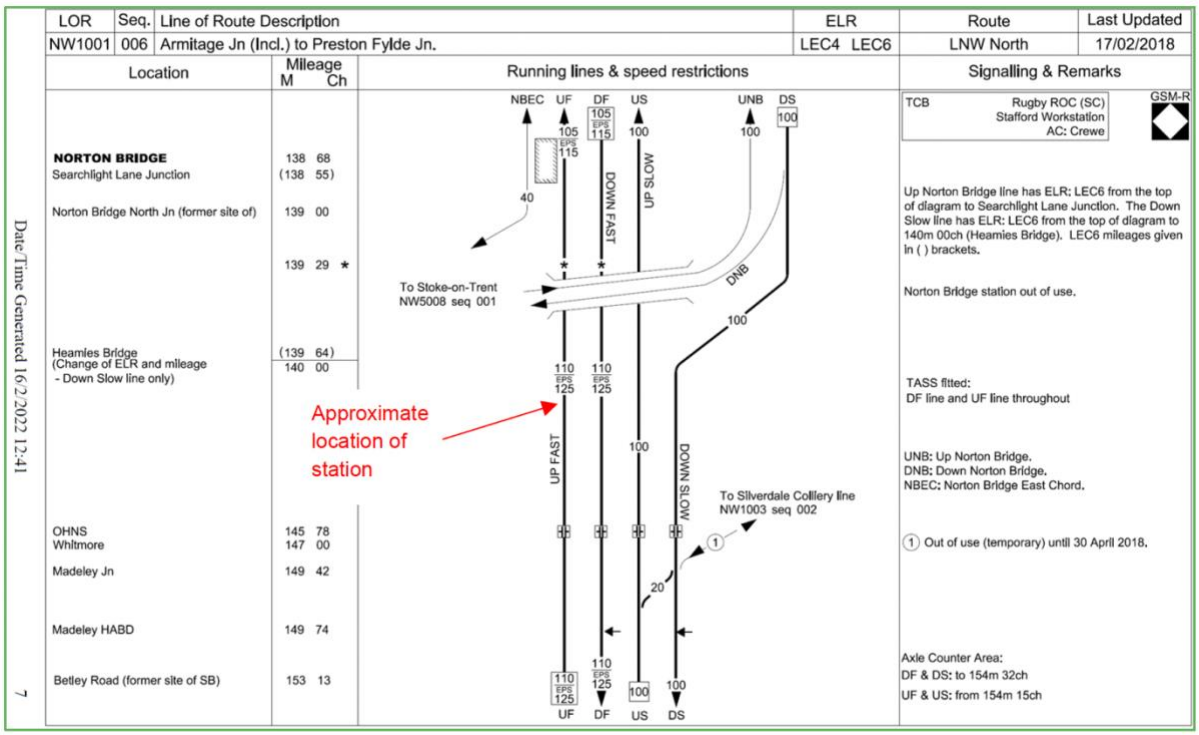


Figure 1: Sectional Appendix extract showing the approximate location of Meecebrook station. Sectional Appendix attached as Appendix II

For the purposes of the initial investigation, the assumption made is for a four-platform station, to accommodate Engineering Access requirements (see Section 8.4) as well as for maximum flexibility in scheduling.

It is assumed that the proposed location is north west of the Heamies Farm road-over-rail bridge (BR24):

Click here to view the map

The approximate route mileage of the station would be 140 miles 24 chains.

3.1 Engineering Factors

Engineering factors have not been considered in any detail at this stage. It is noted that the alignment is in a shallow cutting, on gently curved track with a gradient of 1:569 rising in the Down (north west) direction, and appears sufficient to accommodate platforms c. 240 metres in length, sufficient to accommodate any likely passenger train formation on the route.

The line speed at the location is 110 mph on the Fast Lines (125 mph Enhanced Permissible Speed for tilting trains) and 100 mph on the Slow Lines.

The location is controlled by Rugby Rail Operations Centre (ROC).

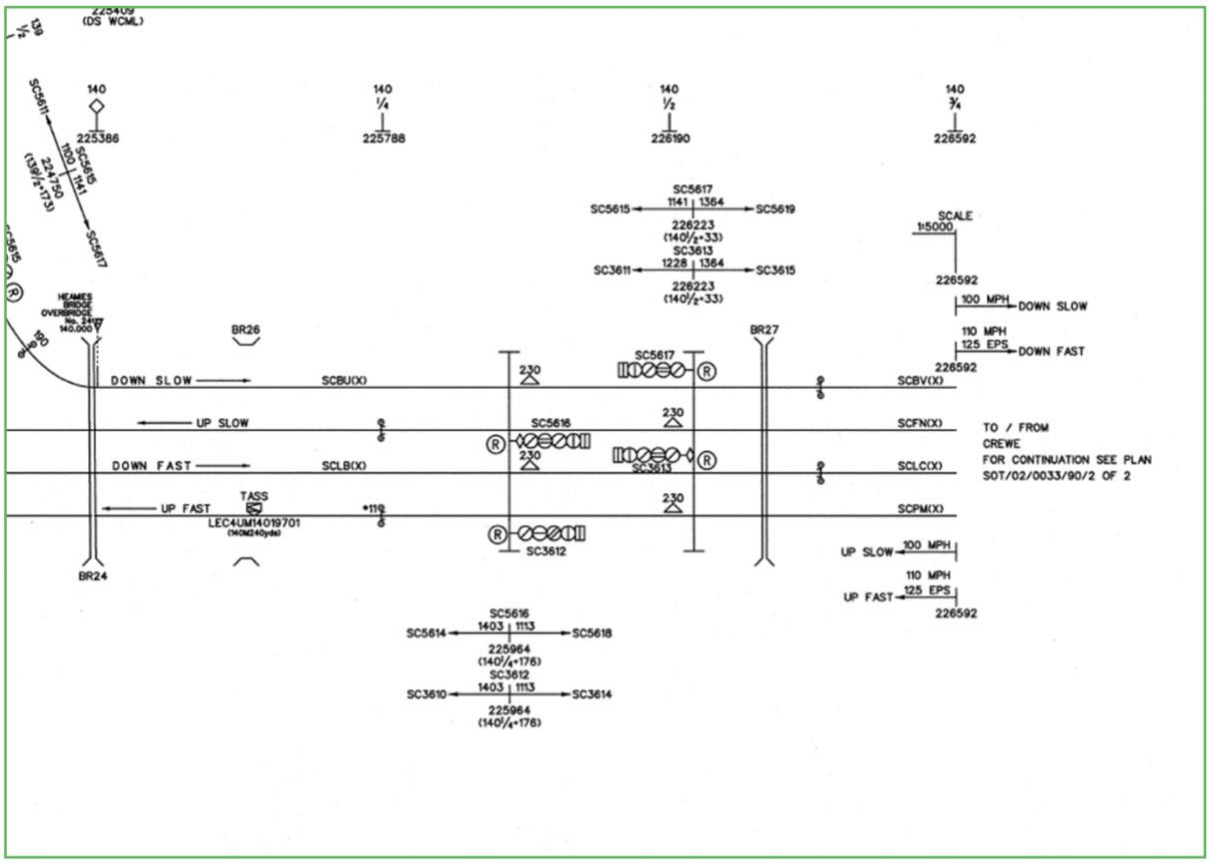


Figure 2: Extract from the local Signalling Plan. Full signalling plans attached as Appendix III

Local signalling is designed for high speed non-stop services, with block lengths of 1100m to 1400m (Figure 2) and the planning headway in the immediate vicinity is 3 minutes between following train services (up to a maximum of 13 trains per hour on the Fast Lines).

Consequently, it should be assumed that the current signalling would not be ideally suited to stopping of services within the signal blocks.

However, given the relatively anticipated level of service, together with the flexibility offered by the 4-track configuration, any alterations to existing signalling are considered likely to be necessary only if it is required to run consecutive stopping services at close headways or if the location of existing signals conflicts with other engineering considerations such as the location of station platforms.

There are no level crossings in the immediate vicinity.

4 Existing Train Service

The December 2019 timetable has been used as the basis for this assessment, representing a likely steady-state once COVID temporary timetables are withdrawn. The conclusions drawn below might vary were the train service specification to remain below December 2019 levels, either by easing planning constraints or, conversely, providing fewer paths that would be amenable to having station calls inserted.

The passenger train service passing through the proposed station site in the December 2019 timetable consists of:

- Twice-hourly West Midlands Trains (WMT) services (branded "London Northwestern Railway") from Liverpool Lime Street to Birmingham New Street and London Euston, with one train per hour continuing directly on to London Euston and one terminating at Birmingham New Street (although in practice, this train sometimes works though to London Euston as well). Unusually, in the December 2019 timetable, this service pattern was imbalanced with one Down (northbound) service currently starting from Birmingham International rather than London Euston
- Hourly WMT services between Crewe and London Euston via the Trent Valley.
- Hourly Avanti West Coast services between Glasgow and London Euston via the Trent Valley
- Hourly Avanti West Coast services between Manchester and London Euston via Crewe and the Trent Valley
- Hourly Avanti West Coast services between Liverpool and London Euston via the Trent Valley
- Hourly Avanti West Coast services between North Wales and London Euston via the Trent Valley
- Hourly Avanti West Coast services between Glasgow/Edinburgh and London Euston via Birmingham New Street
- Occasional Avanti West Coast services between Blackpool and London Euston via the Trent Valley

There is also intensive freight traffic along the WCML past the station site, typically 2-3 paths per hour in each direction.

Services between Birmingham and Stoke-on-Trent diverge from the WCML at Norton Bridge Jn., to the south east of the proposed station site.

4.1 Future changes to train services

There are no short-term significant changes planned to current train services at present other than some retiming anticipated as a result of HS2 stageworks (fewer platforms being available at Euston) and with replacement of Class 221 Diesel Multiple Units with Class 805 Bi-mode Multiple Units expected later in 2022. Note that services are currently running at reduced frequencies as COVID recovery continues, but a realistic assessment seems that the timetable will revert to the December 2019 pattern and frequencies in the medium term (1-2 years).

4.2 Impact of HS2

Longer-term, the opening of HS2 Phase 1 in c. 2026 will lead to substantial timetable changes on the WCML.

Once Phase 2a is open between Birmingham and Crewe, high speed services are expected to operate from London Euston via HS2 and Crewe Hub, to Glasgow, Edinburgh, Manchester, Liverpool and North Wales using classic-compatible high speed rolling stock.

In theory, this will remove most long-distance high-speed traffic from the WCML south of Crewe; however, it appears likely that at least some paths will be retained to maintain connectivity with intermediate stations such as Milton Keynes, Rugby, Coventry, Wolverhampton, the Trent Valley stations and Stafford. As end-to-end journey times will become less sensitive, it is also possible that these paths will be regularised, e.g. adding additional calls at Milton Keynes or Stafford, for example.

This would offer improved journey times from these locations whilst also reducing constraints on capacity on the Stafford-Crewe section, either by reducing the number of required paths or by increasing the flexibility of remaining paths (possibly also opening up the potential to introduce calls at Meecebrook in residual train services).

However, constraints on other routes (Crewe to/from Liverpool in particular, and between Wolverhampton and Birmingham to some extent) would probably remain in place post-HS2.

5 Principal timetabling/capacity constraints

The Stafford-Crewe section of the WCML is intensively utilised, although the segregation of Fast Lines and Slow Lines combined with the recent grade-separation of the junction at Norton Bridge provide some flexibility with the principal constraints being either side of Crewe, where the four-track alignment narrows to a three- or two-track alignment.

South of Stafford, the Trent Valley is a 2-track railway between Milford Jn. and Colwich Jn., then reverts to 4-track except for a short distance south of Nuneaton.

The route between Stafford and Wolverhampton is, by the current standards of the railway network, relatively lightly utilised with only six trains passing in each direction in most hours. Further to the south, this route becomes increasingly congested through Wolverhampton and at Birmingham New Street and the service is sufficiently intensive throughout the day that it is very difficult to find flexibility in train paths.

Onwards towards Liverpool, the route is fairly congested with a mixture of high-speed, regional and local services, although with some flexibility around individual train paths.

In summary, retiming of services to accommodate a station call at Meecebrook would probably need to take place away from Birmingham New Street and the WCML South, and also minimise any impact on high-profile, high-speed services on the WCML.

6 Options for serving Meecebrook station

Consideration has been given as to the most appropriate service(s) in which to insert station calls at Meecebrook.

Avanti West Coast services were discounted from further study at this stage owing to their sensitivity to additional journey time, combined with tight timings and the difficulty in managing knock-on impacts over such a wide area. Post-HS2 Phase 2a, this situation may change.

The WMT London-Birmingham-WCML-Crewe-Liverpool appeared to offer a viable option from a perspective of providing a regular service, with a potential 2 trains per hour, and direct connections and connection opportunities to Birmingham and Liverpool and other key local destinations, including via Crewe.

The WMT London-Trent Valley-Crewe services would provide a once-hourly service and direct connections to London with attractive journey times; these have also been reviewed.

Full extracts from the weekday public and working timetables are provided for information. See Appendix IV.

7 Timetable Study Assumptions

A timetable study has been conducted, to examine the viability of inserting station calls at Meecebrook into the current timetable. The following assumptions have been made:

- The Network Rail Working Timetable (WTT) valid from 14th December 2019 has been used as the basis of this analysis and has been downloaded as a timetable file from the Network Rail Open Data Feeds1;
- The state of the network is taken from the current Network Rail 'Sectional Appendix' and from Reference Data available from, the Open Data Feeds;
- Timetable changes have been constrained by Network Rail's Timetable Planning Rules (TPRs) for London North Western and Western and Wales for 2022, which set out the train planning rules that train operators must observe for the routes in question.

A station stop at Penkridge, as a proxy for Meecebrook, requires 2 additional minutes as specified in the TPRs, comprising of 1.5 minutes braking and acceleration time and 0.5 minute station dwell time. However, the linespeed in the vicinity of Meecebrook is higher than at Penkridge and station dwell times for WMT services generally alternate between 0.5 minutes and 1 minute. For these reasons, the journey time penalty for a station stop at Meecebrook has been estimated at 3 minutes for the purposes of this study. This assumption should be validated in due course using an industry-approved method as set out in the TPRs.

For the purposes of this study, it has been assumed that Avanti West Coast and Arriva CrossCountry paths are fixed as per the December 2019 timetable. Flexibility in other passenger service paths has been assumed provided that existing times can be maintained at key locations, notably Birmingham New Street and London Euston. Flexibility in freight paths has been assumed, provided that it appears reasonably likely that the path could be adjusted within the same half-hour period.

WMT services which stop at Meecebrook have been retimed at locations north of Meecebrook, or between Meecebrook and Birmingham New Street, with times at Birmingham New Street and on the WCML Trent Valley south of Stafford remaining fixed. Where possible, timing adjustments have been minimised by making use of existing timing allowances (pathing allowances) which would no longer be needed once the adjustments are made, or by reducing station dwell times where these are longer than required by the TPRs.

