Appendix 4

MOTT MACDONALD

CAMBRIDGESHIRE & PETERBOROUGH COMBINED AUTHORITY

March to Wisbech Transport Corridor

GRIP 3 Heavy Rail Multi-Disciplinary Option Selection Report

26 June 2020

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Document reference: 398128 | 009 | C

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Abbreviations and Descriptions

Descriptions of abbreviations used in this document are as follows:

Acronym	Description
BIM	Building Information Management
CCC	Cambridgeshire County Council
CCTV	Closed Circuit Television
CIS	Customer Information System
CL	Cover Level
CPCA	Cambridgeshire and Peterborough Combined Authority
DfT	Department for Transport
DHEMR	Designer’s Hazard and Elimination Record
DMRB	Design Manual for Roads and Bridges
DMU	Diesel Multiple Unit
DNO	Distribution Network Operator
E&P	Electrical and Plant
EA	Environmental Agency
EACE	Ely Area Capacity Enhancement Programme
EMGTPA	Equivalent Million Gross Tonnes per Annum
FBC	Full Business Case
FOSD	Full overtaking sight distance
FSP	Functional Supply Point
GI	Ground investigations
GRIP	Governance for Railway Investment Projects
GRP	Glass Reinforced Plastic
IDB	Internal Drainage Board
IDC	Interdisciplinary Design Check
IL	Invert Level
LLFA	Lead Local Flood Authority
LLPA	Long Line Public Address
LOC	Location Cabinet
LV	Low Voltage
M&E	Mechanical and Electrical
mAOD	Metres Above Ordnance Datum
NR	Network Rail
ORR	Office of Rail and Road
OS	Ordnance Survey
PHCC	Points Heating Control Cubicle
PHP	Passenger Help Point
PSP	Principle Supply Point
QBar	Greenfield runoff rate (mean annual maximum flow rate)
RAM	Route Asset Manager

Acronym	Description
REB	Relocatable Equipment Building
RFI	Request for Information
RSA	Road Safety Audit
SOC	Station Operating Company
SPT	Signal Post Telephone
SSD	Stopping sight distance
SuDS	Sustainable Drainage Systems
TP&N	Three Phase and Neutral (electrical supply)
TP&SN	Three Phase & Separate Neutral
TVM	Ticket Vending Machine
TWL	Top of Water Level
UKPN	UK Power Networks
UPS	Uninterruptable Power Supply
URX	Under Road Crossing
UTX	Under Track Crossing
VfM	Value for Money
VRS	Vehicle restraint system
V&V	Verification and Validation

Executive summary

The March to Wisbech transport corridor is a disused railway line between March and Wisbech in Cambridgeshire. The line is approximately seven miles long and was closed to regular traffic in 2000. The line still appears in the Network Rail sectional appendix and is formally considered to be temporarily out of use.

In 2018 Mott McDonald were commissioned under the March to Wisbech Transport Corridor study to develop GRIP 3 design and Department for Transport (DfT) business cases for reinstatement of the transport corridor.

Earlier elements of the study (principally the GRIP 2 Heavy Rail Feasibility Report, Tram Train Feasibility report and Options Assessment Report) have considered a range of transport modes, service patterns and Wisbech station locations. This earlier work has concluded that:

- The preferred transport mode is Heavy Rail (National Rail);
- A new station in Wisbech should be in a central location (immediately south of the current Nestlé Purina site);
- Services should be direct (2 trains per hour) between Wisbech and Cambridge, calling at March and other intermediate stations;
- All 22 existing level crossings on the disused line between March and Wisbech should be closed.

The GRIP 3 design assesses and identifies the infrastructure required for reinstatement of 2 trains per hour, heavy rail, passenger services between Wisbech and March. Assessment of infrastructure has been limited to the March to Wisbech transport corridor, but operational analysis has been undertaken to ensure compatibility with the aspiration for direct onwards running to Cambridge.

The design has been based on 2-car Class 170 rolling stock. The impact of adopting Class 755 bi-mode units has been assessed to have only minor impacts on the infrastructure solution and capital cost. Passive provision for 4-car, Class 170 or 755 units has been allowed for. Rolling stock will be determined at a later design stage in consultation with potential operators.

To reinstate a 2 trains per hour heavy rail passenger service between March and Wisbech with provision for future services operating through to Cambridge, it is necessary to build a large amount of new infrastructure. Key recommendations for infrastructure are:

- At March Station an additional operational platform is needed. A new operational platform at the West End of the old platform 3 is recommended, with an available capacity for a 2-Car Class 170 train and passive provision for a 4-car train;
- A revised track layout at March is required to serve the reinstated platform 3. The preferred option is to re-open a bi-directional platform 3 with the track diverging from the Up Main at the approximate location of the existing March East level crossing;
- To maintain step free access at March a new station footbridge with lifts is required;
- A new signalling layout at March is required, including provision of nine new signals;
- A single bi-directional line should be provided between Whitemoor Junction and Wisbech;
- A passing loop at Coldham approximately 350m long should be provided;

- New signalling infrastructure between Whitemoor Junction and Wisbech is required, including provision of eight new signals;
- A single end fed signalling power supply should be provided;
- A new Wisbech Station should be provided with a single platform to accommodate a 2-car Class 170 train with passive provision for a 4-car train;
- Closure of the 22 existing level crossings should be carried out through construction of 5 highway diversion schemes. These schemes include 7 new bridges.

The estimated capital cost of the proposed infrastructure is approximately £178m, excluding optimism bias, risk and opportunity.

Key project dependencies and risks are:

- Provision of additional train paths through Ely North Junction via the Ely Area Capacity Enhancement scheme;
- Increased level crossing risk on the 39 level crossings of various types between March and Cambridge, some of which may require upgrades. This study assumes that all necessary upgrades to these existing level crossings will be delivered by the Ely Area Capacity Enhancement or other Network Rail projects.
- Recontrol of the existing signalling infrastructure in the March area. This study assumes that the ageing signal control infrastructure at March is recontroled to Cambridge under a separate NR project and that signal control for the reinstated March to Wisbech line can be accommodated at Cambridge.
- Approval of tight radius track curvature around March station by Network Rail. Rejection of the proposed layout would require major changes to the track design and March station platforms, with additional project costs.
- The location of the proposed Weasenham Lane bridge raises concerns in terms of constructability and maintainability, as it is less than five metres from adjacent industrial buildings in places. These hazards are in addition to the project risks of this bridge due to the severance of access to at least three businesses. Changes to the alignment design or bridge configuration could incur additional project costs.
- Fluvial/tidal hydraulic modelling has not been undertaken at this stage of design and thus a design flood level has not been agreed. The flood level could impact the design and location of the proposed infrastructure. This may lead to additional project costs.

1 Introduction

1.1 Purpose of this Document

The purpose of this GRIP 3 Heavy Rail Multi-Disciplinary Option Selection Report is to document the optioneering and engineering employed, to develop a single preferred heavy rail solution, for the March to Wisbech transport corridor, to the level of detail required to support Full Business Case (FBC) cost estimation. A slimmed down version of the GRIP 3 design process has been used, with the focus on developing designs for those elements which significantly impact capital cost.

1.2 Design Stage

This report builds on the GRIP 2 work previously undertaken by Mott MacDonald in 2015 and updated in 2019. The sequence of design stages is detailed in Table 1.1 below.

Table 1.1: Design Stages

Stage	Date	Description	Reference
GRIP 2	July 2015	Feasibility design	Heavy Rail Feasibility Report - 348851/ITD/ITN/001 (Rev B)
GRIP 2	August 2019	Feasibility design	Heavy Rail Feasibility Report (Updated) - 398128 | 002 | B
GRIP 3	June 2020	Option selection	Option Selection Report - 398128 | 009 | B
GRIP 4	TBC	Single option development	TBC – currently unfunded
GRIP 5	TBC	Detailed design	TBC – currently unfunded
GRIP 6	TBC	Construction test and commissioning	TBC – currently unfunded
GRIP 7	TBC	Scheme hand back (to maintainer or operator)	TBC – currently unfunded

1.3 Strategic Context and Objectives of the Project

The Cambridgeshire and Peterborough Combined Authority (CPCA) was formed in 2017 with responsibilities for housing, transport, skills and public service reform. Wisbech and March have been a focus for growth and wider economic regeneration. Enabling this growth through the delivery of transport infrastructure which provides March and Wisbech with improved connectivity to regional centres of economic activity in Peterborough and Cambridge is a high priority for CPCA. CPCA is keen to bring forward transport improvements to the March to Wisbech corridor which delivers this important objective.

CPCA have commissioned the March to Wisbech Transport Corridor study to develop GRIP 3 design and DfT Business Cases for reinstatement of the transport corridor.

1.4 The Existing March to Wisbech Corridor

The line from March to Wisbech, currently runs from March East Junction at 85 miles 78 chains to the nominal end of the line at 93 miles 49 chains at Wisbech. Originally opened in 1847 as a two-track railway by the Eastern Counties Railway, the line had one intermediate station at Coldham. The line was later extended to Watlington Junction (near Watlington on the Fen Line).

Coldham Station closed in 1966 and Wisbech station (and the extension to Watlington) in 1968. The line was singled in 1972, the line being used for freight-only operations as far as the Metal Box and Purina sites located south of Wisbech until around 2000.

Since then the line has been officially described in the Network Rail Sectional Appendix as "Out of Use (temporarily) from 86 miles 18 chains to Wisbech". The March end of the line is used to access Whitemoor Yard in conjunction with the chord from March West Junction and to support shunting movements, but only as far as 86 miles 18 chains. The route is largely straight and virtually level throughout. The line has not undergone any recent maintenance / renewal of track or signalling equipment and has never been included in the planned recording runs by the track geometry recording train.

1.5 Key Findings of Earlier Work

The GRIP 3 heavy rail design builds on earlier elements of March to Wisbech Transport Corridor study. Key elements of preceding work informing the GRIP 3 heavy rail design are:

1.5.1 GRIP 2 Heavy Rail Feasibility Report (398128 | 002 | B)

The primary objective of the GRIP 2 Heavy Rail Feasibility Report was to investigate the feasibility and cost of re-opening the railway line between March Station and Wisbech to heavy rail (National Rail) services. The report focuses on the design and technical feasibility of the scheme development.

Key conclusions of the report were:

- There are a number of viable engineering and timetable options for the re-instatement of a passenger service to Wisbech;
- Running services from Wisbech to Cambridge (via March) is theoretically possible. However, Network Rail had previously stated that the timetable alterations for a service from Wisbech to Cambridge were not deemed possible at this time as this was not seen as best use of available train paths on what is an already heavily constrained network;
- Pathing constraints of the Ely to Ely North Junction area are the primary restriction on services to Cambridge. Upgrade proposals under the Ely Area Capacity Enhancement (EACE) scheme are therefore a key dependency for any proposed Wisbech to Cambridge rail service;
- The 22 existing level crossings between March to Wisbech will need to be closed, with 5 new highway schemes and 7 new bridges constructed to facilitate this;
- Based on a GRIP 2 level of design, the capital cost for the preferred heavy rail infrastructure configuration was estimated at approximately £160m excluding optimism bias, risk and opportunity.

Items identified for further development at the GRIP 3 stage of the project included:

- Coordination of development proposals with the Ely Area Capacity Enhancement scheme;
- Determination of whether any other project is likely to contribute to signalling upgrade costs at March East, reducing or removing the £16m to £20m cost included within the project cost estimate;
- Investigation of opportunities generated by the overlap with proposals for dualling the A47, currently under development by the CPCA;
- The infrastructure layout at March station; and

- The risk to the scheme associated with changes to level crossing safety risk profiles between March and Cambridge stations (as a result of increased train service frequency at each crossing following the introduction of Wisbech to Cambridge services).

1.5.2 Options Assessment Report (398128 | 005 | D)

This Options Assessment Report (OAR) forms part of the business case development process and sets out the process by which a preferred option has been identified for further development. The OAR considered a wide variety of options for the transport corridor to identify which ones best address the underlying challenges of the study area and the CPCA's objectives for the project. Options were structured around three main variables:

- Mode - conventional heavy rail (National Rail) options; a "hybrid" tram-train mode, and a lower cost alternative of a guided busway;
- Service Pattern - between one and three services per hour from Wisbech, with destinations considered that include a "shuttle" service to March only, and "through" services to Cambridge and Peterborough;
- Station location - a variety of locations for a new station or stations in Wisbech, including a parkway option, options of various degrees of proximity to the existing town centre, and options within the planned garden town urban extension.