8 Findings and Conclusions

8.1 WMT London-Birmingham-WCML-Crewe-Liverpool services

1GXX Up services: These service call at Stafford at approximately XX:40 every hour and would pass the proposed Meecebrook station site approximately 5 minutes earlier. Many services have 1 minute pathing allowance approaching Wolverhampton and further pathing time between Wolverhampton and Birmingham New Street combined with a 2-minute dwell at Wolverhampton (1 minute minimum in the TPRs). Retiming each service 3 minutes later into Wolverhampton would generally require the WMT Crewe-Stoke-Euston service, which follows the Liverpool service, to be retimed but this is generally feasible as the Crewe services also have generous dwell times at Wolverhampton.

Alternatively, retiming backward from Liverpool may be feasible. Although the paths slot between a Liverpool-Crewe stopping service and a Liverpool-Chester service departing Liverpool Lime Street, they generally have pathing time inserted between Halton Jn and Weaver Jn which could be removed, with the paths then running slightly earlier and swapping with ECS / freight paths enroute to Crewe. Some paths also have extra dwell time at Crewe, which could be repurposed.

Between Crewe and Stafford, many of the 1GXX paths are scheduled to run on the Slow Lines and could accommodate the station call without impacting on other trains (freight paths are generally slower than passenger paths, and hence well clear at the potential station site). See Figure 3 in Appendix I for an illustration.

2YXX Up services: These services follow a similar pattern to the 1GXX services but on the opposite half hour, calling at Stafford at approximately XX:10. Again, most services have enough allowances between Meecebrook and Birmingham New Street to accommodate the station call by forward-timing. At Wolverhampton, this would require some adjustment to the following services, which in this case are either TfW Shrewsbury-Birmingham New Street services or Avanti West Coast Scotland-Birmingham-London paths (the exact ordering varies from hour to hour). Both of these services generally have excess dwell times at Wolverhampton and/or other allowances that could be used to localise the impact.

Alternatively, and in a similar fashion, backtiming from Liverpool may be possible, although more difficult in this case as the 2YXX paths run immediately behind the prime 1MXX Avanti West Coast Glasgow-Trent Valley-London paths between Halton Jn. and Winsford, meaning that any solution would require the 2YXX paths to run significantly earlier from Liverpool, in front of the 1MXX paths and with other consequential knock-on impacts.

Between Crewe and Stafford, most 2YXX paths are scheduled to run on the Fast Lines and could accommodate the station call without impacting on other trains as the following 1AXX Avanti West Coast North Wales-Euston services are clear behind and there are no paths immediately in front. See Figure 3 in Appendix I for an illustration.

1FXX Down services (XX:15 pattern): These service call at Stafford at approximately

XX:10 every hour and would pass the proposed Meecebrook station site approximately 3-5 minutes later.

These services generally originate at Birmingham International and depart Birmingham New Street on minimum headway ahead of the Birmingham-Wolverhampton stopping service which in turn is followed by Birmingham-Shrewsbury and Manchester-bound CrossCountry services at close to minimum headway, meaning that typically there is only c. 1 minute flexibility to back-time the services. Forward timing from Meecebrook is generally possible along the WCML, subject to some adjustment to freight paths, but between Halton Jn and Liverpool the 1FXX services generally run immediately in front of the down Chester-Liverpool service which in turn is immediately ahead of Avanti West Coast Euston-Liverpool services. The only solution that presented itself would require wholesale re-timing of Chester-Liverpool services.

1FXX Down services (XX:45 pattern): These services generally originate at London Euston and call at Stafford at approximately XX:40 every hour. Again, back-timing from Birmingham is problematic because of the proximity of the Birmingham-Wolverhampton service and the following Avanti West Coast Euston-Edinburgh paths. Forward timing along the WCML also presents a problem, as the current path runs immediately ahead of prime Avanti West Coast Euston-Glasgow high speed services on the Fast Lines.

However, diversion of the 1FXX path along the Slow Lines to Crewe would have, in practice, minimal journey time impact as the Slow Lines allow 100 mph running and, in any case, most 1FXX paths then have allowances either side of Crewe that can be used to recover the Meecebrook station stop time and any other adjustments. Finally, these services also have a more flexible path into Liverpool Lime Street.

1FXX paths would precede a regular freight path along the Slow Lines and it appears that the station call could be accommodated with minimal difficulty. Figure 5 and Figure 6 in Appendix I illustrate the current path and the potential to divert it onto the Slow Lines.

8.2 WMT London-Trent Valley-Crewe services

1UXX Up services: 1UXX Crewe-Euston paths generally depart Crewe at XX:33 and call at Stafford at XX:51, passing the potential Meecebrook Station site approximately 5 minutes earlier. Most paths are scheduled via the Fast Lines, where they slot between an Avanti 1AXX West Coast Manchester-Crewe-Euston path and the 1MXX Avanti West Coast Glasgow-Trent Valley-London paths (see Figure 4 in Appendix I), meaning that a station call on the Fast Lines would be very problematic to accommodate.

A potential solution would be to divert these paths via the Slow Lines between Crewe and Euston. Whilst there are regular freight paths along the Slow Lines, provided the 1UXX paths could precede out of Crewe earlier and ahead of a freight path, there would be sufficient flexibility to accommodate a call at Meecebrook and arrive at Stafford in front of the Arriva Cross Country Manchester-South West path.

1UXX Down services: 1UXX Euston-Crewe paths generally call at Stafford at approximately XX:36 and arrive at Crewe at XX:53, passing the potential Meecebrook Station site at approximately XX:41. Note that paths are different in peak hours.

Most paths are scheduled via the Fast Lines, where they run immediately in front of the 1FXX (XX:45 pattern) WMT path described above (see Figure 5 in Appendix I), meaning that a station call on the Fast Lines would again be very problematic to accommodate.

In a similar manner to the Up direction paths, diversion onto the Slow Lines appears feasible, arriving later into Crewe and with minimal apparent difficulty in this case.

8.3 Resourcing Considerations

WMT Euston-Birmingham-Liverpool services generally operate with turnround times of approximately 20-25 minutes at Liverpool. If both later arrivals at, and earlier departures from Liverpool were required for either the 1FXX/1GXX pattern or the 1FXX/2YXX pattern, then although the resulting turnround would remain compliant with Timetable Planning Rules (minimum value 4 minutes, or 10 minutes after consecutive short turnrounds), given the lengthy journey made by these services there may be a residual performance risk.

WMT Euston-Trent Valley-Crewe services generally operate with relatively generous 40 minute turnround times at Crewe and there are no obvious resource or disproportionate performance risks of retiming arrivals slightly later and departures slightly earlier.

All WMT services are currently formed of 4-car or (2x4) 8-car Class 350 rolling stock; future services may also be formed of 5-car or (2x5) 10-car Class 730/2 rolling stock which will replace the Class 350/2 sub-fleet.

8.4 Engineering Access considerations

The Engineering Access Statement (EAS, attached as Appendix V, in particular refer to page 138) makes provision for standard possession opportunities between Stafford and Crewe, with cyclical disruptive midweek opportunities and, more significantly, disruptive blocks of either the Fast or Slow lines at weekends.

Of particular note is that the Slow Lines may be blocked completely from 08:40 (when the route opens) to 16:30 on Sundays, with the EAS requiring that “Between Searchlight Lane/Little Bridgeford and Crewe South 0840 – 1630 SUN to be timetabled as a two-track railway over the Fast lines”.

Given that, as described above, any passenger service in the medium term is highly likely to be scheduled predominantly on the Slow Lines, this will de facto require any station at Meecebrook to have platforms provided on both the Fast and Slow lines, or else to have no scheduled Sunday service (with platforms provided on the Slow Lines only).

9 Summary

Service Pattern	Direction	Origin Destination	Approximate time at Meecebrook	RAG status
1GXX	Up	Liverpool-Euston	XX:35	G
2YXX	Up	Liverpool-Euston	XX:05	G
1UXX	Up	Crewe-Trent Valley-Euston	XX:46	G
1FXX	Down	Birmingham International-Liverpool	XX:15	R
1FXX	Down	Euston-Liverpool	XX:45	G
1UXX	Down	Euston-Trent Valley-Crewe	XX:41	G

By retiming services as described above, it would seem relatively straightforward, in terms of timetable construction to insert Meecebrook station calls in all three WMT Up direction service groups passing Meecebrook.

Inserting station calls in Down direction services is slightly more problematic, owing to lack of re-useable pathing and excess station dwell time combined with capacity constraints on the WCML and onwards towards Liverpool. Of the two service groups, the 1UXX Euston-Crewe services passing Meecebrook at approximately XX:41 appear the easier to adjust, owing to the ease of forward timing to Crewe.

One of the two 1FXX paths would also appear feasible. This path runs adjacent to the 1UXX path, meaning that both station calls at Meecebrook would occur within a few minutes of one another; however as the two service provide different journey opportunities, this may not be as problematic as it may first appear.

10 Risks

10.1 Performance risk

The issue of performance risk has been considered at a conceptual level. It is inevitable, when inserting additional station calls in existing services, that some level of performance risk is incurred. It is noted that the WMT London Northwestern service groups have recently performed below Operator target performance levels, and any proposals to modify the service are likely to have some degree of sensitivity around potential performance impacts.

In this case, the specific risks would be increases in “1st Order” reactionary delays along the Stafford-Crewe corridor and potentially on towards Rugby, Birmingham and Crewe, i.e. faster trains being delayed by the stopping services.

"2nd Order" reactionary delays, i.e. outbound services delayed by late arrival of the inbound service might also be a risk, in particular at Liverpool (see Section 8.3) and Birmingham New Street where some splitting and joining of services takes place.

These risks could be quantified by timetable performance modelling, for example using RailSys or Trenissimo, which are Network Rail's preferred tools for such purposes. timetable performance modelling could also be used to confirm the stated assumptions regarding the journey time penalty inherent in the additional station calls.

10.2 Other Risks and Issues

The timetable in the vicinity of Meecebrook appears likely to remain fairly stable in the medium term, prior to the opening of HS2 Phase 1 and probably until the opening of HS2 Phase 2, assuming that the pre-COVID timetable is reinstated in full.

Avanti West Coast have stated an objective of running a second hourly Euston-Liverpool path. Details of this service are not yet available; there is some risk that this would further complicate adjustments to the timetable.

Aside from performance risks, there may be complexities in the detail of retiming of services either locally (for example, diverting from the Fast to the Slow line) or more widely (for example, rigid timetable structures in the Liverpool area) that are not apparent from this initial overview.

10.3 Industry Engagement

No industry engagement has been undertaken at the time of writing.

Train Operating Companies (TOCs), Freight Operating Companies (FOCs) and Network Rail will need to be engaged at the earliest opportunity.

11 Next Steps

The next steps of any operational assessment should include:

- Calculation of appropriate Sectional Running Times (SRTs) and Train Planning Rules (TPRs) using industry-agreed methodologies
- Preparation of details conceptual timetables
- Timetable performance modelling using industry-standard techniques
- More detailed reviews of resourcing requirements and constraints
- Industry engagement to support the above processes

Yours Sincerely,

Appendix I: Train Graphs

These graphs illustrate the December 2019 timetable between Crewe and Stafford or vice versa. WMT services are shown in green, and Avanti West Coast services in red, with other operators and freight paths in black.

Crewe to Stafford, Slow Lines

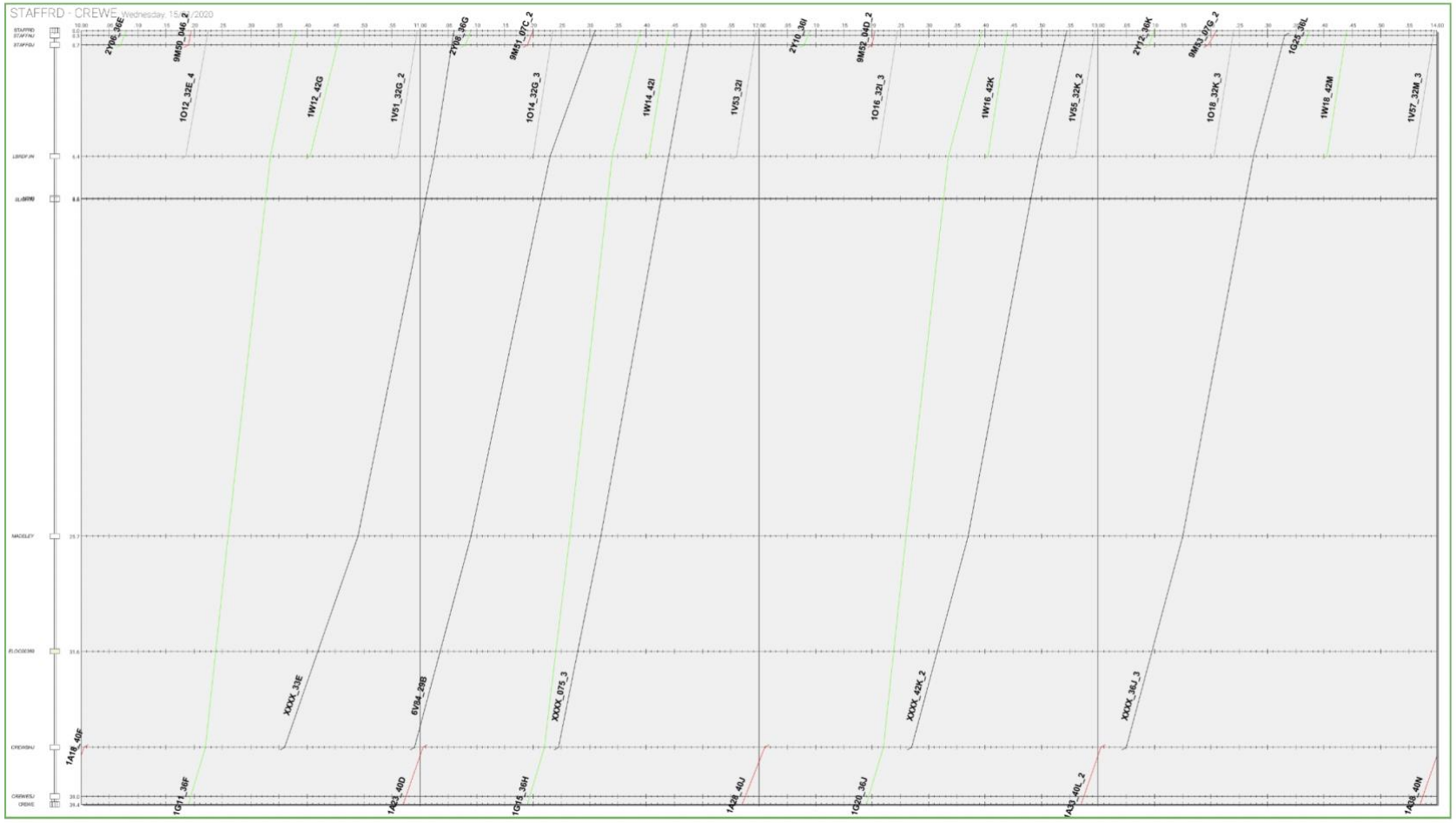


Figure 3: Crewe to Stafford Train Graph, showing trains on the Slow Lines, 10:00 to 14:00