Key findings of the OAR were:

- The preferred transport mode for the March to Wisbech transport corridor is Heavy Rail (National Rail);
- A new station in Wisbech should be in a central location (immediately south of the current Nestlé Purina site);
- Services should be direct (2 trains per hour [tph]) between Wisbech and Cambridge, calling at March and other intermediate stations;

Based on GRIP 2 level cost data, there is a high value for money (VfM) case for reinstating the March-Wisbech line and providing a half hourly (2tph) services from Wisbech to Ely and Cambridge.

1.6 Preparation of Document

Preparation of this document was led by Gavin Jennings (Engineering Manager) with contributions from across the March to Wisbech GRIP3 team. The following discipline leads are responsible for the information in the appropriate sections:

Table 1.2: Project Discipline Leads

Discipline	Lead
Ancillary Civil/Stations Civil Engineering	Andrew Corcoran / Peter Orr
Bridges & Civil Structures	Gerry Dissanaike
Building Information Management (BIM)	Steven Longden
Drainage and Flood Risk	Megan Jones / Andrew Precious (General) Cleopatra Meade / Terry Chung (Track Drainage)
Electrical and Plant	Timothy Granger
Environmental surveys and reporting	Katherine Gareau
Geotechnical	Richard Spence
Highways	Naomi Ward

Discipline	Lead
Operations	Roy Chapman
Signalling	Douglas Crawford
Telecommunications	David Crilly
Track	Gavin Jennings

The assessment and design work informing this report was carried out throughout 2019 and early 2020. The bulk of this work was completed before the COVID 19 pandemic affected the UK. The report and recommendations have not considered possible impacts of any societal changes resulting from the pandemic.

1.7 Structure of Document

The document structure is summarised below.

Table 1.3: Document Structure

Section	Description
1 - Introduction	Purpose and context of this report
2 - Design Inputs	Key information used to develop the design including: • References • Standards • Existing infrastructure • Scope • RFIs
3 - Assumptions	Key assumptions for each engineering discipline used to develop the design
4 - Project interfaces	Interfacing projects and project stakeholders
5 - Design Description	Summary of how the design has developed from the GRIP 2 design and the optioneering undertaken to develop the preferred solution
6 - Constructability	Considerations for construction of the proposed infrastructure
7 - Maintainability	Considerations for maintenance of the proposed infrastructure
8 - Design Outputs	The design deliverables produced to address the scope
9 - Design Assurance	The process undertaken to assure the design including any potential derogations to the standards detailed in Section 2
10 - Safety Assurance	Summary of the hazard identification and mitigation undertaken to date
11 - Environmental	Summary of the environmental analysis of the project
12 - Risks and Opportunities	Key risks and opportunities identified within the design. Risks are intrinsically linked to the consequences of the assumptions in Section 3 and hazards from Section 8
13 - Full Business Case Cost Estimate	The costing for the design work undertaken
14 - Conclusions and Recommendations	Summary of the preferred option and costings and key items to be undertaken if the design were to progress further

2 Design Inputs

2.1 Reference Information

The following references were used in the development of this report.

Table 2.1: References

ID	Title	Reference
1.	March to Wisbech Transport Corridor Study - Scoping Note	398128 | 001 | B
2.	March to Wisbech Transport Corridor - GRIP 2 Heavy Rail Feasibility Report	398128 | 002 | B
3.	March to Wisbech Transport Corridor - Options Assessment Report	398128 | 005 | D
4.	March to Wisbech Transport Corridor - Assessment of Rail Operations	398128 | 007 | C
5.	Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening	eB 147663 V1.0
6.	Network Rail – March to Wisbech Reopening - GRIP Stage 2 Level Crossing Closure Feasibility Study	151321 V1.0
7.	Network Rail Earthwork inspection 5 Chain Record reports	WIG 85.1502 to 93.1126
8.	Ordnance Survey Mapping Tiles (TF4000, TF4005, TF4505, TL4095)	Ordnance Survey
9.	LiDAR survey	Data.gov.uk
10.	IDB (Internal Drainage Board) C2 plans	398128
11.	EA (Environmental Agency) flood data	CCN/2019/139760
12.	British Railways – Locomotives and Coaching Stock - 2010	ISBN 978 1 902336 78 7
13.	March-Wisbech Transport Corridor - Low Cost Alternative - Tram-Train	398128 | 004 | B

2.2 Requirements Management

GRIP 3 design requirements have been derived from the Scoping Note[1] and the Network Rail (NR) Report Review[2].

The key requirements have been summarised in Section 2.5 (Scope) and Section 2.6 (Design Criteria).

2.3 Applicable Standards, Codes and Guidelines

The following standards, codes and guidelines have been used to develop the design.

2.3.1 Track

Table 2.2: Applicable Track Standards

Standard	Description	Version
NR/L3/TRK/2049	Track Design Handbook	Issue 14
NR/L2/TRK/2102	Design and Construction of Track	Issue 8
NR/GN/TRK/058	S&C Track Design Good Practice Guide	Issue 1
Rail Industry Guidance Note GIGN5633	Recommendations for the Risk Assessment of Buffer Stops and End Impact Walls	Issue 1

[1] Reference 1 in Table 2.1
[2] Reference 5 in Table 2.1

Standard	Description	Version
Rail Industry Standard RIS-7016-INS	Interface between Station Platforms, Track, Trains and Buffer Stops	Issue 1.1
Railway Group Standard GC/RT5023	Categorisation of Track	Issue 2 (withdrawn)

2.3.2 Signalling

Table 2.3: Applicable Signalling Standards

Standard	Description	Version
NR/L2/SIG/11201	Signalling Design Handbook	Issue 11
NR/L2/SIG/19609	Requirements for Colour Light Junction Signalling	Issue 1
NR/L2/SIG/30009	Overlaps	Issue 2
RIS-0703-CCS	Signalling Layout & Aspect Sequence Requirements	Issue 1.1
RIS-0734-CCS	Signing of Permissible Speeds	Issue 1
RIS-0775-CCS	AWS and TPWS Interface Requirements	Issue 2
GKRT0075	Minimum Signalling Braking & Deceleration Distances	Issue 1.1

2.3.3 Highways

Table 2.4: Applicable Highways Standards

Standard	Description	Version
Design Manual for Roads and Bridges – Volume 6	Road Geometry Design	Current versions as of August 2019
Housing Estate Road Construction Specification	Cambridgeshire County Council standard for adoptable roads.	April 2018
Inclusive Mobility	UK Government guidance on designing and improving access to public transport, but also summarises guidance applicable to general streetscapes.	2005
Guidance on the Use of Tactile Paving Surfaces	UK Government guidance on tactile paving design.	2007

2.3.4 Geotechnical

Table 2.5: Applicable Geotechnical Standards

Standard	Description	Version
BS EN 1997-1:2007 + A1:2013	Eurocode 7: Geotechnical Design – Part 1: General Rules	2014
NA+A1:2014 to BS EN 1997-1:2004+A1:2013	UK National Annex to Eurocode 7: Geotechnical Design – Part 1: General Rules	July 2014
BS EN 1992-1-1:2004 + A1:2014	Eurocode 2: Design of Concrete Structures – Part 1-1: General Rules and Rules for Buildings	July 2015
NA+A2:2014 to BS EN 1992-1-1:2004 + A1:2014	UK National Annex to Eurocode 2: Design of Concrete Structures – Part 1-1: General Rules and Rules for Buildings	July 2015

Standard	Description	Version
BS 8002:2015	Code of Practice for Earth Retaining Structures	2nd Edition June 2015
BS 8004: 2015	Code of practice for foundations	2nd Edition June 2015
NR/L3/CIV/071	Geotechnical Design	Issue 4
NR/CIV/SD/SG/200	Selection Guide for Retaining Walls	Revision B

2.3.5 Ancillary Civil/Stations Civil Engineering

Table 2.6: Applicable Civil Standards

Standard	Description	Version
GIRT7020	GB Requirements for Platform Height, Platform Offset and Platform Width	Issue 1.1
RIS-7016-INS	Interface between Station Platforms, Track, Trains and Buffer Stops	Issue 1.1
GIRT7073	Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances	Issue 2
Better rail stations	Department for Transport guidance on requirements for provision at rail stations	2009 issue
Design standards for accessible stations	Department for Transport code of practice on requirements for accessible rail stations	Version 04
RT/CE/P/044	Managing Structures Works	Issue 1
NR/L2/CIV/003	Engineering Assurance of Building and Civil Engineering Works	Issue 5
NR/L2/CIV/044	Planning, Design and Construction of Undertrack Crossings	Issue 3
NR/L3/CIV/030	Platform Components and Prefabricated Construction Systems	Issue 3
NR/L3/CIV/071	Geotechnical Design	Issue 4
NR/L3/CIV/151	Engineering Assurance of Standard Designs and Details for Building and Civil Engineering Works	Issue 6
NR/L3/CIV/151/F010	Index of Standard Designs and Details for Building and Civil Engineering Works	Issue 14
NR/CIV/SD/FORMA/200 NR/CIV/SD/200 to 209	Retaining Walls Form A Standard Details for varying types of retaining wall	Issue P4 Varies
NR/CIV/SD/FORMA/260 NR/CIV/SD/260 to 267	Cess Support Structures Form A Standard Details for varying types of cess support walls	Varies
NR/CIV/SD/FORMA/610 NR/CIV/SD/610	Undertrack Crossing (UTX): Open Cut Method: Form A Standard Details for Undertrack Crossing (UTX): Open Cut Method	Issue P3 Issue F
NR/CIV/SD/FORMA/620 NR/CIV/SD/620 to 621	Relocatable Equipment Buildings and Trackside Equipment Housings Form A Standard Details for REB and TEH bases	Issue P3 Issue E
NR/CIV/SD/FORMA/665 NR/CIV/SD/665	Location Case Bases: Form A Standard Details for LOC bases (at grade)	Issue P1 Issue C
NR/CIV/SD/FORMA/670 NR/CIV/SD/670 to 673	Cess Walkways: Form A Standard Details for cess walkways	Issue P1 Issue C
NR/CIV/SD/FORMA/3010 NR/CIV/SD/3010 to 3019	Traditional front wall platform Form A (684021-BTA-00-101) Standard Details for traditional front wall build platforms	Issue 3 Issue A

Standard	Description	Version
NR/CIV/SD/FORMA/3035 NR/CIV/SD/3035 to 3048	Cross-wall platform Type 2 Form A (684021-BTA-00-102) Standard Details for cross-wall Type 2 platforms	Issue 1 Issue A
IPS&E/CIVILS/FORM-AB-001	Non-Accessible Signal Structure Form A	N/A
NAT/122374/EAR/FOA/IAB/FDT	Concrete Foundations for hinged post and non-accessible post signals	Issue A01
IPS&E/EEPF99/CIVILS/5001 to 5003, 5006, 5007	Standard Details for signal superstructure / foundations	Varies
NAT/EEPF99/ECV/FOA/IAB/SRS/101	Soil Retaining Structures Form A	Issue A02
IPS&E/EEPF99/CIVILS/020	Standard Details for Minor Retaining Wall	Issue B01
NR/L3/CIV/162	Platform Extensions	Issue 2
NAT/TW/InfraInv/ENG/EP6248683	Technical Work scope for DNO installations	Issue 3
NR/SP/OHS/069	Lineside Facilities for Personal Safety	Issue 2
NR/SP/SIG/19812	Cross Track cable Management	Issue 1
NR/L3/SIG/11303	Signalling Installation Handbook Appendix 2G05 – Locations: Construction Appendix 2M15 – Signals: Signs & Boards	Issue 8
RT/E/C/11821	Siting Requirements for Lineside Apparatus Housings	Issue 1
NR/L2/TEL/00013	Specification for Cable Troughing	Issue 4
NR/GN/TEL/30138	Buried Cable Route and Cable Route Through Station Platform	Issue 1
NR/GN/TEL/30140	Telecom Cable and Route Installation	Issue 1
NR/L2/OTK/5100	Boundary Measures Manual	Issue 2
NR/L3/TRK/2049	Track Design Handbook Mod 07; Gauging	Issue 14
PAN/E/CE/SS/0017	Signal Structures - Form A Guidance for Loading & Performance	Issue 3
PAN/IP/MI/INS/0062	Gauging Guidance for Civil and Track Project Engineers & Designers	Issue 3
PAN/E/SE/SI/0039	Signal Structure Design Provision for Future Electrification (Obsolete but still cited)	Issue 1
PRM TSI	Persons with Reduced Mobility Technical Specification for Interoperability	Issue 2
Infrastructure TSI	Infrastructure Technical Specification for Interoperability	Issue 1

2.3.6 Bridges & Civil Structures

Table 2.7: Applicable Structural Standards

Standard	Description	Version
BS EN 1992-2:2005	Eurocode 2: Design of concrete structures – Part 2: Concrete bridges – Design and detailing rules	2005
NA to BS EN 1992-2:2005	UK National Annex to Eurocode 2: Design of concrete structure – Part 2: Concrete bridges – Design and detailing rule	2005
BS EN 1990:2002 +	Eurocode: Basis of structural design	2006

Standard	Description	Version
A1:2005		
BS EN 1991-2:2003	Eurocode 1: Actions on structures – Part 2: Traffic loads on bridges	2004
NA to BS EN 1991-2:2003	UK National Annex to Eurocode 1: Actions on structures. Part 2: Traffic loads on bridges	2008
NR/L3/TRK/2049/MOD07	Gauging	Issue 2
NR/L3/CIV/020	Design of Bridges	Issue 1
NR/L3/CIV/006/1C	Handbook for the examination of Structures	Issue 4

2.3.7 Drainage and Flood Risk

Table 2.8: Applicable Drainage Standards

Standard	Description	Version
NR/CIV/SD/350	Network Rail standard design drawing: Standard UTX Drain Details	Issue D
NR/CIV/SD/351	Network Rail standard design drawing: Standard Catchpit Details	Issue D
NR/CIV/SD/322	Network Rail standard design drawing: Drainage Systems	Issue E
NR/L2/CIV/005/09	Module 2 - Railway Drainage	Issue 1
BS EN 752	Drain and sewer systems outside buildings	2017
BS 8533	Assessing and managing flood risk in development (Code of Practice)	2017
National Planning Policy Framework	Flood risk and coastal change	2019
CIRIA C753 SuDS Manual	National guidance covering planning, design, construction and maintenance of Sustainable Drainage Systems (SuDS)	V6

2.3.8 Electrical and Plant

Table 2.9: Applicable E&P Standards

Standard	Description	Version
Signalling Power		
NR/GN/ELP/00015	Guidance Note for Signalling Power Supply Design	Issue 4
NR/GN/ELP/27244	Guidance for Signalling Power Supplies	Issue 1
NR/L2/SIGELP/27409	Product Specification for Functional Supply Points (FSP)	Issue 2
NR/L2/SIGELP/27408	Product Specification for Signalling Power Distribution Cables	Issue 3
NR/L2/SIGELP/27410	Specification for Class II Based Signalling Power	Issue 2
NR/L2/SIGELP/27416	Alterations to Signalling Power Systems	Issue 1
NR/L2/SIG/30050	Signalling Power Circuit Principles	Issue 1
NR/SP/ELP/27243	Specification for Signalling Power Supplies	Issue 1
NR/L3/SIG/SG0065	Management of Disconnections that Affect Signalling Equipment	Issue 2

Standard	Description	Version
NR/L2/SIGELP/50000	Safe Working and Maintenance on or near Signalling Power Distribution Equipment above 175 V	Issue 3
NR/GN/ELP/27318	Insulation Monitoring of 650V Earth-Free (IT System) Power Cables	Issue 1
NR/GN/ELP/00011	Uninterruptible Power Supply (UPS) Equipment	Issue 3
NR/L3/SIGELP/50002	Safe Working Practices when Working on or near Signalling Power Distribution Equipment above 175 V	Issue 1
NR/GN/ELP/27310	Management of Signalling Power Supplies	Issue 1
NAT/TW/InfraInv/ENG/EP6248683	Design and Installation of New, Renewed or Refurbished Distribution Network Operators (DNO's) Intakes and Consumer Facilities	Issue 3
Lift Services		
NR/L2/CIV/193	New & Upgraded Lifts	Issue 1
NR/L3/CIV/194	Selection and Design of New and Upgraded Lifts	Issue 1
Points Heating		
NR/L2/ELP/40045	Electrical Point Heating	Issue 6
NR/GN/ELP/45002	Installation of Electric Point Heating	Issue 4
Lighting		
GI/RT/7016	Interface between Station Platforms, Track and Trains	Issue 5
RIS-7702-INS	Rail Industry Standard for Lighting at Stations	Issue 1
British/European Standards		
BS 7430 + A1	Code of Practice for Protective Earthing of Electrical Installations	2011
BS 7671:2018	Requirements for Electrical Installations - IET Wiring Regulations 18th Edition	2018
BS EN 50122-1 + A4	Railway Applications - Fixed Installations: Part 1 Protective provisions relating to electrical safety and Earthing	2011
Statutory Instrument 2015:51	Construction (Design and Management) Regulations 2015 (CDM 2015)	2015
Statutory Instrument 1989: 635	The Electricity at Work Regulations	1989
Statutory Instrument 2017: 580	The Electricity Works (Environmental Impact Assessment) (England and Wales)	2017
BS 5839-1	Fire detection and fire alarm system for buildings – Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises	2017
BS 5489-1	Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas	2013

2.3.9 Telecommunications

Table 2.10: Applicable Telecommunications Standards

Standard	Description	Version
NR/L1/TEL/30100	Telecoms Design	Issue 3
NR/L2/TEL/30022	Engineering Assurance Arrangements for Communications Schemes and Services	Issue 7
NR/L2/TEL/30130	Electronic Visual Customer Information Systems	Issue 3

Standard	Description	Version
NR/L2/TEL/30132	Asset Management of Station Information and Surveillance Systems (SISS)	
NR/L3/TEL/30134	Design and Installation Requirements for PA, VA and LLPA	Issue 2
NR/L2/TEL/30135	Technical Requirements for Security CCTV Systems on Network Rail Infrastructure	Issue 3
NR/L2/TEL/30151	Design and Installation of Station Cabling	Issue 1
NR/GN/TEL/50017	CCTV for Stations – Functional, Technical and Operational Requirements	Issue 1
NR/SP/TEL/30133	Asset Condition Assessment for Telecommunications Equipment	Issue 2
NR/GN/TEL/30139	The Survey and Design of Telecoms Cable and Route	Issue 1

2.4 Existing Infrastructure and Condition

A site visit was undertaken in April 2015 as part of the previous GRIP 2 study and an assessment of the condition of the infrastructure is detailed in Section 2 of the GRIP 2 Heavy Rail Feasibility Report[3].

In addition to this, the following site visits have been undertaken as part of the GRIP 3 study:

- October 2019: Platform-side visits to March station with representatives from:
  - Bridges and Civil Structures;
  - Telecommunications;
  - Electrical and Plant;
- February/March 2020: Bridge Inspections undertaken by Bridges and Civil Structures team.
- February/March 2020: Rail corridor walkover (including operational railway around March station and Whitemoor yard) with representatives from:
  - Ancillary Civils;
  - Bridges and Civil Structures;
  - Telecommunications;
  - Electrical and Plant;
  - Geotechnical;
  - Track Drainage;
  - Environmental (Ecology).

For the following disciplines, as the current rail corridor is not operational, it is assumed that the condition of the infrastructure is comparable to that documented in 2015:

- Track
- Signalling
- Drainage
- Highways

Where applicable, further detail is provided in the following sections.

[3] Reference 2 in Table 2.1

2.4.1 Track

Assumed as per Section 2.4 of the GRIP 2 Heavy Rail Feasibility Report[4].

2.4.2 Signalling

Assumed as per Section 2.3 of the GRIP 2 Heavy Rail Feasibility Report[5].

2.4.3 Highways

The condition of the level crossings is assumed as per Section 2.6 of the GRIP 2 Heavy Rail Feasibility Report[6].

Further surveys of the condition of highway pavements, or associated infrastructure such as lighting, signage and signals have not been undertaken, but it has been assumed that they are maintained to appropriate Cambridgeshire County Council standards.

2.4.4 Geotechnical

Desktop condition assessments of existing railway embankments have been based on the Network Rail Earthworks Inspection Report and findings reported as per Section 2.4.6 of the GRIP 2 Heavy Rail Feasibility Report[7].

A visual survey of the disused line was completed February 2020 to confirm the observations recorded in both the GRIP 2 Heavy Rail Feasibility Report and the Network Rail Earthworks Inspection Reports[8]. Additional surveys with access on or near the line were undertaken in March 2020.

Observations made during these surveys have been included in the Site Walkover Observation Plans included in Appendix V.1.

2.4.5 Ancillary Civil/Stations Civil Engineering

A visual survey from the operational platforms (1 and 2) at March Station was undertaken in October 2019 and has been used to inform assessment of the existing infrastructure. No access was possible to the currently disused Platform 3.

Additional surveys with access on or near the line were undertaken in March 2020. A walkover of the majority of the route was completed, with the exception of areas blocked by significant vegetation growth (circa 33% of the route). A selection of photographs from the visits, taken around the March station area and along the disused line, can be found in Appendix V.1 and V.2.

For the length of the accessible disused route the condition of boundary fencing was very poor, where present. However, adjacent landowners have in some instances erected a private boundary fence which is typically in a good condition.

Where the track is built upon embankment there are localised areas where the crest of the embankment allows little space for additional infrastructure to the east of the rail. However, due to the historical twin track arrangement, there is ample space to the west of the corridor.

[4] Reference 2 in Table 2.1
[5] Reference 2 in Table 2.1
[6] Reference 2 in Table 2.1
[7] Reference 2 in Table 2.1
[8] Reference 7 in Table 2.1

Around the March station and Whitemoor yard area there are various existing assets still maintained as part of the operational lines serving March station. All operational equipment appears to be in a good condition. Existing trough route between March station and Norwood Road overbridge is in a poor condition and needs replacement. There is a cess walkway and trough route through Norwood Road Overbridge and north towards the disused line which is in a good condition.

The disused platforms at March station appear to be in a poor condition with significant areas of the front walls in need of repair. The platforms appear to have been extended to the west including an oversail block detail. The extensions of the platforms appear to be in a good condition.