Crewe to Stafford, Fast Lines

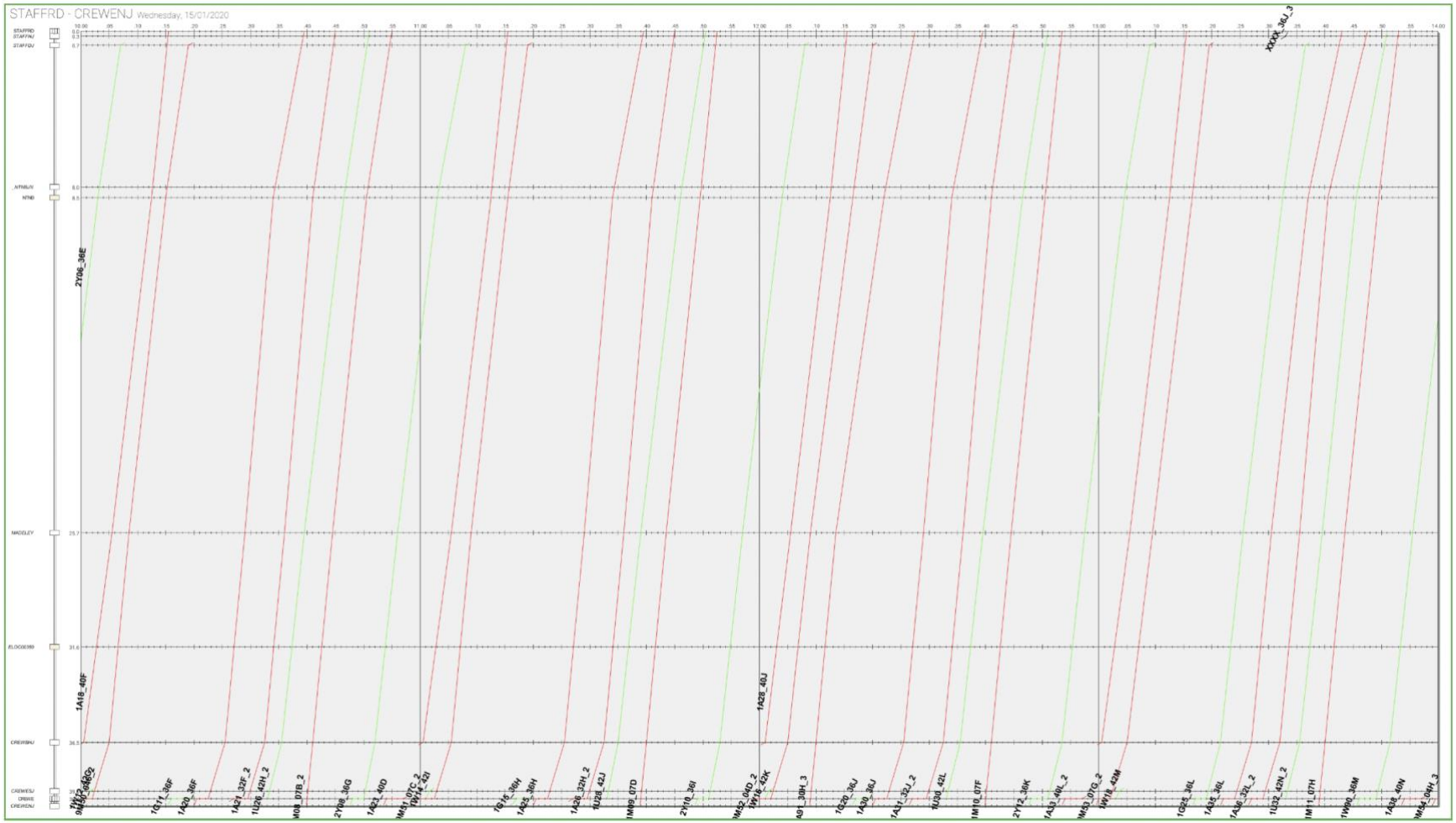


Figure 4: Crewe to Stafford Train Graph, showing trains on the Fast Lines, 10:00 to 14:00

Stafford to Crewe, Fast Lines

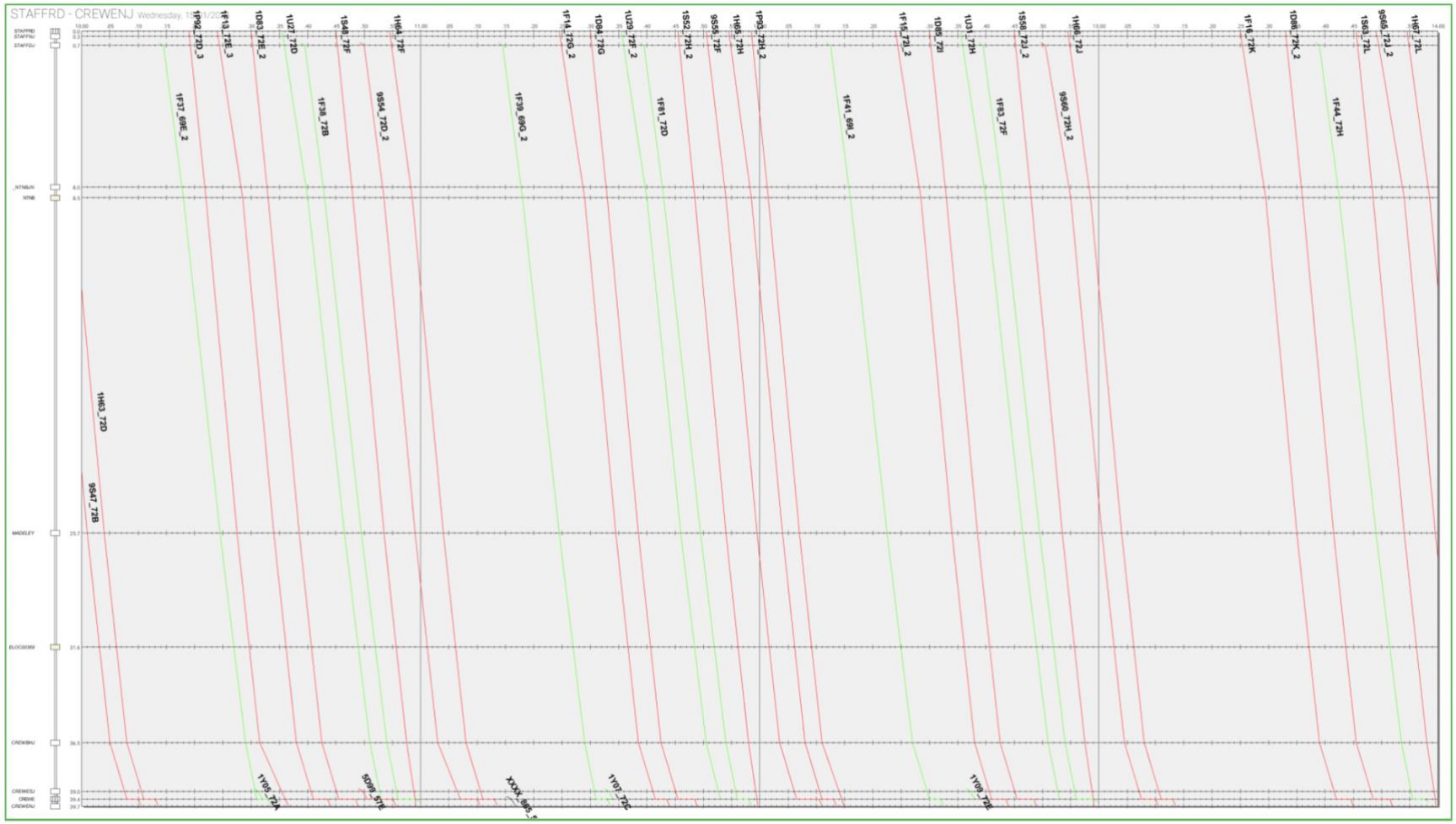


Figure 5: Stafford to Crewe Train Graph, showing trains on the Fast Lines, 10:00 to 14:00

Stafford to Crewe, Slow Lines

Figure 6: Stafford to Crewe Train Graph, showing trains on the Slow Lines, 10:00 to 14:00

SLC Rail

Meecebrook Station

Engineering Feasibility Report

SLC Rail

Contents

Document Control

Version Control

Version No.	Date	Created/Modified by	Notes
V1.0	15/06/2022	Andrey Smirnov	First Issue
V2.0	22/06/2022	Andrey Smirnov	Updated following internal team review
V3	09/09/2022	Ismael Muvunyi	Updated figures per client instruction

Approvals

Version No.	Name of approver	Title & organisation	Date
V1.0	Sam Uren	SLC Rail	17/06/2022
V2.0	Sam Uren	SLC Rail	22/06/2022
V3	Andrey Smirnov	SLC Rail	09/09/2022

Abbreviations

Abbreviation	Description
BCR	Benefit-Cost Ratio
BGS	British Geological Society
DfT	Department for Transport
EA	Environment Agency
ELR	Engineers Line Reference
GSM-R	Global System for Mobile Communications – Railways (radio)
LOC	Location Case/Cabinet
MVP	Minimum Viable Product
NR	Network Rail
OHLE	Overhead Line Electrification
OS	Ordnance Survey
PE	Project Engineer
PRM-NTSN	Persons with Reduced Mobility (PRM) National Technical Specification Notice (NTSN)
RAM	Route Asset Manager
RRAP	Road-Rail Access Point
SBC	Stafford Borough Council
S&C	Switches & Crossings
SDO	Selective Door Opening
SME	Secondary Means of Escape
SSSI	Site of Special Scientific Interest
TAD	Through Alignment Design
TOC	Train Operating Company
WCML	West Coast Main Line
UAV	Unmanned Aerial Vehicle
UXO	Unexploded Ordnance

1. Executive Summary

This feasibility study reviews potential locations for a new station on the West Coast Main Line (WCML), to serve the proposed Meecebrook Garden Community development. This report informs the Client, Stafford Borough Council, of the implications and constraints associated with building a new station at various locations and will help in selecting a preferred location. Based on the train service planning review (at pre-feasibility), a key assumption for this feasibility study is that the station will have to serve all four lines.

An initial desk study was completed in March 2022 to review key engineering constraints relating to the site (topography, ground conditions, mining risk, flooding risk, environmental aspects, etc) and to the existing WCML infrastructure (track alignment, drainage, existing structures, signalling, electrification, etc). A site walkout was then undertaken (on publicly accessible paths only) to better understand these constraints.

Based on the above, three location options were confirmed as potentially viable for a new station: north of Swynnerton Rd (Swynnerton Option), between Swynnerton Rd and Baden Hall Fisheries access road (North Option) and south of Baden Hall Fisheries access road (Central Option). The naming has been adopted to keep consistency with the pre-feasibility study which covered the North and Central options; the Swynnerton Option is a new addition as part of this feasibility study and is located furthest north of the three options.

Two additional locations further south were reviewed and discounted. Locating the station near the Grove Estate Vineyard requires significantly greater structural interventions (and risks) compared to other options; locating the station inside the start of Norton Bridge North Junction requires significant track and signalling alterations and is unlikely to be accepted by Network Rail. Both sites have limited access for construction.

A high-level track alignment design was produced for each of the three viable options to determine the extents of alignment changes required to accommodate the station and its platforms and to assess the implications for existing infrastructure and site constraints. The Swynnerton Option has favourable topography but requires reconstruction of the existing road overbridge and relocation of lineside equipment including a signalling relay room and a radio mast. The North Option has favourable site topography and is the only option not to affect existing structures, however it has more significant implications for the signalling system. The Central Option requires smaller changes to the signalling system but involves significant civils earthworks and extending the Meece Brook underbridge. The significantly constrained site and difficult access results in high constructability risks and high impact on the railway operation. Reconstruction of the Baden Hall Fisheries access road overbridge would be required. This may be turned into an opportunity for the new bridge to double as a road and as access to the station and between platforms. Upon detailed analysis of the locations, the North Option is deemed to be the preferred location.

A high-level cost estimate found that the North Option costs would be circa £55m, whereas the Swynnerton and Central Options would cost circa £70-72m. This is based on an assumed platform length of 185m to accommodate 8-car trains. Based on current experience with Network Rail and Train Operating Companies, and likely future service provision post-COVID and the impact of HS2, this is considered to be the Minimum Viable Product for Meecebrook station.

It is recommended that a benefits analysis is undertaken, to obtain a BCR for each option and validate that the North Option is preferred. In addition, the DfT, NR, TOCs and key stakeholders should be engaged, to highlight project risks and acceptance of the proposals, which may impact on the high-level costs and swing the balance in favour of a particular option. In particular, the assumption of platform lengths to accommodate 8-car trains should be validated. The integration of the station into the Meecebrook Garden Community masterplan is also a key factor for deciding on the preferred option location. Early engagement with the chosen developer is recommended in order to progress the station project further. A number of key assumptions have been made at this stage and further work is recommended to validate these and reduce the cost risk at the next design stage. Finally, it is recommended to further develop the station concept, starting with definition of Client Requirements and development of a Client Outcome Specification.

2. Introduction

2.1. Background

Stafford Borough Council (SBC) are developing a concept for Meecebrook, a new Garden Community near Yarnfield (Staffs) and have commissioned SLC Rail to investigate the viability of building a new station on the West Coast Main Line (WCML) to serve it. This feasibility study builds on the outcomes of SLC Rail's pre-feasibility work, which confirmed that 'there would appear to be a good prospect of a scheme of medium value for money which would deliver an acceptable BCR'.

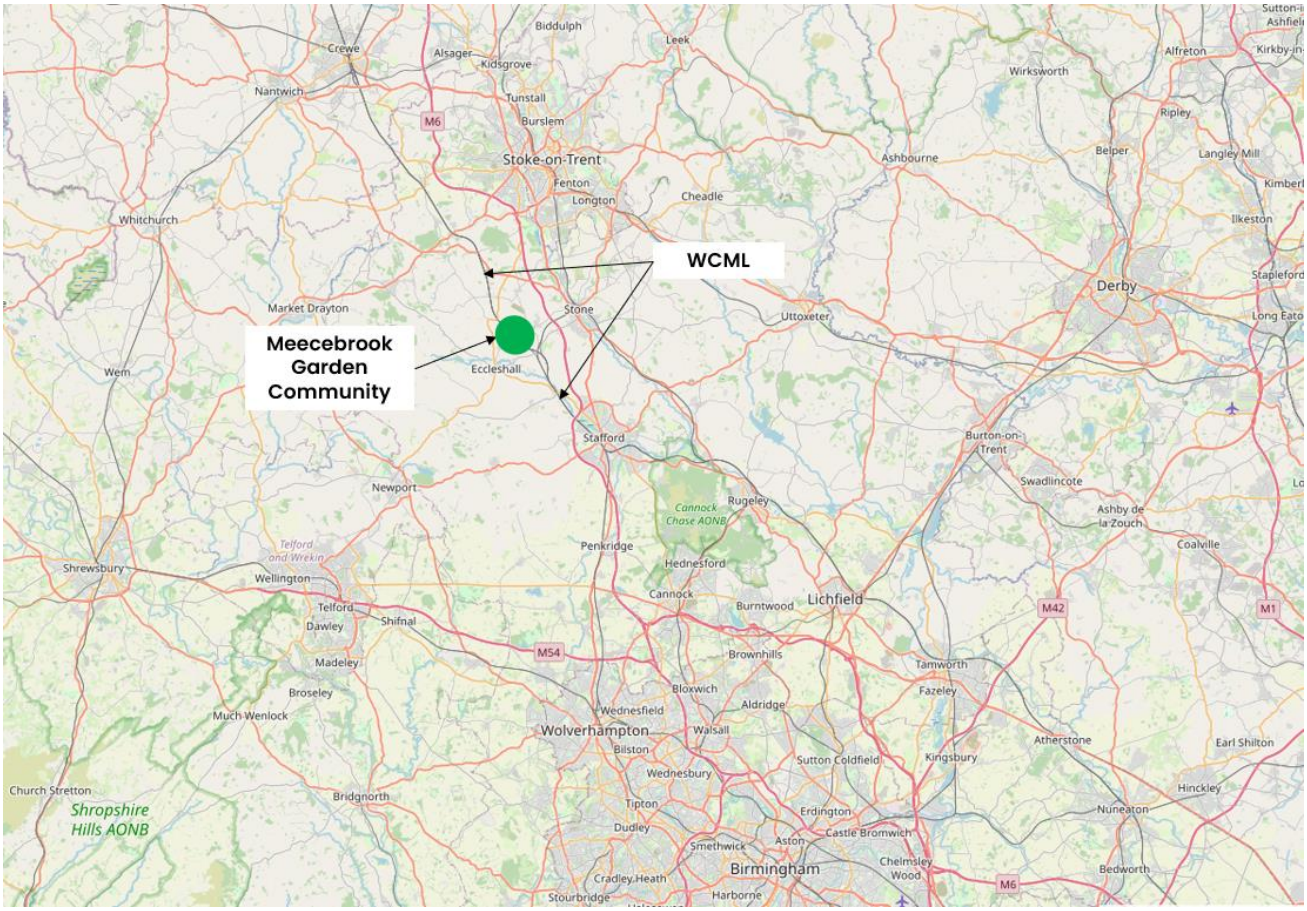


Figure 1 – Meecebrook Garden Community location (map source: OpenStreetMap)

This feasibility study reviews the possible sites and the adjacent WCML infrastructure in more detail to establish potential locations for the proposed station, highlighting key engineering implications and risks associated with each potential location, and forming the basis for a more robust cost-benefit analysis to be undertaken. The outputs of this feasibility study will help SBC to decide on whether to proceed with building the new station, and which location to select for it. This feasibility study does not cover detailed timetable performance modelling to confirm what potential stopping patterns could be accommodated at the station. However, a high-level timetable review was carried out as part of the pre-

feasibility study, which confirmed that the station could likely be accommodated with the existing WCML services, but that platforms to all four lines would be required.

2.2. Requirements

The following high-level requirements have been used to determine the concept layout of the station.

Table 1 - Key project requirements (high-level)

Requirement	Description	Source e.g. client, site constraint, standard, PRM NTSN, TOC etc.
Number of platforms	The new station is to serve all four lines, i.e. four platforms will be required (two facing platforms and one island platform)	The train service planning review identified the need for all four lines to be served, to provide sufficient operational resilience
Length of platforms	All platforms to be 185m long in order to accommodate 8-car rolling stock	Deemed to be MVP ahead of engagement with Network Rail and TOCs
Location of station	The station is to be located within or adjacent to the boundaries of the Meecebrook Garden Community site (as per Vision Statement, June 2021)	Client requirement
Accessibility	Station to be fully compliant to current accessibility standards, including step-free access to all platforms	DfT, PRM-NTSN

2.3. Methodology

The following steps were followed to produce this feasibility study:

1. Desk study to review key constraints of existing site (topography, ground conditions, mining, flooding risk, etc) and existing WCML infrastructure (track, drainage, structures, signalling, electrification, etc);
2. Site walkout (on publicly accessible paths only) to gain a better understanding of the constraints;
3. Confirmation on which locations are viable in terms of their impact on existing topography and the rail infrastructure and hence to be studied in more detail;
4. For each viable location, produce high-level track alignment and assess engineering interventions required and risks associated with building a station at that location;

5. Produce high-level cost estimates for each viable location based on the above assessment;
6. Provide recommendations on which location(s) to investigate further, and what next steps to take.

The pre-feasibility study considered a station suitable for 12-car trains as this is the maximum length of train that might run on the WCML in the foreseeable future. To provide evidence of this worst case scenario, the track layouts (see Section 4.2) have been developed for 12-car (250m long) platforms for the purposes of this feasibility study, to demonstrate the potential worst case impacts on the rail infrastructure. However, our current experience indicates that 8-car trains are likely to be acceptable to Network Rail (NR) and the Train Operating Companies (TOCs) as longer trains are unlikely to be required due to reduced traffic post-COVID and the future impact of HS2.

This is therefore considered the Minimum Viable Product (MVP), and the cost estimates have been produced based on the 8-car (185m long) platforms. There is a risk that consultation with stakeholders may result in longer platforms being required, with the consequential increase in cost. If longer trains are introduced, they could still call at the station using Selective Door Opening (SDO) and be accommodated on shorter platforms.

3. Existing Site and Infrastructure

3.1. Site Location

The site comprises a 2.5km corridor of the WCML (Engineers Line Reference (ELR): LEC4) immediately north of the Norton Bridge North Junction, between 140 and 141 miles from London. The WCML runs on a southeast-northwest axis at this location, passing between the villages of Yarnfield (1km northeast) and Eccleshall (3km southwest). The villages are connected by Swynnerton Rd which passes over the WCML at the northern end of the site. The WCML at this location consists of four lines (two in each direction), encompassing both Fast lines on the east side and then both Slow lines to the west. The north east side of the line is the Up side (to London) and the south west side is the Down side (to Crewe). The Meece Brook watercourse flows predominantly along the Up side of the railway, crossing under the WCML at the southern end of the site. Figure 2 illustrates the location and extents of the site in red.

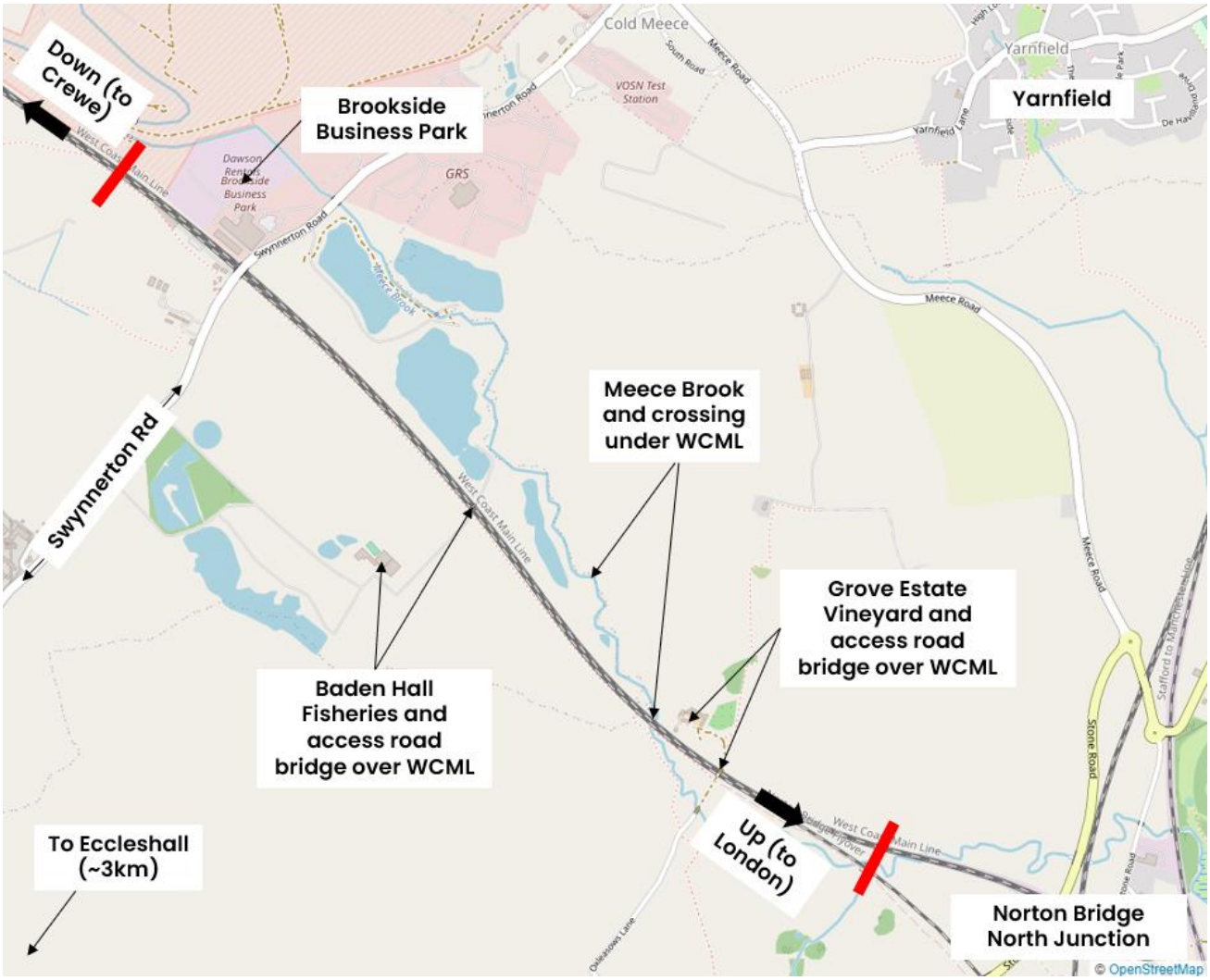


Figure 2 – Site location (map source: OpenStreetMap)

3.2. Site Description

The railway corridor is generally bounded by greenfield land on both sides, with industrial units (Brookside Business Park) at the north end of the site. Most of the land around the site is currently being used by a fishery (Baden Hall Fisheries, including the Grade II listed Baden Hall building), with several artificial ponds located along the northeast boundary of the railway, between the railway and Meece Brook, and agricultural land to the southwest of the line. A small plot of land on the east end of the site is occupied by a vineyard.

Upon review of the British Geological Society (BGS) online interactive maps the bedrock (solid geology) is detailed as mudstone (Mercia Mudstone Group in the northern half of the site, Stafford Halite Member in the southern half). The mudstone is overlain by superficial deposits which broadly follow the Meece Brook watercourse and thus intersect the railway in several locations within the site. These consist of River Terrace Deposits (predominantly sand and gravel) in the northern parts of the site, and Alluvium (predominantly silt, clay and sand) in the southern parts of the site. No geological faults were found within or near the site. Refer to Appendix B for extracts from BGS interactive maps, illustrating the ground conditions.

Coal Authority online maps were reviewed, and no mining related risks were found within or near the site.

Unexploded ordnance (UXO) online data (www.zeticauxo.com) was reviewed and found the UXO related risks to be low within and near the site.

Environment Agency (EA) flood risk maps were reviewed and found that southern parts of the site where the railway crosses over Meece Brook are within Flood Zone 3 (high risk) and Flood Zone 2 (medium risk). These flood zones run parallel to the railway corridor in the northern parts of the site but are not immediately adjacent to the railway. Much of the site is therefore within Flood Zone 1 (low risk). Refer to Appendix B for extracts of EA flood risk maps, illustrating the flood risk zones within the site.

A high-level review of ecological features, done using publicly available maps (magic.defra.gov.uk), found no SSSI or other conservation areas within or near the site.

3.3. Rail Infrastructure Description

The WCML comprises four tracks throughout the site: two Fast lines (max. line speed 110mph, enhanced permissible line speed 125mph) on the northeast side and two Slow lines (max. line speed 100mph) on the southwest. The horizontal alignment is generally on gentle curves throughout the site, with a tighter radius curve in proximity of the vineyard. Three overbridges cross the WMCL within the site:

- Swynnerton road (two-lane public highway) to the north,
- An occupation bridge (private access road) within the fishery at the centre of the site, and
- A public access road to the vineyard to the south.

The tracks run at-grade with the surrounding topography at the northern end of the examined section, in a cutting in the central section of the site, and on a low embankment at the southern end. There is a gentle vertical rise in alignment from south to north. The space between the Fasts and the Slows (known as the 10-foot) is generally at its standard width (3m), with a widening at the northern end of the site, either side of Swynnerton Rd overbridge (a two-span structure with a central support within the 10-foot). From the site walkout, it appears that track drainage is only present north of Swynnerton Rd, with no visible track drainage throughout the rest of the site.

In addition, the railway crosses over Meece Brook at the south end of the site, adjacent to the vinery. A review of the 5-mile diagram (a diagrammatic record of the railway infrastructure) also identified several culverts under the railway across the site, however the presence of these could not be confirmed during the site visit.

Lineside infrastructure includes 25kV Overhead Line Electrification (OHLE) to all four tracks throughout the site. There are several Location Cases (LOCs), mostly positioned on the Down side of the railway corridor, as well as a signalling relay room to the north of Swynnerton Rd overbridge. Troughing routes run either side of the railway, assumed to contain signalling, telecoms and power cabling. They may also contain 3rd party fibre optic

cables. In addition, two radio (GSM-R) masts are located within the site, one at its northern end and one at the southern end, both on the Down side of the railway corridor.

A Road-Rail Access Point (RRAP) is located on the Down side of the railway corridor, around 140m north of Swynnerton Rd overbridge, and another on the Up side, around 460m south of Swynnerton Rd overbridge. A pedestrian access point is located off the vinery access road overbridge.

A review of the 5-mile diagram identified several utility services (sewers, drains, water and gas mains) crossing the railway corridor. Some of these appear to be positioned in proximity to the overbridges and may therefore be carried over the railway within the confines of or attached to the structures. This is to be confirmed by surveys at subsequent project stages, along with presence of any other services.

The section of WCML running across the site has been part of Network Rail's Stafford Area Improvement Programme, a scheme aimed at improving line speeds and remove a historic bottleneck at Norton Bridge. As part of this scheme, which was completed around 2014-2016, this section of the WCML has been re-signalled and Norton Bridge North Junction has been re-configured to provide grade separation. It can therefore be assumed that the signalling equipment within the bounds of the site is modern and likely in good working condition.

Several signals are located within the site, most carried on signal gantries spanning all four tracks:

- Gantry carrying Down (northbound) signals, around 400m north of Swynnerton Rd overbridge;
- Two individual Up (southbound) signals on posts around 90m south of Swynnerton Rd overbridge;
- Gantry carrying Down signals, around 90m south of the fishery access road overbridge;
- Gantry carrying Up signals, around 260m further south of the above down-direction gantry;
- Gantry carrying Down signals, around 100m south of the vinery access road overbridge.