2.4.6 Bridges & Civil Structures

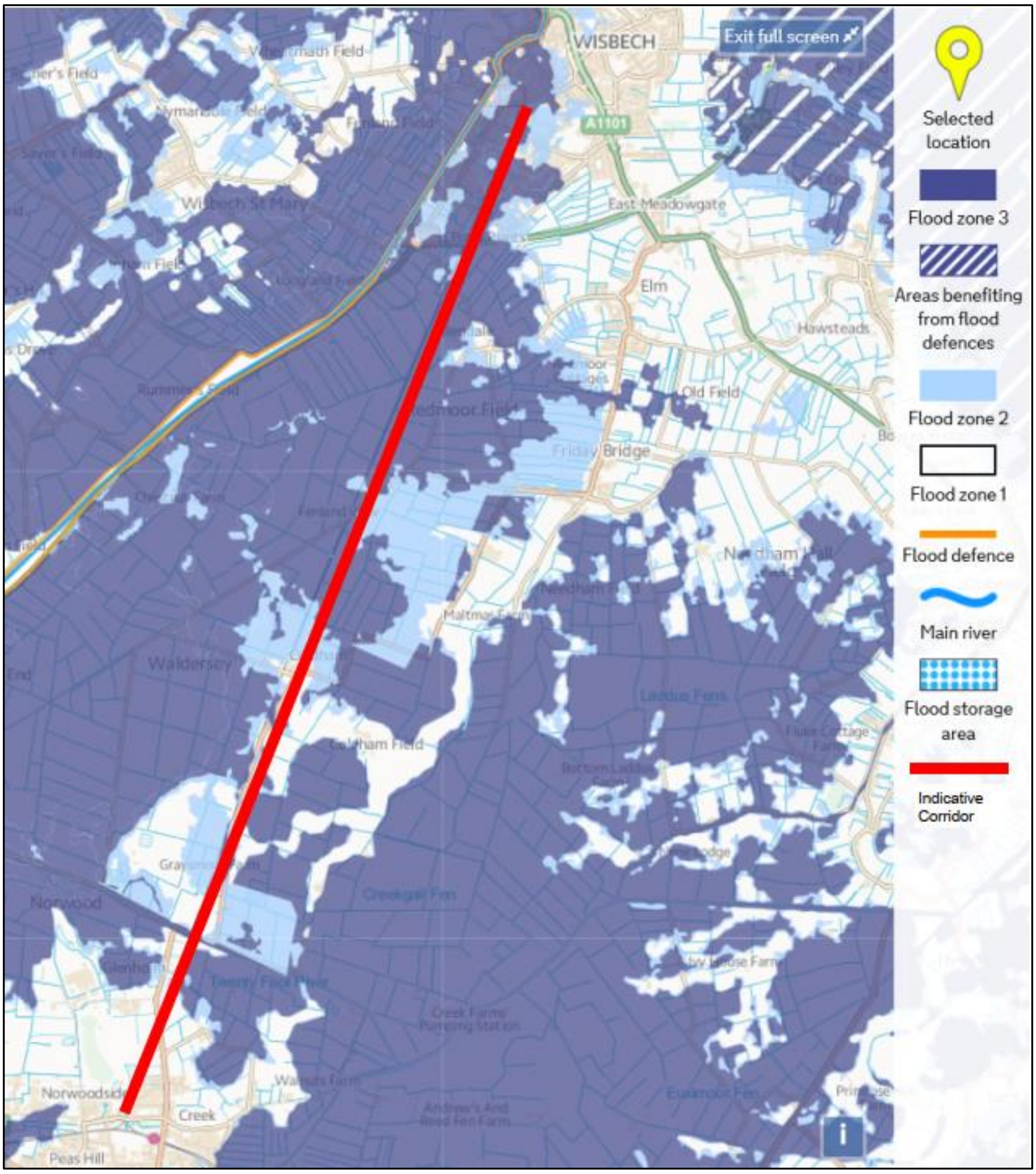
Visual inspection of the existing underbridges, namely Chain Bridge, Mulbary Drain, Waldersey Drain and Redmoor Drain, has been carried out for structural assessment purposes and is recorded in Appendix M. It is noted that these inspections were limit to visual inspection of accessible parts of the structure. The condition of culverts has been assumed to be as per Section 2.5 of the GRIP 2 Heavy Rail Feasibility Report[9]

[9] Reference 2 in Table 2.1

2.4.7 Drainage and Flood Risk

Flood risk mapping data has been referred to from gov.uk (see Figure 2.1) below.

Figure 2.1: Flood Risk Mapping



Source:https://flood-map-for-planning.service.gov.uk/confirm-location?easting=545481.692&northing=309714.383&placeOrPostcode=wisbech

IDB C2 plans were used to develop the design. These show the location of IDB watercourses between March and Wisbech. This information did not identify culverts, managed water levels, invert/channel levels, channel dimensions, culvert sizes or condition of assets.

OS mapping, LiDAR and aerial photography has been used to develop the design in absence of private/adopted drainage records.

Additional surveys, with access on and near the disused line, including the March station platforms, were undertaken in March 2020. A walkover of the entire route and March station was completed, apart from areas blocked by dense vegetation growth and unsafe access points.

For the majority of the length of the accessible disused route there are no existing ditches and/or bunds along the railway boundary, for example refer to photos 115744 and 162432 in Appendix V.2. However, in some instances, ditches were observed near the rail boundary, seemingly to receive run-off from third-party lands, with visible shallow gradients falling towards the railway area. Where the track is built on an embankment the existing ditches also receive run-off from the rail area. The boundary fences (where present) were in very poor condition, making it difficult to establish whether the existing ditches are situated within the rail boundary or on third-party land.

Where existing drainage ditches were present, patches of dense vegetation made it difficult to observe the ditch extent and alignment. Generally, the ditches appear to terminate at existing culverts with outfalls to local IDB drains. Where the existing ditch is in close proximity to the track, there is little space between the crest of the embankment and boundary to accommodate additional track drainage.

Some existing culverts observed along the route do not outfall to a local IDB drain but instead transfer the existing ditch to the opposite side of the track. Most of the culverts and headwalls visible from the track were in good condition with only a few containing significant visual structural damages to the brick headwall. Other culverts at the juncture of large IDB drains were either submerged above the soffit or not visible due to dense vegetation near the crossing.

At March station, multiple old concrete catchpits with iron grating were observed in the track area between the existing platforms 3 and 4. Drainage to the existing disused station canopy comprised downpipes with gravel pits constructed at the back of the platform with no outfalls visible from the platform to the track area.

On the approach to Whitemoor yard the only drainage features observed are the two existing large ponds adjacent to the operational track approx. 100m south of the Norwood overbridge. A NR owned culvert seemingly connects these two ponds, however only above ground markers indicating the culvert position were observed.

Further information on March 2020 visual survey findings is provided in Appendix V.2.

2.4.8 Electrical and Plant

2.4.8.1 March Station

A site survey was undertaken at March station on the 23 October 2019. This included: low voltage (LV) distribution cubicles, lighting columns, canopy lighting and platform distribution network operator (DNO) supply points.

For a detailed overview of the existing infrastructure across March station refer to Appendix J (398128-MMD-00-XX-RP-E-0001-A - Station Report).

2.4.8.2 March East DNO supply (UKPN Substation)

A second site survey was undertaken on the 24th March 2020 during which the Electrical and Plant team were able to gain trackside access on Network Rail land. This survey allowed access to the 400V supply cubicle labelled; ‘March Substation ‘G’ Low Voltage Supply Cubicle’.

The photos below show the supply cubicle located in the UKPN substation compound fence line adjacent to March station Platform 2 east entrance. The cubicle is accessed from the derelict Network Rail yard and was found to be a single sided, double door, 400V three phase & neutral (TP&N) supply cubicle. The existing supply cubicle has only been visually assessed as part of the GRIP 3 design; no load measurements were taken. The meter tails were found to be 4 single core 185mm sq. cables and the outgoing Three Phase & Separate Neutral (TP&SN) fuse switch was rated to 630A. This indicated satisfactory spare capacity at this supply point.

Photo 2.1: March UKPN Substation Compound

Source: MML Survey 24 March 2020

Photo 2.2: March Substation 'G' Low Voltage Supply Cubicle

Source: MML Survey 24 March 2020

2.4.8.3 March Relay Room Low Voltage Switch Room

March East Relay Room LV Switch Room main incomer is supplied from a DNO cubicle located at March East Level Crossing labelled; 'March East Junction Points Heating Cubicle No.2 Metering Cubicle'. The switch room at the east end of the Relay Room is the supply point for the following:

- March East Signal Box
- March Relay Room Consumer Unit (Domestics)
- March East REB Building Services DB
- March East REB UPS

Photo 2.3: March East Relay Room LV Switch Room – Exterior

Source: MML Survey 24 March 2020

Photo 2.4: March East Relay Room LV Switch Room - Internal

Source: MML Survey 24 March 2020

2.4.8.4 March East REB

March East REB is located beside March East Relay Room near the track access gate. The UPS room located at the east end of the REB is supplied from the Relay Room LV switch room. The changeover panel within the UPS room provides the supply for the March East Relay Room and March East REB signalling supplies.

Photo 2.5: March East REB – UPS Room Changeover panel

2.4.8.5 March East and Whitemoor Junction Points Heating Control Cubicles

The existing points heating installation at March East and Whitemoor Junction has not been assessed as part of the GRIP 3 development; the assumption of existing spare capacity has been made based on the existing track points in the areas surrounding each points heating control cubicle (PHCC).

Photo 2.6: March East Junction PHCC No.2

Source: MML Survey 23 October 2019

Photo 2.7: Whitemoor Junction PHCC

Source: MML Survey 23 October 2019

2.4.9 Telecommunications

SISS information was gathered from a site survey undertaken at March station on the 23 October 2019 and the Operational information was gathered from a site survey undertaken on 24 March 2020. This information is detailed within the Telecoms Report in Appendix K.

2.4.10 Environmental surveys and reporting

Refer to Environmental Report 398128-MMD-00-XX-RP-EN-0001-A and Preliminary Ecological Assessment 398128-MMD-00-XX-RP-EN-0003-A (issued separately).

2.5 Scope

The key scope items for each discipline, extracted from the Scoping Note[10] (MM Report 398128 | 001 | B11) are detailed below.

2.5.1 GRIP 3 Level Multi-Disciplinary Option Selection Report

Table 2.11: Option Selection Report Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.2.4	GRIP 3 report defining and selecting a single preferred heavy rail option.	398128-009 (This report)
3.2.4	Full Business Case cost estimate for preferred heavy rail option.	Appendix A
3.2.4	Project risk register.	Section 12.1
3.2.4	Project assumptions register.	Appendix B
3.2.4	CDM Risk Register.	Appendix C
3.2.4	Inter Disciplinary Check (IDC) certificates.	Appendix D

2.5.2 Track

Table 2.12: Track Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.1	GRIP 3 - Plan and profile drawings (1:500 or 1:1000 scale).	Section 8.1.1

2.5.3 Signalling

Table 2.13: Signalling Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.2	Signalling scheme sketch.	Section 8.1.2
3.10.2	Outline project specification.	Section 8.2.2
3.10.2	Signal box capacity report.	Not undertaken, assumption is existing Signal Box will be abolished.
3.10.2	Outline signal sighting.	Section 8.2.2

[10] Reference 1 in Table 2.1

2.5.4 Highways

Table 2.14: Highways Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.6	GRIP 3 - Highways alignment design and drawings (Level crossing closure schemes).	Section 8.1.3 [Scheme 1 drawings: 398128-MMD-00-XX-DR-H-0101 to 0112 Scheme 2 drawings: 398128-MMD-00-XX-DR-H-0201 to 0203 Scheme 3 drawings: 398128-MMD-00-XX-DR-H-0301 to 0302 and 0321 to 0324 Scheme 4 drawings: 398128-MMD-00-XX-DR-H-0401 to 0402 Scheme 5 drawing: 398128-MMD-00-XX-DR-H-0501]
3.10.6	GRIP 3 - Highways pavement design and drawings.	Section 8.1.3 [398128-MMD-00-XX-DR-H-1201 to 1202]
3.10.6	GRIP 3 - Kerbing, Safety Fencing, VRS, Signage design and drawings (Level crossing closure schemes).	Section 8.1.3 [Kerbing, indictive safety fencing/VRS shown on the following scheme drawings: Scheme 1 drawings: 398128-MMD-00-XX-DR-H-0101 to 0112 Scheme 2 drawings: 398128-MMD-00-XX-DR-H-0201 to 0203 Scheme 3 drawings: 398128-MMD-00-XX-DR-H-0301 to 0302 and 0321 to 0324 Scheme 4 drawings: 398128-MMD-00-XX-DR-H-0401 to 0402 Scheme 5 drawing: 398128-MMD-00-XX-DR-H-0501 Signage design not undertaken at GRIP 3, as more appropriate for the next stage of the design.]