3.4. Emerging Masterplan Description

Based on the 'Vision Statement – June 2021' document, it is envisaged that the Meecebrook Garden Community will comprise circa 6,000 homes and will span across both sides of the WCML railway corridor and may be delivered in stages. Adjacent to the railway, the development will encompass land currently occupied by Baden Hall Fisheries and the surrounding fields, as well as land currently occupied by the Brookside Business Park at the northern end of the site. The ambition is for the development to become home to a community with a focus on sustainability, harmony and environmental responsibility.

The integration of the existing WCML infrastructure, which, like any railway corridor, acts as a natural barrier to mobility and nature, is therefore a key consideration for the Garden Community project. Indicative site boundaries and transport corridors across the WCML are shown in Figure 3 and have been considered as part of this feasibility study and options appraisal process.

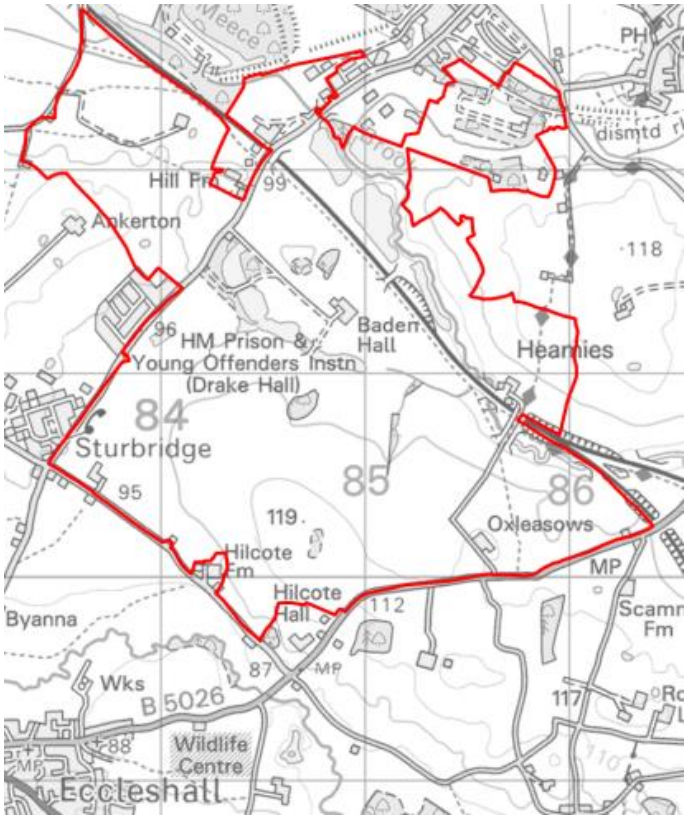


Figure 3 – Indicative site boundaries (Provided by Client)

3.5. Key Constraints & Risks

Based on the desk study and site walkout, the following general key constraints and risks have been identified. These will be described in more detail in Section 4 in relation to specific station location options.

- It has been assumed that the scheme will not require any line speed improvements and will not add additional trains onto the WCML (i.e. only those services already running on the WCML will call at Meecebrook station). If additional services are deemed to be required (e.g. to support the scheme business case), there may be significant implications on the wider WCML network beyond the immediate station site. In particular, there could be an impact on the traction power requirement, with additional power supply and distribution infrastructure being needed to supply additional trains. Increasing line speed has implications on the existing signalling system, as well as the risk profile at level crossings (which are not located within the site, but those located

beyond the site may still be affected). Given these significant implications, it is assumed that the project will not require to accommodate either line speed improvements or an increase in trains on the WCML;

- The Railway (Interoperability) Regulations 2011 legislation sets out the technical standards for design of railway infrastructure and systems through National Technical Specification Notices (NTSNs). One of the key NTSNs applicable to new stations relates to Persons of Reduced Mobility (PRM), known as the PRM-NTSN, includes a requirement to provide PRM access to all platforms. For Meecebrook station, this implies that a footbridge will be required across all four tracks, with stairs and lifts to all platforms. In addition, recent changes to the British Standard on fire safety (BS 9992) now require the Secondary Means of Escape (SME) to be PRM compliant. This may trigger the need for two or even three separate footbridges to access the island platform, with fire resistant lifts to support PRM evacuation (for costing purposes two footbridges were assumed, one main and one SME, connecting all platforms);

- Due to the cost and time risks associated with access and alterations to the Fast lines of the WCML (significant lead in times for obtaining possessions, limited durations of the possessions, etc), a key constraint is keeping the Fast lines in their existing location. The implication is that the Slow lines will be slewed (moved laterally) away from the Fasts to accommodate an island platform;

- The existing overbridges pose constraints on the location of the station and may need to be re-built to accommodate the wider railway corridor with the realigned Slow lines;

- The existing signalling infrastructure throughout the site presents both constraints and opportunities depending on location within the site. Train drivers need to have clear line of sight to the next signal beyond the station (both when passing the station at line speed or setting of from the platform after a stop). Changes to existing signalling infrastructure, such as installation of additional signals, can have significant cost implications and may have acceptance risks from Network Rail. The location of the station relative to existing signalling infrastructure is therefore a key consideration;

- The track alignment is on a curve adjacent to the vineyard. The best practice for new stations is to build platforms on straight alignment as far as practicable. The implication is that either significantly greater alignment changes will be required to accommodate the platforms, or platform construction types would vary throughout the curved alignment, reducing possibility to use modular construction;

- Ground conditions throughout the site are generally favourable for construction of a station, with no significant risks, but an area of alluvium deposits is present around Meece Brook crossing under the railway, adjacent to the vineyard. This may imply deeper, possibly piled, foundations at this location;

- The relocation of the signalling relay room (if required) could have significant cost implications;

- The relocation of GSM-R masts (if required) could have significant cost implications and may be subject to a lengthy approvals process, as mast siting is critical to good radio reception for trains;

- The existing public right of way footpath running along the railway on the southern side will need to be relocated to accommodate the station. Whilst this is not deemed a significant risk to the project there will be timeframes and consents procedures that are required;

- Based on visual observations from the site walkout, there appears to be a level difference between the Fasts and the Slows. The implication is that to accommodate the island platform between the Down Fast and the Up Slow lines, this level difference will have to be reduced to facilitate a compliant platform design (which is constrained in terms of crossfalls across the width of the platform, as each side of the platform will have to slope away from its track). This poses a risk of the Up Slow line having to be lifted or lowered to match the level of the Down Fast line more closely, which in turn could result in gauging issues at adjacent existing structures (and OHLE, as discussed below);

- During the site walkout, which took place following a number of days with rainfall, no apparent issues of wet beds or excessive water were observed in areas where track drainage is not present, including where the track is in a cutting. However, there may still be a risk of the track condition being affected by recurring drainage issues;

- The existing OHLE constrains the adjustments that can be made to the vertical track alignment. Additionally, sufficient clearance needs to be provided between the OHLE and any new station infrastructure. There is a risk that existing electrical clearances will not be compliant with standards once the platforms are constructed, resulting in the need to alter the existing OHLE infrastructure;

- Several utility services crossing the WCML have been identified on the 5-mile diagram. This may pose a risk associated with diversion of live service routes. However, there is also opportunity to integrate any required diversions into the wider Garden Community development utility proposals.

4. Station Location Options

4.1. Summary

Based on the information gathered from the desk study and site walkout and the identified constraints and risks, five location options for a new station have been considered within the site, as shown in Figure 4:

- Swynnerton Option – station located immediately north of the existing Swynnerton Rd overbridge;
- North Option – station located between Swynnerton Rd and Baden Hall Fisheries access road;
- Central Option – station located between existing signals south of Baden Hall Fisheries access road;
- South Option – station located adjacent to Grove Estate Vineyard;
- Junction Option – station located at the start of Norton Bridge North Junction.

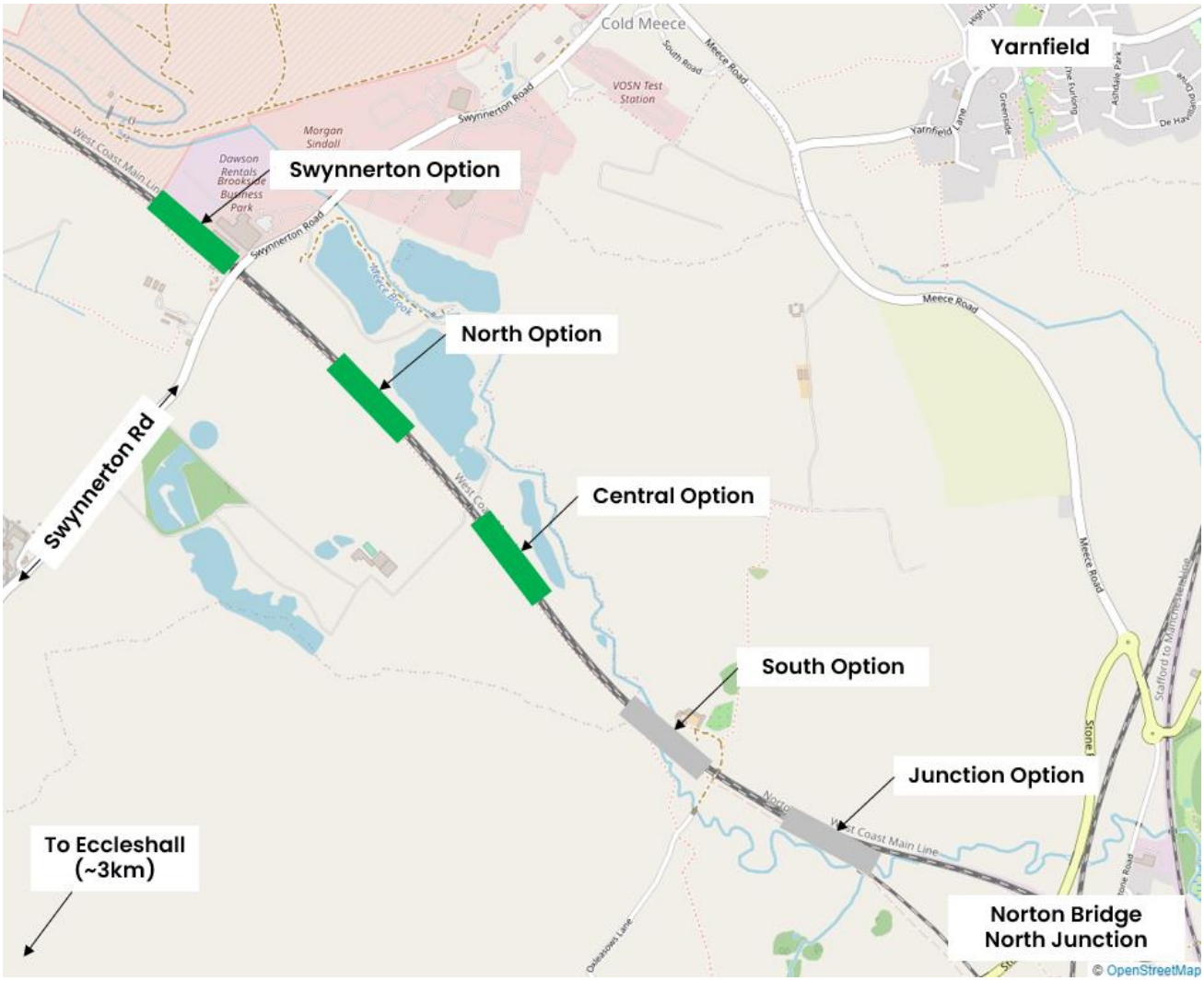


Figure 4 - Map showing station location options considered (image source: OpenStreetMap)

After a high-level review of constraints and risks, the South and Junction options were deemed unviable and have been discounted (detail in Section 4.6 below). The remaining three options – Swynnerton, North and Central – were reviewed and assessed in more detail following a track alignment study.

For all options, specific details of car parking provision were not reviewed as part of this feasibility study, however all three locations are deemed to be suitable for car parking to be provided adjacent to the station once requirements are established at subsequent design stages. In addition, the most basic station facilities or 'minimum viable product' (MVP) have been assumed as per the pre-feasibility study, with no provision for a station building. This is based on the pre-feasibility passenger demand study, which estimated the demand to be circa 0.15-0.25m annual trips, which would place the prospective station Category F (Small Unstaffed) within the DfT categorisation. The specifics and requirements for this can be established in more detail at subsequent design stages.

4.2. Track Alignment Study

The key requirements of the study were not changing the alignment of the Fasts (due to prohibitive operational and cost implications) and producing an alignment design (vertical and horizontal) compliant to current industry standards. As outlined in Section 2.3, a 250m platform length was conservatively assumed for the purposes of the track alignment study, to demonstrate that 12-car trains (the longest currently running on the WCML) could be accommodated by all options if required. Conservatively, the width of the island platform was assumed to be 9m to accommodate a clear 3m width either side of the footbridge, lifts and stairs (there is scope to refine the width at subsequent design stages). Refer to Appendix A for track alignment drawings.

The study uses Ordnance Survey (OS) grid tile data and the existing rail strings from the OS mapping to regress (reproduce) the existing WCML alignment, which is then used as a baseline for the proposed concept alignment for each option. This approach is sufficiently accurate for the purposes of this feasibility study; however the OS grid data cannot give the same level of accuracy as a full track and topographical survey. For example, the existing vertical alignment is based on distinct points on the OS grid at 5m intervals and not along the rail itself, and therefore appears to be fluctuating (when in reality the track alignment generally follows smooth constant gradients). For the purposes of this study, the OS data was sufficient to give assurance that a compliant horizontal track alignment can be achieved and tied into the existing alignment for all options. There will also be scope to finesse the horizontal alignments at subsequent design stages - using more detailed and accurate data will enable the existing tie-in locations to be refined and potentially reduce the extent of re-alignment and magnitude of slews.

For the platforms serving the Slows, the optimum solution for all locations was to place the new platforms on a straight alignment (which is preferred). A sensitivity check was undertaken to place the platforms on a shallow curve to closer mirror the Fasts platforms, however as explained below this would result in the overall length of track affected to be greater (due to additional transition lengths), increasing the overall impact on the existing infrastructure, and was therefore not considered further.

For all locations, the platforms serving the Fasts follow the existing alignment of the Fasts and therefore on slight curves. The curve radius was checked and confirmed that it is above the minimum radius required for a compliant new platform (i.e. the existing Fasts are on very shallow curves that would not result in dangerously large stepping distances). There is a residual risk of the existing alignment having transitions (sections of track where the alignment goes from a straight to a constant radius curve) in locations of the proposed platforms. The implication of this would be more challenging platform construction, due to the constantly changing track cant and thus changing position of the train step in relation to the platform. This risk can be mitigated at the next design stage by requesting the Through Alignment Design (TAD) for this section of the WCML from Network Rail. This will provide the actual managed track alignment and confirm the presence or otherwise of transitions through the site. It will also enable a more detailed horizontal alignment to be developed.

The outcomes of the track alignment study are included in the analysis of each location and summarised below.

4.3. Swynnerton Option

In this option, the station is located immediately north of the existing Swynnerton Rd overbridge, between the Brookside Business Park to the north, and buildings (ownership and current use not confirmed) to the south. This location is at the north-west corner of the Garden Community masterplan, and the surrounding topography is generally flat and at-grade with the railway throughout.