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.6	GRIP 3 – Road Safety Audit (RSA) Stage 1 of the Single Option Preliminary Design.	Section 8.2.3 Appendix P [Road Safety Audit - Scheme 1: 398128-MMD-00-XX-RP-H-0001-A_Road Safety Audit - Scheme 1 Road Safety Audit - Scheme 2: 398128-MMD-00-XX-RP-H-0002-A_Road Safety Audit - Scheme 2 Road Safety Audit - Scheme 3: 398128-MMD-00-XX-RP-H-0003-A_Road Safety Audit - Scheme 3 Road Safety Audit - Scheme 4: 398128-MMD-00-XX-RP-H-0004-A_Road Safety Audit - Scheme 4 Road Safety Audit - Scheme 5: 398128-MMD-00-XX-RP-H-0005-A_Road Safety Audit - Scheme 5]
n/a	Utilities: › Combined C2 Utilities Plan › C3 Budget Estimates	Section 8.1.3 Appendix W

2.5.5 Geotechnical

Table 2.15: Geotechnical Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.5	Geotechnical desk study.	Appendix G [398128-006-A]
3.10.5	Input to GRIP 3 grade separation designs (ground conditions, foundation types, retaining structures).	Section 5.5 [398128-009-A (This report)]
3.10.5	GRIP 3 General Arrangement drawing for Rail embankment stabilisation 89m60c - 90m80c.	Section 8.1.4 [398128-MMD-00-XX-DR-G-0002]
3.10.5	GRIP 3 General Arrangement drawing for Typical Embankment Details	Section 8.1.4 [398128-MMD-00-XX-DR-G-0001]
n/a	GRIP 3 General Arrangement drawing for Retaining Wall	Section 8.1.4 [398128-MMD-00-XX-DR-G-0003]

2.5.6 Ancillary Civil/Stations Civil Engineering

Table 2.16: Civil Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.9	Desktop review of previous level crossing studies (including ORR review).	Meeting attended on 03/06/19 with Office for Rail and Road (ORR), CCC and CPCA to discuss any comments. ORR would accept open crossings if other options were found to be grossly disproportionate to implement. Refer to Appendix U for minutes.

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.9	1 level crossing workshop (with CCC/CPCA and NR) to discuss and agree basis for heavy rail crossings designs. Assumed outcome; the preferred level crossing closure options identified in the GRIP 2 Level Crossing Closure Feasibility Study dated 14th April 2016 will be taken forward for GRIP 3 design development.	Following meeting with ORR; CCC, CPCA, and Mott MacDonald agreed to progress with level crossing closures from GRIP 2 study. The level crossings were not assessed further to determine if there was a case to retain the open crossings.
3.10.9	GRIP 3 Civils design drawings – March Station: General Arrangement drawings for Platform reinstatement works.	Section 8.1.5 [Station: 398128-MMD-00-XX-DR-C-0002 (and NR Standard Details for Traditional Front Wall platform) Car Park: 398128-MMD-00-XX-DR-H-1001]
3.10.9	GRIP 3 Civils design drawings– Wisbech Station: General Arrangement drawings for 2 new platforms, new modular station building, and station car park.	Section 8.1.5 [Station: 398128-MMD-00-XX-DR-C-0001 (and NR Standard Details for a Type 2 Cross-wall platform) Car Park: 398128-MMD-00-XX-DR-H-1000] Note – Only single platform required at station following operational review
3.10.9	GRIP 3 Ancillary civils design drawings – Cable route's and Under Track/Road Crossings (General Arrangement and typical detail drawings).	Section 8.1.5 [Lineside General Arrangements: 398128-MMD-00-XX-DR-C-0100 to 0115] NR standard details referenced where applicable
3.10.9	GRIP 3 Ancillary civils design drawings - Signals & lineside equipment - typical detail drawings for equipment bases and REB compound(s).	Section 8.1.5 [Lineside General Arrangements: 398128-MMD-00-XX-DR-C-0100 to 0115] NR standard details referenced where applicable
3.10.9	GRIP 3 Ancillary civils design drawings – Lineside fencing.	Section 8.1.5 [Lineside General Arrangements: 398128-MMD-00-XX-DR-C-0100 to 0115 Lineside Boundary Risk Assessment: 398128-MMD-00-XX-RP-C-0001]
3.10.9	GRIP 3 Ancillary civils design drawings – Access points.	Section 8.1.5 [Lineside General Arrangements: 398128-MMD-00-XX-DR-C-0100 to 0115 Lineside Boundary Risk Assessment: 398128-MMD-00-XX-RP-C-0001]

2.5.7 Bridges & Civil Structures

Table 2.17: Structural Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.4	Inspection for assessment of existing rail under bridges between March and Wisbech.	Visual inspection of Chain Bridge, Mulbary Drain, Waldersey Drain and

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
		Redmoor Drain was carried out in early March. Refer to Appendix M.
3.10.4	Inspection for assessment of existing culverts between March and Wisbech.	No inspections have been carried out to existing underbridges as no access has been provided by Network Rail at this stage. A culvert risk assessment (398128-MMD-00-XX-TN-S-0001) has been carried out and is included in Appendix L.
3.10.4	Combined inspection and assessment reports will be produced covering the above structures (in MM format).	A level 0 assessment of the existing underbridges has been carried out based on the latest visual inspection. Refer to Appendix M.
3.10.4	Assessments will be carried out on the basis that structures will be subject to an ongoing programme of inspection and assessment in accordance with NR standards following re-opening of the line.	Refer to Preliminary Assessment of 4 NR Underbridges (398128-MMD-00-XX-TN-S-0002) – Appendix M. Assessments to existing under bridges are high level based on the latest visual inspection and information provided in previous examination reports.
3.10.4	GRIP 3 Bridge general arrangement drawings for 7 no. grade separations (5 road over rail bridges and 1 road over river) for the preferred level crossing closure options identified in the GRIP 2 Level Crossing Closure Feasibility Study dated 14th April 2016.	Section 8.1.6
3.10.4	GRIP 3 Bridge general arrangement drawings for strengthening for 1 bridge (Chain Bridge).	Preliminary Assessment of 4 NR Underbridges (398128-MMD-00-XX-TN-S-0002) – Appendix M No strengthening drawings have been prepared as there are no record drawings available or adequate information in the examination reports. However, the preliminary assessment reports outlines recommended strengthening measures.
3.10.4	GRIP 3 bridge/structural general arrangement drawings for 3 new lifts to be installed at March Station (to connect the existing footbridge to the platforms).	Section 8.1.6

2.5.8 Drainage and Flood Risk

Table 2.18: Drainage and Flood Risk Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.7	Drainage design of heavy rail formation.	Section 8.1.7
3.10.7	Drainage design at proposed Wisbech station.	Section 8.1.7
3.10.7	Drainage design at grade separations (for the preferred level crossing closure schemes defined in the preferred level crossing closure options identified in the GRIP 2 Level Crossing Closure Feasibility Study dated 14th April 2016.	Section 8.1.7
3.10.10	Desktop flood risk assessment.	Appendix Q

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
Additional	Drainage design at proposed March station	Section 8.1.7

2.5.9 Electrical and Plant

Table 2.19: E&P Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.3	Input to multi-disciplinary GRIP 3 report.	Section 5.9
3.10.3	Provision of high-level site surveys at key sites, to identify existing E&P assets including condition and spare capacity assessments.	Section 2.4.8
3.10.3	Development of up to 3No. viable signalling power options to support the proposed signalling and telecoms options.	Section 5.9.2 Section 5.9.3 Section 5.9.5
3.10.3	Selection of a single preferred signalling power solution, to be progressed at GRIP 4, that economically delivers the stakeholders requirements.	Section 5.9.9
3.10.3	High level drawing(s) supporting the single signalling power option.	Section 8.1.8
3.10.3	Commentary of points heating requirements, based on preferred single option proposals of the signalling and permanent way disciplines.	Section 5.9.10

2.5.10 Telecommunications

Table 2.20: Telecommunications Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.8	Survey of GSM-R base station at March East to determine whether installation can be modified to cover re-opened line.	Partially undertaken at GRIP 3, as there was no track access provided, a visual survey was undertaken from a distance. This shall be conducted at the next stage of the design.
3.10.8	Survey in the Coldham area for a new repeater location.	Not undertaken at GRIP 3, as there was no track access provided. This shall be conducted at the next stage of the design.
3.10.8	Survey for a new lineside cable route (beginning, middle and end of the route).	Partially undertaken at GRIP 3, as there was no track access provided, a visual survey was undertaken from a distance. This shall be conducted at the next stage of the design.

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.8	Survey of March East Station for SISS equipment.	Section 2.4.9 Survey was conducted and SISS equipment has been identified, availability of as-built records and maintenance records is recommended to establish spare capacity of the SISS head end equipment at the next stage of the design. This will need to be explored at the next design stage.
3.10.8	Survey March East Signal Box and TOC Control Centre.	Not undertaken at GRIP 3, as there was no track access provided. This shall be conducted at the next stage of the design.

2.5.11 Environmental surveys and reporting

Table 2.21: Environmental Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.11	Environmental report.	Environmental constraints mapping included in Appendix O. Report issued separately (398128-MMD-00-XX-RP-EN-0001-A)
3.10.11	Phase 1 Habitat Survey.	Issued separately as Preliminary Ecological Assessment 398128-MMD-00-XX-RP-EN-0003-A
3.10.11	Heritage Site Visit.	Not deemed necessary following desktop assessment, which concluded that the proposed scheme would not impact on heritage listed buildings.

2.5.12 Operations

Table 2.22: Operations Scope

Scoping Note Reference	Scope Item	Report Reference
3.7	Findings from our operational analysis will be incorporated into the FBC and GRIP 3 (or sub-mode alternative) documents.	Section 5.1.7

2.5.13 Cost Estimation

Table 2.23: Cost Estimation Scope

Scoping Note Reference	Scope Item	GRIP 3 Report Reference
3.10.12	Updated OBC cost estimates for a heavy rail scheme.	Reference 2 in Table 2.1
3.10.12	FBC cost estimates.	Section 13

2.6 Design Criteria

In addition to the standards detailed in Section 2.3 and scoping requirements detailed in Section 2.5, the following design criteria have been used to develop the design.

2.6.1 Track

Table 2.24: Track Design Criteria

ID	Reference	Requirement
A01	[4] Assessment of Rail Operations report (Section 5)	Maximum design speed of 60mph with 20mph at March station

2.6.2 Signalling

Table 2.25: Signalling Design Criteria

ID	Reference	Requirement
B01	[4] Assessment of Rail Operations report (Section 5)	Maximum design speed of 60mph
B02	[4] Assessment of Rail Operations report (Section 5)	Passing Loop at Coldham
B03	[4] Assessment of Rail Operations report (Appendix N)	Operational Restrictions at March

2.6.3 Highways

Table 2.26: Highways Design Criteria

ID	Reference	Requirement
C01	March to Wisbech Transport Corridor Study - Scoping Note 398128 | 001 | B	Highways designs to be based on NR GRIP 2 designs
C02	Meeting held 15.08.19 with CCC highways representative Alex Woolnough.	Highways to be designed to DMRB standards, with standard details as per CCC standards.

2.6.4 Geotechnical

N/a – no additional design criteria proposed

2.6.5 Ancillary Civil/Stations Civil Engineering

Table 2.27: Civil Design Criteria

ID	Reference	Requirement
E01	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.6)	Passive provision for Electrification
E02	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.5)	Pedestrian flow modelling to be undertaken
E03	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.5)	Step free access required at March Station
E04	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.1 and 3.2.7)	Requirement to consider cable theft and consider measures to secure trough lids (if surface mounted)

ID	Reference	Requirement
		or provided buried route. Trough route assumed over entire length of route.
E05	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.2)	Safe cess walkway required along the route.
E06	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.2)	Fencing required in accordance with NR standards over length of the proposed route.
E07	[8] Mott MacDonald – Assessment of Rail Operations Report (Section 6)	Length of platforms to accommodate 2-car class 170 services. The western end of March Platform 3 is to be utilised and a single platform station provided at Wisbech.
E08	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.2)	Assessment required to consider platform gauge clearances / stepping distances and / or options to avoid stepping distance non-compliances are to be adopted.
E09	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 4.1 – MDL-253)	Emergency evacuation plan (fire) to be considered at stations

2.6.6 Bridges & Civil Structures

Table 2.28: Structural Design Criteria

ID	Reference	Requirement
F01	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.6)	Passive provision for Electrification
F02	[6] Network Rail – March to Wisbech Reopening - GRIP Stage 2 Level Crossing Closure Feasibility Study (Section 7.6)	Bridge Design requirements

2.6.7 Drainage and Flood Risk

Table 2.29: Drainage and Flood Risk Design Criteria

ID	Reference	Requirement
G01	NR-L2-CIV-005	Track. Lineside equipment may need to be located above track level depending upon the flood risk in the area (reviewed at next stage)
G02	IDB (Middle Level Commissioners)	Proposed outfall level to be above IDB managed water level (to be confirmed).
G03	IDC Meeting – Geotechnical Team	Highways. Proposed drainage features to be offset minimum 1m from proposed bottom of embankments.
G04	IDB (Middle Level Commissioners)	Stations and Highways. Proposed drainage to be segregated from IDB ditch with suitable flow control device. Minimum 60mm orifice plate for swales and flow control chamber (hydro brake or similar) set to 2l/s for other, larger, attenuation features.
G05	National Planning Policy	Highways. Attenuation features sized for 1 in 100-year return period +40% climate change. Stations. Attenuation features sized for minimum 1 in

ID	Reference	Requirement
		100-year return period +20% climate change and no off-site flooding at +40%.