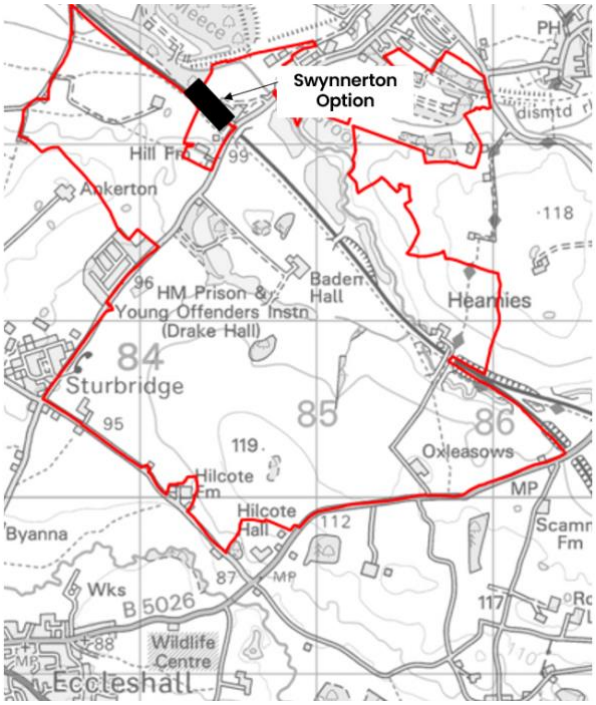


Figure 5 - Swynnerton Option in relation to site boundary

To build a new station at this location, the Slows will need to be slewed by up to 8.2m away from the Fasts into land currently occupied by buildings and Network Rail's RRAP, to accommodate the 9m wide island platform. This will affect approximately 1,600m track length on each line. Due to the 3.4m slew being required under the existing Swynnerton Rd overbridge, the existing structure will need to be reconstructed. Reconstruction of the bridge could only be avoided by shifting the station position further north (away from the development) by approximately 300-400m, which would result in the station being disconnected from the development.

However, reducing the length of the platforms and, if possible, reducing the width at the ends of the island platform would reduce the extent of the slews and may avoid the need for reconstructing Swynnerton Road bridge. This should be explored at the next design stage.

The RRAP and access route along the south side of the railway, as well as several lineside cabins and a GSM-R mast, are all affected by the proposed station and will need to be relocated. The signalling relay room will also need to be relocated (at significant cost). There is an existing banner repeater signal on the Down Slow line, which would be on the

proposed Down Slow platform. This may need repositioning and the existing signalling gantry north of the station would have to be renewed with a longer span.

The side platforms could be constructed as crosswall and plank (pre-cast support ‘walls’ perpendicular to tracks, supporting pre-formed deck units), maximising use of prefabrication and reducing installation time on site. The island platform could be of modular construction (lightweight composite decking units on a frame support system). Given the ground conditions (river terrace deposits over mudstone), it may be possible to install the platforms on shallow pad foundations, avoiding piles. The Down Slow platform and track could be built offline, before completing connections and slewing the Slow lines into final position.

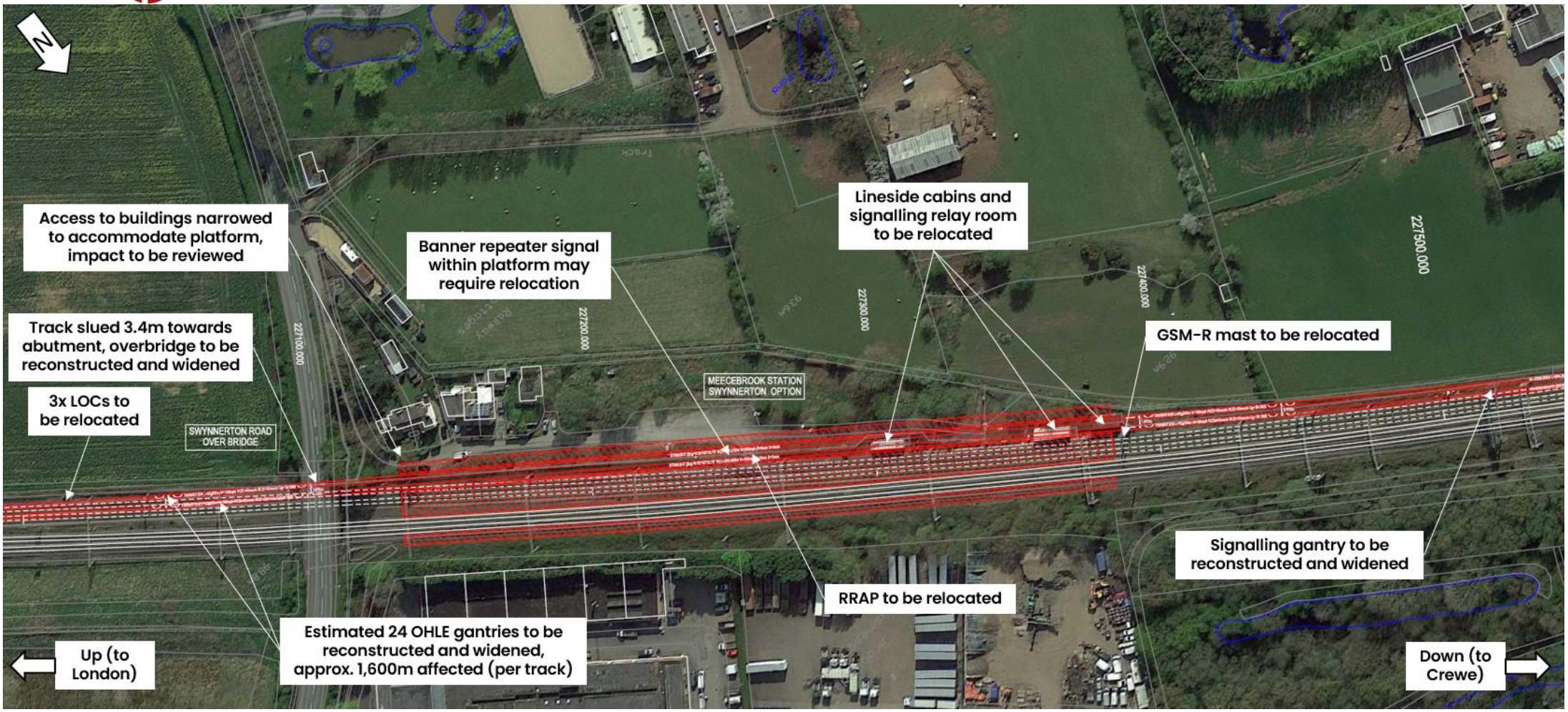


Figure 6 – Swynnerton Option impact assessment (see Section 5 and Appendix A for detail)

4.4. North Option

In this option, the station is located between the Swynnerton Rd and Baden Hall Fisheries access road overbridges, at the centre of the current fishery site. This places the station favourably within the Garden Community masterplan, with the station entrance being located within the development. The surrounding topography is flat and at-grade with the railway throughout.

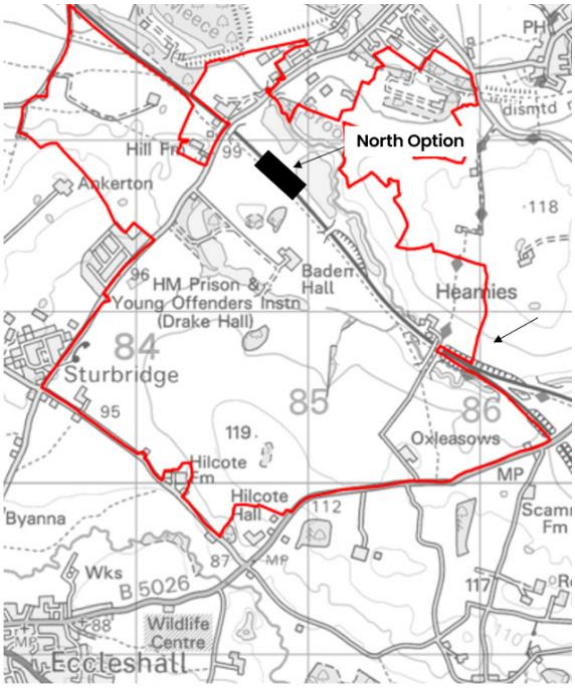


Figure 7 - North Option in relation to site boundary

To build a new station at this location, the Slows will need to be slewed by up to 11m away from the Fasts, into land currently occupied by agricultural fields, to accommodate the island platform, with around 1,300m track length affected on each line. The preliminary track alignment design shows slews of around 400-700mm under the existing Swynnerton Rd and Baden Hall Fisheries overbridges. Given the limitations on accuracy of the OS mapping data (see Section 4.2 above) and assuming there is some lateral structural clearance under the existing structures, it is assumed that a more detailed track alignment design will find that neither of the two overbridges will be affected. Reducing the length of the platforms would also be expected to allow retention of the existing bridges.

Additional banner repeater signals are expected to be required in both directions at either end of the platforms, as it is unlikely that satisfactory signal sighting will be achieved from the platform ends. However, no existing signals or gantries will be impacted. The existing Network Rail RRAP on the north side of the railway will have to be relocated to accommodate the proposed platform location, and three LOCs at ground level on the south side of the railway will need to be moved laterally to enable the track slews.

The platform construction and foundations are likely to be similar to the Swynnerton Option (crosswall and plank or traditional side platforms, modular island platform, potential to have shallow foundations).

A possible construction sequence would involve building the new Down Slow platform and significant sections of both Slows tracks, connecting the new Slows into the existing, building the island and Up Fast platforms, and finally installing the footbridge, lifts and stairs to all platforms. A significant advantage of this site is the ample space available for construction (access and compound) in the field south of the proposed station. This will enable a larger proportion of the station (compared to other options) to be built without disruption to the existing operational railway.

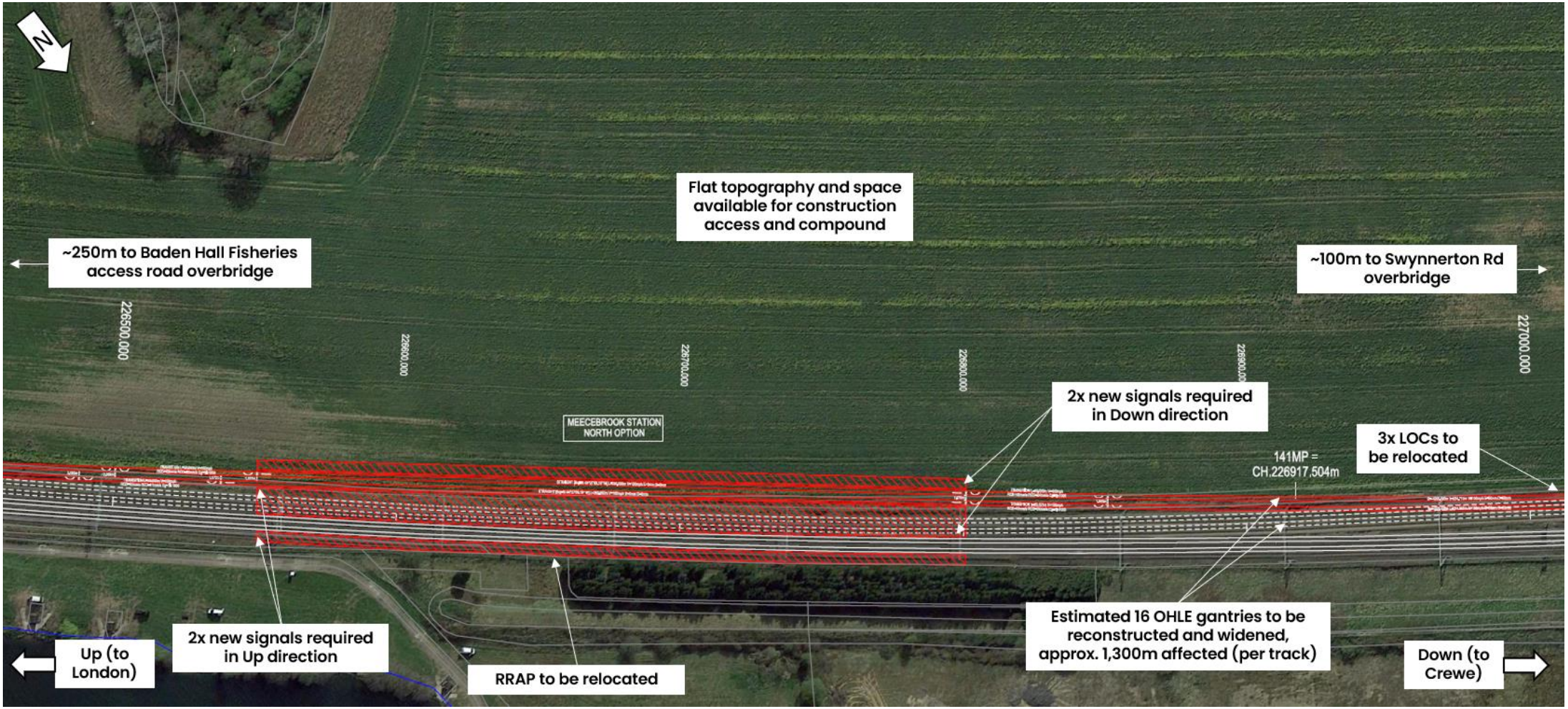


Figure 8 – North Option impact assessment (see Section 5 and Appendix A for detail)

4.5. Central Option

In this option, the station is located south of the Baden Hall Fisheries access road overbridge, between a fishing pond to the north and an agricultural field to the south. The railway is in a cutting here, based on observations during the site walkout the cutting is around 2.5-3.0m deep (south end appears to be deeper).

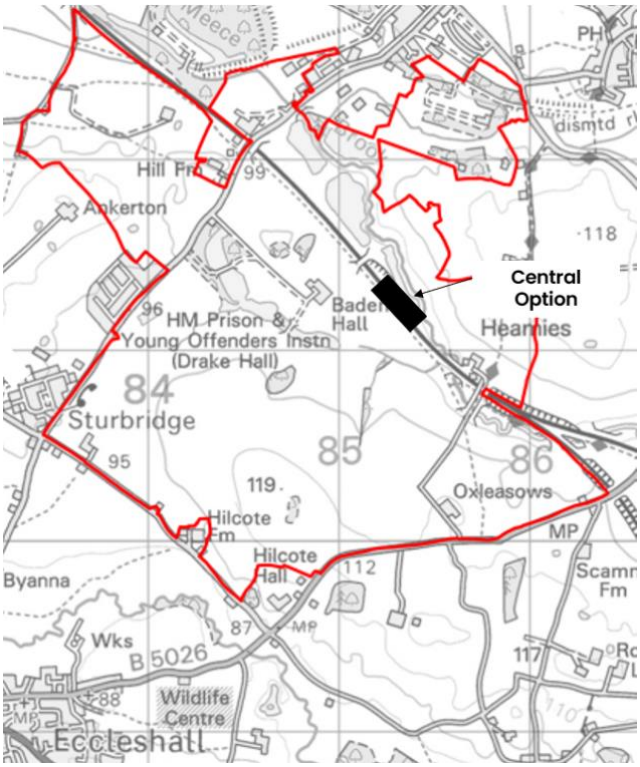


Figure 9 – Central Option in relation to site boundary

The relatively high line speed on the Slows, combined with the curve adjacent to the vineyard, results in the London end tie-in point being located beyond the point at which the railway crosses over Meece Brook. This has significant implications on the cost and risk of delivering this option, including on its constructability, which will be discussed in more detail in Section 5.

Significant widening of the existing cuttings will be required to build a new station at this location, especially on the south end where the Slows are to be slewed by up to 9.5m away from the Fasts, to accommodate the island platform. Around 1,500m total track length is affected on each line. In addition to the impact on Meece Brook underbridge, the Baden Hall Fisheries overbridge will also have to be re-built to accommodate the station. This can be considered as an opportunity to incorporate the new overbridge into the station (see Section 5 for detail).

One advantage of this option is that the station could likely fit in between existing signalling gantries, and only minor signalling alterations will be required. However, this is unlikely to outweigh the severe drawbacks outlined above (see Section 5 for detail). In addition, four LOCs on elevated platforms on the south side of the railway will need to be moved laterally to enable the track slews.

The side platforms will likely be front wall and fill (to minimise extents of widening of existing cutting), and the island platform of modular construction as for other options. Given the absence of superficial deposits at this location, shallow foundations are likely at the station location, however piled foundations will likely be required for the Meece Brook underbridge widening (based on desk study, to be confirmed by ground investigation). Retaining structures or re-grading of the existing cutting slope will likely be required behind the Down Slow (southernmost) platform.

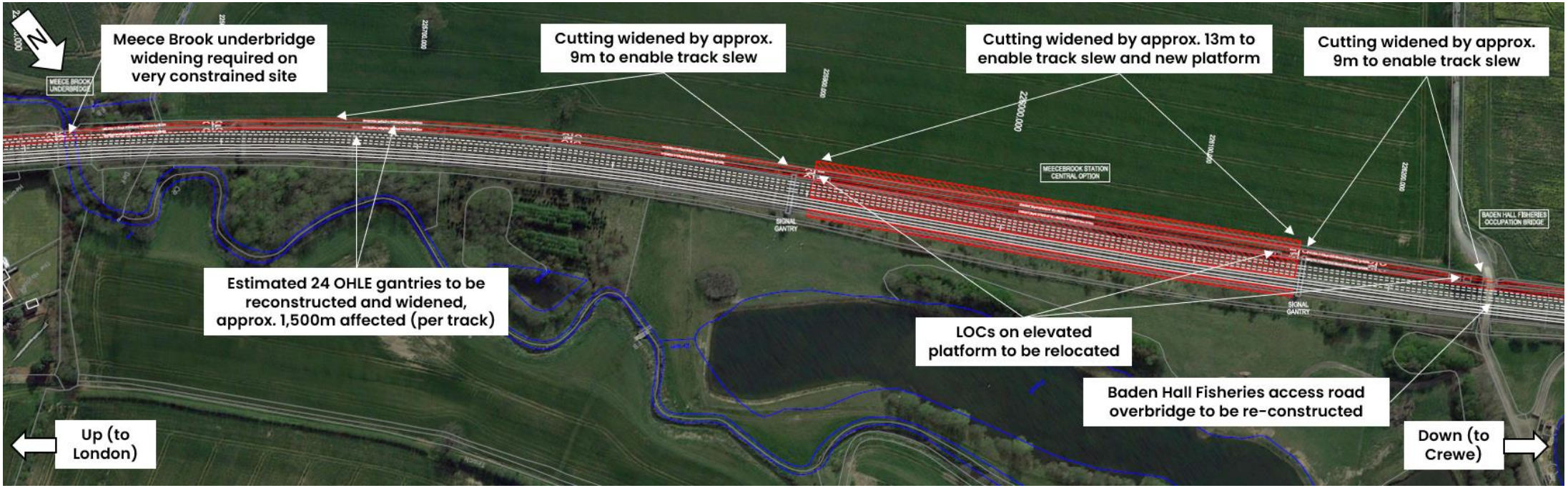


Figure 10 – Central Option impact assessment (see Section 5 and Appendix A for detail)

4.6. Discounted Options

The South Option (adjacent to the vineyard) effectively magnifies the key issues associated with the Central Option. Due to the even tighter curve radius at the South location and the closer proximity to Meece Brook underbridge, the extents of widening of the underbridge would be significantly greater than for the Central Option, whilst all of the limitations of constructability of the extension would remain. In addition, the existing curve would need to be straightened out to accommodate the platforms, which will result in a significantly greater length of tie-in compared to other options, with substantially more land take being required to the north of the proposed station, to accommodate the new track alignment whilst it transitions back to tie into the existing alignment.

The Junction Option (in the 'vee' of the Norton Bridge North Junction) will require complex re-modelling of the junction in order to accommodate the new platforms, and it is against good practice to locate new stations adjacent to existing Switches & Crossings (S&C) equipment, such as at junctions. Constructability of platforms will be very difficult due to the varying transitions and opposite handed cant likely to be present at the start of the junction, with a high risk of the platform design having non-compliant stepping distances (a safety-critical issue), and thus unlikely to be approved by Network Rail.

5. Cost & Risk

5.1. Summary

Table 2 summarises constraints associated with each option identified following the track alignment study.

Table 2 – SWOT table and indicative high-level costs (see Appendix C for detail)

Site	Swynnerton Option	North Option	Central Option
Development Context	Beyond masterplan outline	At centre of masterplan	On edge of masterplan
Topographical	Flat, at grade	Flat, at grade	In cutting (2.5-3.0m deep), significant civils earthworks
Surrounding Buildings	Various properties south, business park north	None	None
Geotechnical	Within river terrace deposits (adequate for foundations)	Within river terrace deposits (adequate for foundations)	Alluvium near Meece Brook (worse for foundations)
Mining	No risk identified	No risk identified	No risk identified
Flooding	Low risk (Flood Zone 1)	Low risk (Flood Zone 1)	Low risk (Flood Zone 1)
Environment	No constraints identified	No constraints identified	No constraints identified
UXO	Low risk	Low risk	Low risk
Heritage	No constraints identified	No constraints identified	No constraints identified
Infrastructure	**Swynnerton Option**	**North Option**	**Central Option**
Structures	Likely requires re-building Swynnerton Rd overbridge	Unlikely to have an impact on structures	Re-building fishery access road overbridge, widening Meece Brook underbridge (constrained site)

Site	Swynnerton Option	North Option	Central Option
Track	Wide 10-foot near Swynnerton Rd overbridge, on gentle curve	Wide 10-foot near Swynnerton Rd overbridge, on gentle reverse curve	Near tight curve adjacent to vineyard, long tie-ins due to high line speed
Drainage	Evidence of existing track drainage (constraint for track slews, opportunity for platform drainage)	No existing track drainage (no constraint for track slews, no pre-existing outfall for platform drainage)	No existing track drainage (no constraint for track slews, no outfall for platform drainage)
Signalling	Requires widening of existing gantry and relocation of relay room	Likely to require additional signals in both directions	Least impact on existing, station between gantries
OHLE	Risk of reduced clearances and alterations due to proximity to overbridge	Not constrained by existing structures	Not constrained assuming fisheries access road overbridge is re-built
Lineside Equipment	Relocation of RRAP, GSM-R mast, lineside cabins	Relocation of RRAP and three LOCs at ground level	Relocation of four sets of LOCs on elevated platforms
Access to Platforms	New footbridge and lifts, opportunity to incorporate re-constructed Swynnerton Rd overbridge into SME	New footbridge and lifts	Opportunity to incorporate re-constructed fisheries access road into step-free route between platforms
Indicative Cost *	**£70.1m**	**£54.6m**	**£72.1m**

* The above costs are based on 2Q22 rates, 60% risk allowance (in line with DfT guidance) and 185m long platforms to accommodate 8-car trains. Land acquisition and car park costs are excluded. It is noted that the direct cost rates for platforms have increased significantly compared to the pre-feasibility study estimates (from circa £800-1,200/m^2 to circa £2,400-3,500/m^2). This is based on recent cost data received by SLC Rail from for several platform project tenders undertaken since the Meecebrook pre-feasibility study and is reflective of the significant cost increases currently seen within the construction industry.

5.2. Swynnerton Option

The main risks and cost drivers for this option are associated with the re-construction of Swynnerton Rd overbridge (including associated implications of temporary road closures) and the relocation of a significant amount of lineside equipment on the southern side of the railway corridor, including a signalling relay room, GSM-R mast and a Network Rail RRAP.

The costs and risks associated with relocation of the above are greater given that this side of the railway is not currently included within the red line boundaries of the Meecebrook Garden Community masterplan. At this stage it has to be assumed that additional land (beyond current masterplan boundaries), will need to be purchased in order to deliver this option. For the purposes of this feasibility study and costing, land acquisition and costs were not reviewed, but are likely to be a significant contributor to the overall cost of this option.

Given the proximity of the station to Swynnerton Rd, reducing the platform width has a significant impact on the reduction of the required lateral track slew. Based on this, reducing the width of the island platform from 9m to 5.5m would probably eliminate the need to re-construct the existing overbridge. However, this is unlikely to work in practice, as the island platform would need to taper in from its widest point (at the location of the lift and stairs from the footbridge) to the platform end. Given the Fast lines are to remain in their current position, the taper would need to be on the Slows side of the island platform, which is unlikely to fit a compliant track alignment given the existing curve at this location.

In addition, some modifications are likely to be required to the existing signalling. A banner repeater signal on the Down Slow line would be located in the middle of the new platform. Whilst this is feasible, signal sighting will need to be considered and may complicate the platform design especially if the signal is low or if the platform furniture and columns interfere with line of sight. Sighting to other existing signals will also need to be checked, to confirm that no additional signals or changes to the signalling scheme plan are required.

Given the significant implications and risks associated with this option, it is not recommended to consider it for further development.

5.3. North Option

The main risk and cost drivers for this option are associated with the signalling modifications required to accommodate the station, as the existing signals are too far away (and obstructed by structures) to be visible from the platform ends. Early engagement with Network Rail's Signalling Project Engineer (PE) and Route Asset Manager (RAM) is therefore critical to the success of this option.

In addition, the Network Rail RRAP will need to be relocated to accommodate the new platform, however as the existing RRAP and access route is located fully within the boundaries of the current development masterplan, it is assumed that this relocation will be feasible and some change to the RRAP will be required as part of the development masterplan, regardless of the station project going ahead.

These risks are less significant than for the Swynnerton Option, and it is reasonable to expect that they can be successfully managed in further stages of the project. Furthermore, given the complexities associated with the Central Option (see below), **the North Option is considered to be the best location for the station based on this feasibility study, and is recommended for further development into the next design stage.**

5.4. Central Option

One key risk associated with this option, which may be seen as a one of the 'show-stoppers', is the requirement to widen the existing underbridge carrying the railway over Meece Brook. Whilst the existing structure appears to be of relatively short span, and the additional width needed is likely to be around 4-5m, the constraints of the site and the very limited access into the site create significant constructability risks. As the site is located adjacent to the brook and in a floodplain, the ground conditions are anticipated to be poor and it is assumed that piles will be required for the widening. The likely poor ground conditions will also severely constrain access for heavy machinery that will be required for piling and lifting. Road access to the site is along a single-track lane that leads to the vineyard, and which is not suitable for heavy construction traffic. A full blockade of the Slow lines will likely be required to enable construction of the widening.

Whilst there are engineering solutions to deliver this option and the significant risks can be managed at a cost, it would be more rational to adjust the location of the station (moving it further north towards Swynnerton Rd) in order to avoid impacting on the Meece Brook underbridge. This would mean losing the benefit of the station being placed in between existing signals, however the benefits and reduction in risk associated with the avoiding the underbridge widening will outweigh the additional signalling implications.

The alignment presented as part of the feasibility study maximises all allowable track design parameters in order to keep the proposed alignment as close to the existing as possible. However due to the high line speed on the Slow lines and the curvature adjacent to the vineyard, there is no viable solution for avoiding the need to widen the Meece Brook underbridge. The only alternative would be a reduction in line speed, however being on one of the key national routes, this is simply not feasible.

In addition to the risks and costs associated with the underbridge widening, another implication and cost driver for this option is the significant amount of earthworks required on the southern side of the railway, where the existing cutting will need to be widened by approximately 13m to accommodate the new track and the Down Slow platform. There may be an opportunity to re-use some of the excavated material within the wider development works, however engagement with the developer will be required to confirm this (soil testing for contamination and suitability for re-use elsewhere on site will also be required). However, the existing topography could bring a benefit of blending the station into the surroundings, and 'hiding' it from views from the south. The topography may also be used as an advantage to reduce the extents of stairs and lift required to access the Down Slow platform.

A number of LOCs on elevated platforms will need to be relocated to accommodate the new track and platform, however this is not a significant risk and can be managed.

Another implication of this option is the requirement to re-construct the fishery access road overbridge. This could also be turned into an opportunity, incorporating the new structure into the station to provide access between platforms. Engagement with Network Rail and the TOCs will be required to consult on potential risks of the station being accessible from a public road.

The main benefit of this option compared to other options is the limited impact on the existing signalling equipment. However, this is outweighed by the implications of widening the Meece Brook underbridge, as well as other constraints outlined above.

6. Conclusions & Recommendations

6.1. Conclusions

Five different locations for a new station to serve the Meecebrook Garden Community were reviewed as part of this feasibility study. Two options (South and Junction) were discounted on the basis of existing infrastructure constraints (refer to Section 4.6). Another three options (Swynnerton, North and Central) were investigated further through a high level track alignment study. Of those, the North Option was found to make best use of the existing site and infrastructure constraints and is recommended for further development into the next design stage (refer to Section 5).

6.2. Recommendations

Reconciliation with Business Case

It is recommended that a thorough benefits analysis is undertaken to confirm the BCR score for each option and confirm that the North Option is the preferred location (i.e. that the Swynnerton or Central options do not present exponentially greater benefits, which will result in a greater BCR despite the significantly higher costs and risk profile of these options).

Engagement with Stakeholders

It is recommended that the next stage focuses on engagement with DfT, Network Rail and the TOCs, to understand their requirements and confirm a number of key assumptions made as part of this feasibility study, in particular the assumption that 185m long platforms to accommodate 8-car trains are acceptable. In addition, the Through Alignment Design for this section of the WCML should be requested from Network Rail, to enable a more accurate review of the proposed alignment and associated impacts. Network Rail's Signalling Project Engineer and Route Asset Manager should also be consulted as a matter

of priority, to confirm the acceptance in principle of any proposed option and establish extents of changes required to the existing signalling systems.

It is also recommended that the designers responsible for the masterplan of Meecebrook Garden Community are engaged, in order to better understand the requirements and opportunities to integrate the station into the development. For example, there may be scope to move the location of the station slightly so that it is in between the North and Central options and then link the station in with a re-built overbridge over the railway which would also act as one of the main transport corridors linking the two sides of the development either side of the railway. The requirements for car parking and provision of a station building have not been explicitly considered as part of this feasibility study, however the proposed locations do not preclude the provision of either, once the detailed requirements are determined with stakeholders at subsequent design stages.