2.6.8 Electrical and Plant

Table 2.30: E&P Design Criteria

ID	Reference	Requirement
H01	[5] Network Rail - March to Wisbech Report Review - 147663 Wisbech Branch Line Re-opening (Section 3.2.6)	Passive provision for Electrification

2.6.9 Telecommunications

Table 2.31: Telecommunications Design Criteria

ID	Reference	Requirement
J02	Refer Section 2.4.9	Non-Intrusive site survey findings

2.7 Specialist Engineering Input

The following specialist engineering input has been used to develop the design.

Table 2.32: Specialist Engineering Input

Reference	Provider	Description
OS Mapping	Ordnance Survey	Plan survey features
LIDAR	Environmental Agency	Level information
C2 Utilities	Various	Utilities (refer to C2 Utilities Plan, Section 8.1.3)
BGS Boreholes	British Geological Survey	Geological information of ground conditions throughout the site.
Earthworks Inspection Reports	Network Rail	Earthwork inspection records showing conditions of existing railway embankments.
Signalling Records	Network Rail	Existing signalling drawings for March East Signal Box

2.8 Design Inputs from Stakeholders

2.8.1 Network Rail

Network Rail's Asset Protection team has provided responses to Requests for Information from the project team. NR have also provided access to existing infrastructure to facilitate surveys. NR have not reviewed or commented on the GRIP 3 proposals. Further engagement with NR would be required to complete the GRIP 3 stage gate approval (see also Section 14.2).

2.8.2 Cambridgeshire County Council Highways

In addition to regular project meetings with Cambridgeshire County Council (CCC) the following highways meetings were held.

Table 2.33: Summary of Highways Meetings

Meeting Date	Stakeholders	Key Design Inputs
15 August 2019	Alex Woolnough, Highway Development Management Engineer (CCC)	• CCC do not have a problem with speed limits having to be lowered, provided that the road alignment reflects this, as it should be self-enforcing. • The project should link in with: – Fenland local plan for March – Wisbech Access Strategy – Wisbech Southern Relief Road • Cycleways/footways should be re-provided as existing. • Provision of a cycleway within the rail corridor should be considered. • The CCC highways details can be used for rural distributor roads, design to DMRB for main roads. • Any junction changes should be nil detriment and modelled to prove this • Junctions should be non-signalised. • Connections for peds and cycles between Wisbech Station and the town centre should be considered
10 October 2019	CCC Representatives: • Camilla Rhodes, Asset Information Manager • Roger Payne, Asset Information Definitive Map Manager • Barry Wylie, Highways Asset Manager	Highways Scheme 1 • Consider Non-Motorised User (NMU) provision for road overbridge Highways Scheme 2: • Consider Non-Motorised User (NMU) provision for road overbridge Highways Scheme 3 • Changes to the By-ways: Users could class as a loss - consultation will be required • Non-Motorised User (NMU) provision for road overbridge at Broad Drove • Concern Broad Drove becomes a rat run from the A47? - Potentially install bollards but keep access for motorcyclists etc A47 Bypass • Highways England will require consultation • NMU requirement - probably not but needs to be run past cycling team • New Bridge Lane crossing is not a public right of way but currently has cycle access Weasenham Lane: • Non-Motorised User (NMU) provision for road overbridge • Wisbech Station Carparking • Access road to belong to NR (trunk road from Oldfield Lane) • Oldfield Lane connection to Cromwell road is not ideal • March Station Carparking • Concerns with proximity of carpark access and level crossing at Elm Road, potentially changes the risk profile of the level crossing

2.9 Requests for Information (RFI)

Project requests for information are detailed in Table 2.34. RFI responses received after October 2019 have not been incorporated in this revision of the GRIP 3 design. Where RFIs are open the design has proceeded based on assumptions (refer Section 3).

Table 2.34: Project RFI

RFI Ref	Description	Action/Notes	Date Returned	RFI Open/Closed
QF1822 M-W BC-1	Civil Records - Structures on ELR WIG	n/a	14/01/2020	Closed
QF1822 M-W BC-2	Civil Records - Structures on ELR WIG	n/a	14/01/2020	Closed
QF1822 M-W BC-3	Civil Records - Structures on ELR WIG / EMP	n/a	14/01/2020	Closed
RFI-001	Existing Geotechnical and structural data for March to Wisbech line (ELR – WIG)	n/a	02/08/2019	Closed
RFI-002	Existing Telecoms Records – March to Wisbech line ELR - WIG	S Tombs confirmed via telephone that no records are available. NR to provide written RFI response confirming this and MM to close RFI.	24/06/2020	Closed for GRIP 3 design. Consider reopening at next stage of design for formal confirmation that existing records do not exist
RFI-003	NR GIS data March to Wisbech line (ELR – WIG)	Response received 26/09/2019 however did not provide requested information (.dgn files). PDF files provided as part of RFI-004 response	26/09/2019	Closed for GRIP 3 design. Consider reopening at next stage of design for additional information during NR consultation
RFI-004	NR underground services searches	n/a	14/01/2020	Closed
RFI-005	NR GRIP 2 Highway designs and CAD data for level crossing closures	Partial response received Superseded by MM GRIP 3 highways design and C2 searches	31/10/2019	Closed
RFI-006	NR drainage records	n/a	1401/2020	Closed
RFI-007	Strategic Flood Risk Assessment Flooding, Breach and Overtopping Shapefiles and GIS data	Response received 03/01/2020, data includes 2011 flood model report, raster files and flood map PDFs from 2015. Some of the rasters are thought to be corrupt. PDF flood maps were used in the production of the FRA.	03/01/2020	Closed
398128-RFI-008	Whitemoor Yd Operational Data	n/a	14/01/2020	Closed

RFI Ref	Description	Action/Notes	Date Returned	RFI Open/Closed
398128-RFI-009	March East Control Area - re-control of signalling	Partial response received under NR responses to RFI-014 and RFI-015	14/01/2020	Closed for GRIP 3 design. Further information on interfaces with the Ely-March-Peterborough (EMP) Resignalling will be required at GRIP 4.
398128-RFI-010	CCC Adopted Highways Data	n/a	n/a	Closed for GRIP 3 design. Consider reopening at next stage of design for additional information to support design development and consultation.
398128-RFI-011	March Station Area Heritage	n/a	30/04/2020	Closed
398128-RFI-012	Highways operational expenditure	Phone call with Barry Wylie and Jack Eagle 12/02/2020 - Commuted sums are applied to non-standard items. Current policy is stated in section 7 of CCC's Highway Policies and Standards (Volume 1) Nov 2014.	12/02/2020	Closed
398128-RFI-013	Route Classification	n/a	20/05/2020	Closed
398128-RFI-014	Signal control assumptions and interfaces	n/a	20/05/2020	Closed for GRIP 3 design. Further information on interfaces with the Ely-March-Peterborough (EMP) Resignalling will be required at GRIP 4.
398128-RFI-015	Signal interlocking assumptions and interfaces	n/a	20/05/2020	Closed for GRIP 3 design. Further information on interfaces with the Ely-March-Peterborough (EMP) Resignalling will be required at GRIP 4.

3 Design Assumptions

A full list of design assumptions is provided in Appendix B. The following sections detail the key design assumptions for each discipline.

3.1 Track

Table 3.1: Track Design Assumptions

Reference	Assumption	Consequences
10	Track - Track Bed will be 250mm (plain line), 300mm (S&C) thick Bottom Ballast and 200mm Top Ballast	Increase in project cost if more onerous ballast depths are proposed
36	The existing track level for vertical alignment purposes is 200mm above the LIDAR surface level	Changes to track vertical alignment as a result of more detailed survey information leading to increased earthworks costs
46	Operational platform lengths are based on two car class 170 length from GRIP 2 report (47.22m).	Change in rolling stock could impact track and platform design
47	It is assumed that exceptional track radius of <200m (NR/L2/TRK/2102, table 6) and flexed turnout with exceptional track radius at March station will be approved by the NR RAM [Track] with the provision of lubrication and check rails (where feasible)	Major changes to track design (Opportunities to flatten the radii are limited due to the location of the station platforms, Norwood Road Overbridge and adjacent pond)
48	At existing chain river bridge, proposed sluing of the track is approximately 300 mm from the existing horizontal alignment. The minimum existing clearance from track to the hog back girder is approximately 900 mm, the minimum clearance required is 730 mm. Therefore, a train can potentially clash with the bridge girders. Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage with detailed topographical survey.	There may be a requirement to replace the bridge (or parts of). Note, this has been included for in the cost estimate (Refer Section 13).
112	Current speed for March station to Whitemoor Yard is 10mph. To meet the project operational requirements, the speed needs to be increased, to improve running times. Initial speed calculations have indicated that the track geometry is capable of 20mph and this has been briefed to Operations. It is noted that due to the tight track curvature there may be increased noise, vibration and wear as a result of raising the speed.	Increase in speed is not accepted by Network Rail and therefore impacts the timetable of the scheme. Initial analysis suggests that with a speed limit of 10mph imposed at western end of Platform 3 (138,355m) until turnout PM2 (138,713m), where the Platform 3 line meets the single line, equates to a time penalty of 40 seconds (compared to 20mph). This would be rounded up to 60 seconds when compiling a timetable.
124	March East level crossing will be closed as part of the EACE or other Network Rail project.	Ability to relocate the turnout to the east of March Platforms as far east as possible to maximise a signalling overlap and then add a crossover. This offers operational benefits, increasing ability to reliably run March to Wisbech service with 2tph

3.2 Signalling

Table 3.2: Signalling Design Assumptions

Reference	Assumption	Consequences
89	Only a passenger service from March to Wisbech is planned. No provision for Freight trains.	Provision for regular operation of freight trains beyond Whitemoor Junction would require changes to signalling design. (See item 92)
90	The proposed rail infrastructure (refer section 5.1.2) is to be capable of operating 2 trains per hour between Wisbech and March (and onwards to Cambridge)	Provision of Crossing Loop.
92	Minimum Signalling Braking Distance (between Whitemoor Junction and Wisbech): GKRT0075 Appendix C Table 3 “MSBD data for enhanced braked passenger trains with 9%g or higher deceleration rate”. Any rolling stock (other than modern DMUs) using the line (between Whitemoor Junction and Wisbech) will operate under special instructions (with Speed Restrictions as appropriate for braking capability).	If a different braking rate was to be used, positions of signals and associated equipment locations would need to be altered (Signalling, E&P, Civils redesign costs).
93	Use of AWS Cancelling Indicators for 'wrong direction' trains passing over permanent AWS magnets on the Wisbech line. The maximum of two ‘wrong direction’ trains per hour, could be permitted by RIS-0775-CCS Iss 2, section 3.1.6.5.1, subject to risk assessment.	If the AWS magnets need to be suppressed, extra equipment, LOC cases and possibly power supplies would be required. (Signalling, E&P, Civils redesign costs).
125	Badgeney Road LC and Horsemoor LC proposed for closure under EACE project (source: info from CCC project manager)	If these crossing remain opening the detailed design phase will need to consider alterations to crossing controls.
126	March East Jn Signal Box and March South Signal Box will be closed, under a resignalling project with re-control to a Central location (e.g. Cambridge PSB) by the end of CP7 2029. Source Network Rail Anglia Route Strategic Plan, March 2019.	If the existing Signal Boxes remain, it risks the ability to integrate the proposed new signalling with existing electro-mechanical signalling at March and re-opened the Wisbech line.
141	One Train Working at Wisbech end of line	No signals required at Wisbech.