Risk Management

A number of key assumptions have been made at this stage. In order to reduce the risk or realise the opportunities associated with these assumptions, further work should be carried out prior to, or at the start of, the next design stage, as detailed below.

Table 3 - Assumptions, risks and opportunities

Assumption	Associated risk / opportunity	Recommended action
Platform length should be 185m	**Risk:** Longer platforms would increase extent of track slews and increase cost of works	Engagement with TOC and NR to confirm minimum acceptable platform length. If 12-car trains requested, consider operational solutions such as SDO.
Signalling alterations are minimal and limited to moving some signals laterally with track slews and provision of new banner repeater signals at platform ends where necessary	**Risk:** Additional signalling works required by Signal Sighting Committee	Obtain advice from signalling experts to assess likely extent of works
Overhead line clearance to platforms can meet standards	**Risk:** Significant work to raise OHLE to provide compliant clearance. Bridge(s) may have to be raised or track lowered to provide clearance.	Topographical (and/or UAV) survey and OHLE height and stagger survey to enable clearances to be determined
Ground conditions are suitable for construction	**Risk:** Additional piling required **Opportunity:** Piling not required	Carry out targeted ground investigation works where there are concerns around ground risk
Feasibility alignment design based on OS tile information	**Risk:** Larger lengths of track (and more infrastructure) affected than currently envisaged **Opportunity:** Smaller lengths of track (and less infrastructure) affected than currently envisaged	Obtain Through Alignment Design from NR and undertake more detailed track alignment design study for preferred location
Existing culverts and other utilities under the railway are not affected by the works	**Risk:** Additional work required to protect or divert services under the railway	Detailed survey to confirm services
Diversion or renewal of services over the railway on the overbridges can be managed with minimum disruption	**Risk:** Third parties object to service disruption and require more expensive alternatives	Survey of all services and engagement with stakeholders to understand existing utilities and their condition

Assumption	Associated risk / opportunity	Recommended action
No third party fibre optic cables in lineside cable route	**Risk:** Significant costs incurred to manage relocation of fibres	Obtain records from NR and third parties
New track drainage provided	**Opportunity:** As no track drainage is provided at present, existing ground may be sufficiently permeable	Engagement with NR Track Engineer

Concept Development

It is recommended to further develop the concept for the proposed station, in conjunction with the stakeholder engagement and risk management workstreams described above. This would include:

1. Developing a Client Outcome Specification, defining the outputs and aims of the project. This will enable the requirements management process (see below) to be undertaken effectively;

2. Through engagement with the Client and stakeholders, refine and agree the core requirements of the station scheme, noting that all requirements should relate back to the aims set out in the Client Outcome Specification. This process enables distinguishing the ‘wants’ and ‘nice to haves’ that may be suggested by stakeholders, from the ‘needs’ of the project to meet the Client Requirements;

3. Further development of the engineering design of the concept, including reviewing design elements and disciplines which were not covered by this Feasibility Study (as they would have the same implications regardless of location). This includes but is not limited to reviewing and developing a concept for the station power supply, traffic assessments and car parking provision, lighting design, ecology considerations, drainage strategy, telecoms and other railway systems aspects, etc.

4. The above should be underpinned by a Design Decision and Assumptions Log, where key decisions and assumptions made throughout development of the concept can be recorded. This would provide a clear audit trail of how the concept was established (including any decisions to discount certain options or considerations during the concept development process) and also enables better understanding and management of key risks.

Appendix A – Track Alignment Drawings

Refer to separate PDF files:

- 220505-CRL-ETR-DRG-00001_P01 (Sheet 1 of 3) – Swynnerton Option
- 220505-CRL-ETR-DRG-00001_P01 (Sheet 2 of 3) – North Option
- 220505-CRL-ETR-DRG-00001_P01 (Sheet 3 of 3) – Central Option

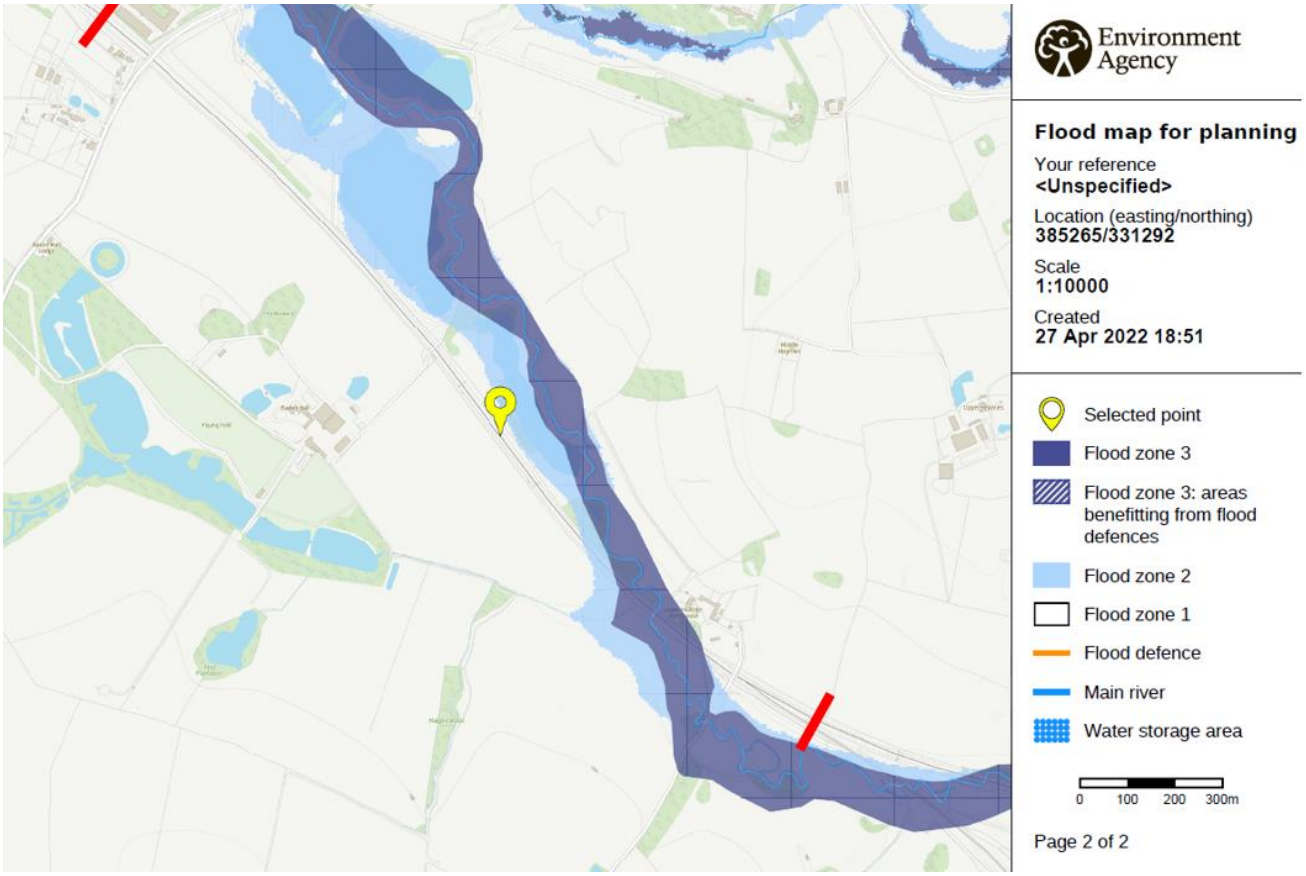
Appendix B – Desk Study Information

British Geological Society (BGS) Online Mapping Information

Bedrock

Superficial Deposits

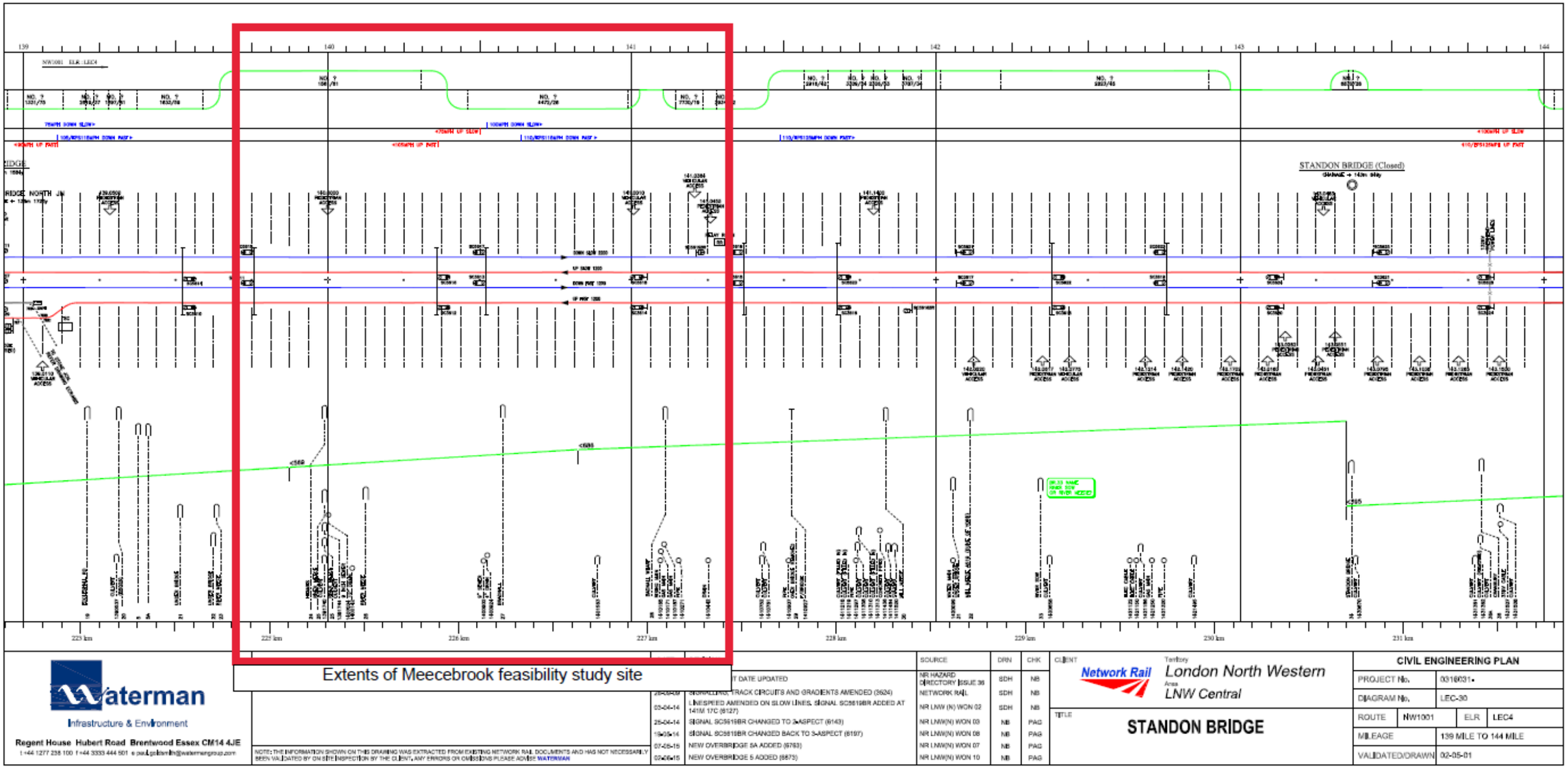
Environment Agency (EA) Online Flood Risk Mapping Information



SLC Rail

5 Mile Diagram (2015)

LIST OF ROUTES	TO UK MAP	CIVIL ENGINEERING PLAN	SIGNALLING PLAN	ELECTRICAL PLAN	HAZARD PLAN	TRACK QUALITY	POSSESSION PLANNING



SEARCH		DRIVER MANUAL	TELECOMS PLAN	KEY	MAIN MENU

Appendix C – Feasibility Cost Estimate

22 June 2022

SLC Rail

2Q22

Rev 4

Ref	Estimate Breakdown			Swynnerton Option	North Option	Central Option
1	**Direct Construction Works Costs**			**Value (£)**	**Value (£)**	**Value (£)**
1.01	Signalling			£1,715,938	£450,993	£205,718
1.02	Overhead Line			£1,278,915	£834,075	£979,395
1.03	Power			£50,550	£50,550	£50,550
1.04	Permanent Way			£1,094,525	£1,136,349	£1,499,616
1.05	Telecoms			£936,980	£936,980	£938,142
1.06	Platforms			£13,563,497	£13,424,137	£12,527,497
1.07	Civils			£3,604,382	£447,020	£3,754,392
1.07	Enabling Works			£72,034	£72,034	£72,034
1.09	Access Road and Drop Off Area			£305,524	£235,967	£1,669,464
	DIRECT CONSTRUCTION WORKS COST TOTAL			**£22,622,345**	**£17,588,104**	**£21,696,809**
2	**Indirect Construction Works Costs**					
2.01	Preliminaries	30%	40%	£6,786,704	£5,276,431	£8,678,724
2.02	Contractors Overhead and Profit		9%	£2,646,814	£2,057,808	£2,733,798
2.03	Traffic Management - Allowance			£0	£0	£0
2.04	Temporary Works - Allowance			£50,000	£50,000	£50,000
	INDIRECT CONSTRUCTION WORKS COST TOTAL			**£9,483,518**	**£7,384,239**	**£11,462,521**
	TOTAL CONSTRUCTION COST			**£32,105,863**	**£24,972,343**	**£33,159,330**
3	**Design, Project Management and Other Project Costs**					
3.01	Design		15%	£4,815,879	£3,745,851	£4,973,900
3.02	Project Management		12%	£3,852,704	£2,996,681	£3,979,120
3.03	TOC PMO Costs			£48,000	£48,000	£48,000
3.04	TOC Compensation		0.5%	£113,112	£87,941	£108,484
3.05	NR BAPA			£150,000.00	£150,000.00	£150,000.00
3.06	NR APA Costs		7.5%	£1,696,676	£1,319,108	£1,627,261
3.07	Network Rail Fee Fund		10%	£169,668	£131,911	£162,726
3.08	Network Rail Industry Risk Fund		2%	£825,105	£642,655	£851,631
3.09	Surveys and Assessments - Allowance			£20,000	£20,000	£20,000
	DESIGN, PROJECT MANAGEMENT AND OTHER PROJECT COST TOTAL			**£11,691,143**	**£9,142,146**	**£11,921,121**
	BASE COST ESTIMATE			**£43,797,006**	**£34,114,489**	**£45,080,451**
4	**Risk**					
4.01	Risk - Allowance		60%	£26,278,203	£20,468,694	£27,048,271
	RISK COST TOTAL			**£26,278,203**	**£20,468,694**	**£27,048,271**
5	**Land**					
5.01	Land Costs - Excluded			Excluded	Excluded	Excluded
	LAND COST TOTAL			**£0**	**£0**	**£0**
	ANTICIPATED FINAL COST (excluding Inflation)			**£70,075,209**	**£54,583,183**	**£72,128,722**