3.3 Highways

Table 3.3: Highways Design Assumptions

Reference	Assumption	Consequences
34	In line with Table 1 of the standard: NR-l3-trk-2049-mod07, a minimum clearance of 4780mm is assumed from the proposed top of rail level to the soffit of the overbridge structures.	None
49	It is assumed that the scheme 1, 2, 4 and 5 highways design should be developed directly from the GRIP 2 design provided by NR.	Highway alignments from GRIP 2 may not be the most appropriate solution.
50-57	Various assumptions have been made in terms of land acquisition and access to businesses on Weasenham Lane.	Scheme objections, increased design cost later if this needs to be re-considered.

Reference	Assumption	Consequences
58	It is assumed that highway lighting will be reinstated/installed in the following areas, in line with the existing situation: Scheme 1 - Within 30/40mph areas. Scheme 2 - None Scheme 3 - New link road, about 100m from the A47 roundabout. A47 Wisbech Bypass - None, assumes lighting on approach to roundabouts is not affected. Weasenham Lane - all along Assumes that existing lighting is adequate.	Increased costs for lighting surveys/assessment/design.
115	Highway embankment slopes to be at a grade of 1 in 3.	Ground conditions to be confirmed following GI at next phase and may result in the need for slacker embankment slopes to limit potential for deep slips.
116	Pavement design assumes a CBR of <2%	Pavement design build-up to be reviewed following GI at next phase.

3.4 Geotechnical

Table 3.4: Geotechnical Design Assumptions

Reference	Assumption	Consequences
37	Where sections of embankment could not be inspected due to dense vegetation, condition of existing embankments to be based on information included in the NR Earthworks Inspection Reports and observations in the GRIP 2 Report.	Conflicting observations between NR reports and GRIP 2 report and hence regrade locations may change following further site inspections.
38	Ground conditions and groundwater profile assumed based on limited historical boreholes located at the centre of the scheme and within Wisbech.	Ground conditions to be confirmed following GI at the next phase and may require additional location specific ground models.
39	Existing bridges conditions assumed to be as per 2020 visual inspection survey (Appendix M). It is conservatively assumed that historic settlement at the high mileage abutment of Chain Bridge is symptomatic of inadequate existing foundations. It is further assumed that the abutment will need to be reconstructed on new piled foundations prior to supporting train loading.	Bridge foundation strengthening solutions will need to be reviewed following detailed site inspections.
95	Highway embankment slopes to be at a grade of 1 in 3.	Ground conditions to be confirmed following GI at next phase and may result in the need for slacker embankment slopes to limit potential for deep slips.
114	Pile loading was provided for Weasenham Lane and the most heavily loaded pile was used for all piles throughout the scheme.	Pile lengths based on conservative values and may be reduced at the next stage.

3.5 Ancillary Civil/Stations Civil Engineering

Table 3.5: Civil Design Assumptions

Reference	Assumption	Consequences
33	It is assumed no further improvements to March station facilities will be provided, other than those required to bring the dis-used platforms back into operation.	Greater passenger demand at the station will not see an increase to the facilities on Platforms 1 or 2 or within the existing ticket office.
35	Passive provision shall be provided for electrification of the branch line where new infrastructure is proposed. No existing infrastructure shall be modified to provide passive provision.	Additional works may be required in the future should the line be electrified.
41	The existing canopy over Platform 3 and the station building on Platform 4 are proposed to be incorporated into the accessible station areas. There are no records of these elements however during site surveys no major defects were noted.	If the elements are found to be in a poor condition during detailed site surveys, they may require remedial works or partial demolition/reconstruction.
42	The existing platform levels are unknown. It is assumed with the proposed coper locations, providing new surfacing to the existing platform areas will allow for compliant crossfalls (between 1:40 and 1:80 away from the coper edge).	If this is not achievable this could cause a risk of prams/wheelchairs falling onto the track, or if too shallow could allow ponding of water. This could be addressed but would require further works to the existing station.
43	The existing foundations for the platforms at March station are unknown. It is assumed the foundations are to the standard detail NR/CIV/SD/3012.	If these dimensions are different the platforms could be impacted by the proposed construction works, affecting their stability. This may lead to re-design once the foundations are verified.
59	Current provision for parking at the station is below expected demand. Additional through services to Cambridge are expected to increase parking demand up to 3-fold for passengers starting their journey at March Station. Demand for an increase of parking between 200-300 spaces is expected based on demand modelling. 6% of these spaces will be allocated for disabled users. It is not proposed to provide any additional bus stops/taxi ranks for this station as it is assumed the existing arrangements are sufficient.	Increased scheme cost/scheme objections. It is acknowledged there is an opportunity to reduce the works required for the car park as part of this project. Integration / modification of the proposed parking area with the Fenland Stations proposals are to be agreed at the next design phase. This has been identified in Opportunity OE02 in Table 12.13
60	A new car park is proposed at Wisbech station. It is assumed that this car park will require between 60 and 200 spaces to meet the proposed demand. 6% of these spaces will be allocated for disabled users. It is assumed a taxi rank, bus stop and cycle parking will all be required at the station.	Increased scheme cost/scheme objections
144	The land required for the preferred carpark location for Wisbech station is able to be purchased as part of the project	Alternative, less preferable carpark locations are required with increased scheme cost/scheme objections

3.6 Bridges & Civil Structures

Table 3.6: Structural Design Assumptions

Reference	Assumption	Consequences
61	For the purposes of assessing the 4 existing rail underbridges, it is assumed that the limited record information provided in January 2020 and visual inspections carried out in March 2020 are representative of the structural arrangement and condition.	Incorrect assumptions regarding assessed rating could result in overly optimistic or conservative assessment. This may result in abortive work, requirement for re-work, programme delay, additional cost.

3.7 Drainage and Flood Risk

Table 3.7: Drainage and Flood Risk Design Assumptions

Reference	Assumption	Consequences
102	Existing defences against fluvial flooding are adequate up to 1 in 200-year return period. No interventions required to increase resilience of the proposed infrastructure against fluvial/tidal flooding.	To provide increased resilience levels may require additional infrastructure interventions. Risk to capital cost of the scheme.
105	The rational method with 50mm/hr will be used to calculate existing runoff from the existing railway corridor, except for the grassed areas where the greenfield rate of 1.4l/s per ha will be used. For new track where there is no existing track the noted 1.4l/s per ha will be used.	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.
106	For the proposed condition a runoff coefficient of 0.8 will be applied to the ballasted track area and a coefficient of 1.0 will be applied to the maintenance access, cycle lane and ditch profile. For the remaining grassed areas to the NR boundary, a runoff coefficient of 0.4 will be applied.	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.
110	The proposed new overbridges will be the Council's assets and associated drainage will not be discharged into the railway area drainage.	Drainage system redesigned to allow additional capacity to accommodate additional surface water discharge flows.
113	Due to limited information, it will be assumed that all existing culverts, rivers or local IDB drains have enough depth to accommodate railway drainage outfall connections. If bypassed existing culverts are found at shallower depths and pose a constraint to the ditch construction a new outfall shall be installed at that existing culvert.	Additional chambers required for culvert connections. Drainage catchment areas and attenuation storage volumes to be reassessed.
123	Track. A minimum discharge rate of 5 l/s has been considered for small catchments. Stations and Highways. The discharge rate strategy is limited to a 60mm orifice plate for ditches (variable l/s) and a flow control chamber (hydro brake or similar) @ 2l/s for larger attenuation features.	A lower discharge requirement would result in increased ditch sizes and attenuation volumes

Reference	Assumption	Consequences
127	Drainage swales to have a minimum 1m offset from toe of highway embankment	Incorrect assumptions may result in additional land take, increased design costs, design time and abortive work in this or any future design stages.
130 & 131	Water quality at Wisbech and March car parks managed by permeable paving. Water quality at Highways managed by filter strip, swale and pond.	Incorrect assumptions may result in additional land take, increased design costs, design time and abortive work in this or any future design stages.
143	Existing drainage ditch within the railway boundary to be retained at locations clashing with proposed ditch. Ditch profile sufficient to convey partial design flows from track surface run-off. Subject to detailed topographical survey.	Re-design and potential increase of construction costs to reprofile the existing ditch.

3.8 Electrical and Plant

Table 3.8: E&P Design Assumptions

Reference	Assumption	Consequences
62	It is assumed that all signalling supplies within the March West & East junctions' area would be derived from March Substation 'G' Low Voltage Supply Cubicle. After visual assessment of the cubicle on the March 2020 surveys there was found to be spare capacity for the additional proposed supplies.	Incorrect assumption on existing capacity and the ability to utilise this existing supply point may result in increased cost to E&P design.
63	The route is categorised as critical and thus warrants a UPS with a mobile generator connection at each signalling supply point. This will be discussed with the RAM at GRIP4 and conclusion will be drawn on how critical each supply is.	Potential reduction in capital expenditure, realised through the decreased complexity of the required signalling power infrastructure.
64	Wisbech station shall be supplied directly from a dedicated signalling supply point, due to the remote sitting of equipment.	Remote load supplied from proposed signalling supply point at Coldham loop; resulting in an additional 5km of trackside feeder cable.
65	It is assumed that both March East Junction PHCC No.2 and Whitemoor Junction PHCC has sufficient spare capacity for the addition of the proposed points heating installations. This is based on the existing number of points in the area surrounding the two PHCCs.	Design and installation of additional PHCCs at each location; resulting in increased design, construction and maintenance costs.
66	Proposed DNO at Coldham loop is feasible; based on desktop survey of the area and historic DNO connection.	Unsuitability of proposed E&P options; alternative signalling power approach shall be required, including the assessment of feasible DNO locations.
67	March station lifts are assumed to have capacity for 16 people. The lift load requirements are assumed to be 40kVA.	Potential change in capital expenditure and operational costs.
68	It has been assumed that the March station fire alarm system shall be a category L5 system.	Potential increase to E&P design and construction costs.

Reference	Assumption	Consequences
69	Record information regarding the lighting at March station is assumed to be correct. This has formed the basis of the proposed lighting design.	Potential increase to E&P design and construction costs.
70	Approximately 50No. 6m high lighting columns, at 15m spacing, shall achieve required lighting levels for the proposed March station car park.	Increase in construction cost due to greater number of required lighting columns.
71	It is assumed that the proposed DNO connection at Wisbech station for the LV station supply shall be feasible and not cost prohibitive.	Re-design/development of proposed signalling power options, additional design costs.
72	Approximately 55No. 6m high lighting columns, at 13m spacing, shall achieve required lighting levels for the proposed Wisbech station car park.	Increase in construction cost due to greater number of required lighting columns.
96	Segregated REB which will house a PSP and Signalling assets within the same building shall reduce costs in comparison to a singular bespoke PSP REB.	Independent REBs required, resulting in increased Civils costs at design and construction phases. Additional assets requiring maintenance.
97	Existing 110V supplies to Locs 85/71 and 85/77 shall be unaffected by these works, or where affected shall be renewed like for like.	Potential increase to E&P design and construction costs.
98	Existing signalling power cables have sufficient slack to enable 'lift and shift' into the proposed cable trough route to ELR: WIG, distance 138.360km.	Potential increase to E&P design and construction costs.
99	At March station the lighting required across the proposed footbridge will be supplied from the spare ways available at Platform 1's LV cubicle 'DB/1'. The cable for this lighting shall be routed across the proposed footbridge.	Potential increase to E&P design and construction costs.
100	LV cubicle 'DB/A', on Platform 2 of March station, has a number of spare ways; this cubicle shall supply the proposed lighting across the reinstated platform 3 whilst also supplying the proposed telecom assets across Platforms 2 & 3.	Potential increase to E&P design and construction costs.
101	Existing junction lighting installed at Whitemoor Junction shall need to be moved due to the proposed track layout. This junction lighting shall be 'lifted and shifted' to the relevant clearance zone to illuminate the walkway. Assumed that this lighting is still required and that the lighting itself is adequate.	Increased design and construction costs relating to a redesign of the existing walkway lighting.

3.9 Telecommunications

Table 3.9: Telecommunications Design Assumptions

Reference	Assumption	Consequences
14	That a new pre-cast concrete cable trough will be required throughout the route length	No route to support Telecoms, E&P and Signalling infrastructure
15	24 Way Fixed Telephone Network Fibre and Signalling Power Cable throughout the route length	Lack of provision for Lineside Telephony circuits to support the route
16	Provision of new GSM-R Repeater Location in Coldham Area	Lack of GSM-R would negate the running of trains

4 Project Interfaces

4.1 Interfacing Projects

A detailed description of interdependent studies and projects is provided in Section 3 of the Options Assessment Report[12]. Table 4.1 provides a summary of the key projects and interfaces.

Table 4.1: Key Interfacing Projects

Project	March to Wisbech Heavy Rail Interface
Ely Area Capacity Enhancement (EACE) scheme	• The overall EACE scheme aims to deliver capacity for at least 11tph through the Ely area. • These capacity enhancements could alleviate operational constraints in the Ely area and facilitate the service pattern of Wisbech-Ely-Cambridge 2tph proposed under this study. • The scheme proposes enhancements to numerous level crossings in the area. This includes upgrades and closures of level crossings on the Up and Down Mains between March and Cambridge (including closure of March East level crossing). Suitable access and/or diversions will be provided for closed level crossings.
A47 Dualling Scheme	• The overall scheme is for dualling the remaining sections of the A47 between Peterborough and Kings Lynn. • The plans include three potential routes at Wisbech. One of the three proposals would see ‘online’ dualling of the existing A47. The other two proposals would see a new A47 dual carriageway take an alternative route around Wisbech. • The existing single carriageway A47 intersects the March to Wisbech line at a level crossing. Under this study it is proposed to close the existing A47 level crossing and construct a new road over rail bridge (refer to Highway Scheme 4 in section 5 of this report).
Wisbech Access Strategy	• The Wisbech Access Strategy (WAS) is a package of individual transport schemes that aim to improve the transport network in Wisbech. This includes proposed highway improvement schemes on New Bridge Lane, Cromwell Road, Weasenham Lane and the A47. • The following elements of infrastructure are proposed under this study and would interface with WAS highway schemes: – Highways scheme 4 (A47) – Highways scheme 5 (Weasenham Lane) – Wisbech Station • At this stage the two projects are developing independently, and no attempt has been made to integrate the WAS schemes with the GRIP 3 proposals for the March to Wisbech line.
Ely-March-Peterborough (EMP) resignalling project	• Planned for late CP7 (2027-2029) the Ely-March-Peterborough re-signalling project will result in a number of crossing boxes and smaller locations being closed, and the authority for train movements being re-controlled into Cambridge Power Signal Box. • It has been assumed (pending confirmation from NR) that this re-signalling project will include closure of March East Jn Signal Box and March South Signal Box with re-control to a Central location.

[12] Reference 3 in Table 2.1

Project	March to Wisbech Heavy Rail Interface
Fenland District Council – March Station Masterplan	• Fenland District Council are developing proposals for improvements at March Station, these include a new carpark area. • At this stage the two projects are developing independently

4.2 Current Stakeholders

Stakeholders consulted during the GRIP 3 heavy rail design include:

- Cambridgeshire and Peterborough Combined Authority
- Cambridgeshire County Council
- Network Rail
- The Office of Rail and Road
- The Environment Agency
- Internal Drainage Board - Middle Level Commissioners
- Anglian Water (Weasenham Lane)
- Greater Anglia (current Train Operating Company)
- Utilities Owners:
  - Anglian Water
  - Cadent Gas
  - Openreach
  - UK Power Networks (UKPN)
  - Virgin Media

5 Design Description

This section describes the further optioneering and design development that has been undertaken to identify the preferred GRIP 3 infrastructure solution. Designs have been developed for the infrastructure at March, Wisbech and the rail corridor between. Operational analysis has been carried out in tandem with design development and has also considered key interfaces with the wider network.

5.1 Rail Infrastructure Optioneering

5.1.1 Key Requirements

Prior to the GRIP 3 design commencing, the Options Assessment Report[13] recommended that the GRIP 2, DS2 option was adopted for the heavy rail transport mode with the following key outputs:

Table 5.1: Options Assessment Report key outputs

Parameter	Selected Output
Service pattern	Wisbech-Ely-Cambridge 2tph
Wisbech station location	Town Centre (north of Weasenham Lane, at the southwest end of Hilburn Road)

The GRIP 2 heavy rail feasibility report[14] developed preliminary infrastructure proposals to meet the above requirements and confirmed that the GRIP 3 design should now progress on the basis that all 22 existing level crossings between March and Wisbech would be closed.

Network Rail's GRIP 2 Level Crossing Closure Feasibility Study[15] defined proposed closure schemes for each of the level crossings. Five preferred highways schemes were identified, including seven new bridges (six new road over rail bridges and a new bridge over Twenty Foot river).

A number of alternative service patterns, station locations and transport modes were considered at earlier design stages. Refer to the Options Assessment Report[16], GRIP 2 Heavy Rail Feasibility[17] and Tram-Train Feasibility Report[18] for further information on service patterns, station locations and transport modes considered and rejected prior to GRIP 3.

5.1.2 Initial Sifting

The recommended outputs from Table 5.1 (above) sifted options from the GRIP 2 report[19]. These are detailed below in Table 5.2 with the rational for sifting.

[13] Reference 2 in Table 2.1
[14] Reference 3 in Table 2.1
[15] Reference 6 in Table 2.
[16] Reference 3 in Table 2.1
[17] Reference 2 in Table 2.1
[18] Reference 13 in Table 2.1
[19] Section 7.1, Reference 2 in Table 2.1

Table 5.2: Discounted GRIP 2 Options

Location	Grip 2 Option	Rationale for Sifting
Wisbech Station	South of A47 - One New Bay Platform	Town Centre station location preferred.
	South of A47 - Two New Bay Platforms	Selected Town Centre location provides closest physical location to the town centre on the former rail alignment - supports regeneration, accessibility and demand, with lower levels of car travel.
March Station	Option 1 - One Bay Platform	Did not support regular through running to Cambridge, the preferred service pattern in the Options Assessment Report
	Option 3 - One New Through Platform and One New Turnback Platform	Complex track layout to facilitate connection to Peterborough no longer required

The remaining options from the GRIP 2 report were taken forward and are detailed below, in Table 5.3.

Table 5.3: GRIP 2 Options taken forward to GRIP 3

Location	GRIP 2 Option
Wisbech Station	Town Centre - One new Bay Platform
	Town Centre - Two New Bay Platforms
March Station	Option 2 - One New Through Platform
	Option 4 - Two New Through Platforms

To address the requirements in Section 5.1.1, two alternative rail infrastructure configurations were considered, utilising combinations of the options detailed in Table 5.3:

i. 1 new through platform at March + 1 new bay platform at Wisbech + Intermediate passing loop (refer Figure 5.1 below).
ii. 2 new through platforms at March + 2 new bay platforms at Wisbech, no passing loop required (refer Figure 5.2 below).

For both configurations the proposed line speed is 60mph on the through alignment.

Figure 5.1: Indicative infrastructure configuration i.

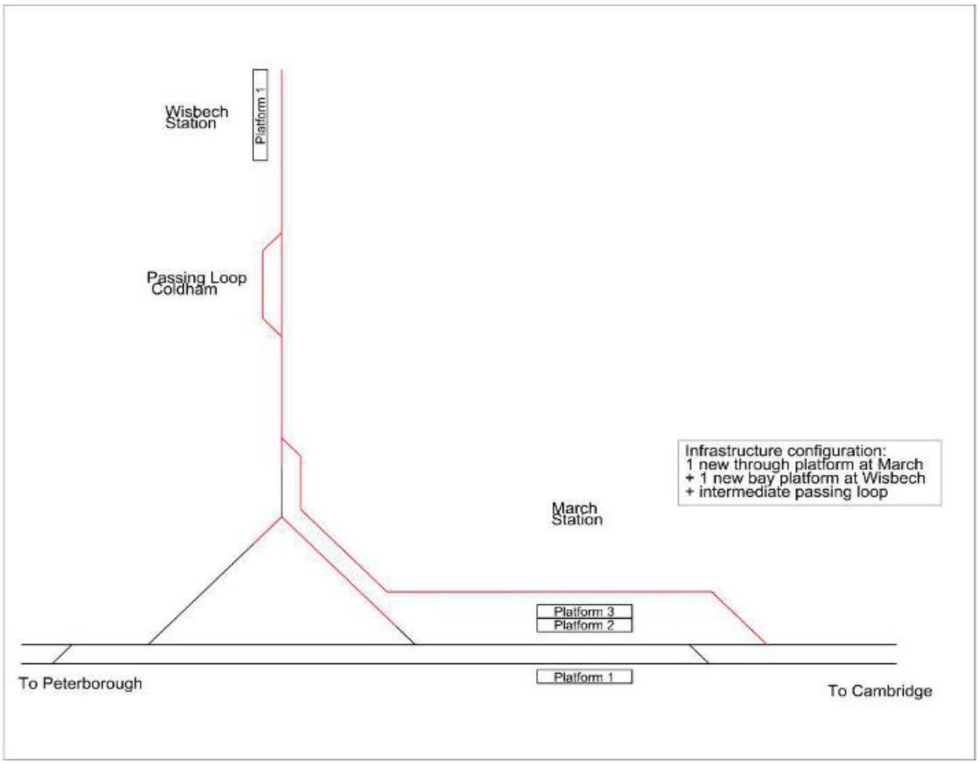
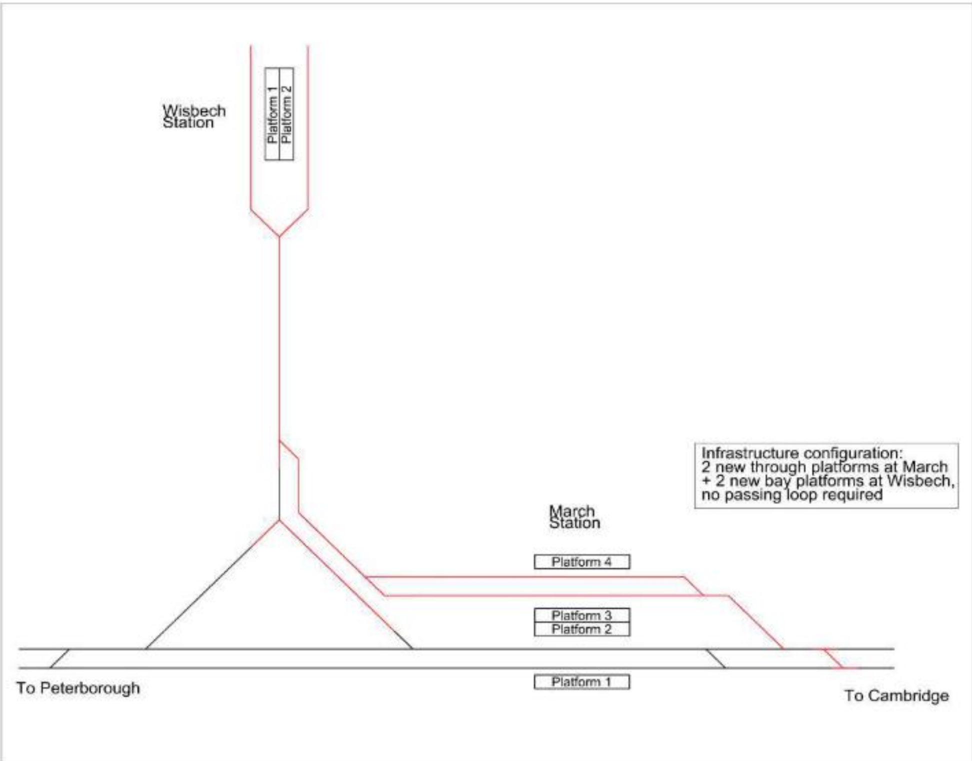


Figure 5.2: Indicative infrastructure configuration ii.



5.1.3 March Area Infrastructure Options

Optioneering initially focussed on the most complex aspect of the works at March station with layouts being developed based on the original GRIP 2 designs. A key consideration of the track layout around March Station was the tight track geometry required to connect Platform 3 to the existing alignment north of Norwood Road overbridge. Opportunities to flatten the radii were limited due to the location of the station platforms, Norwood Road Overbridge and adjacent pond. Drawings/sketches of the options are provided in Appendix N.

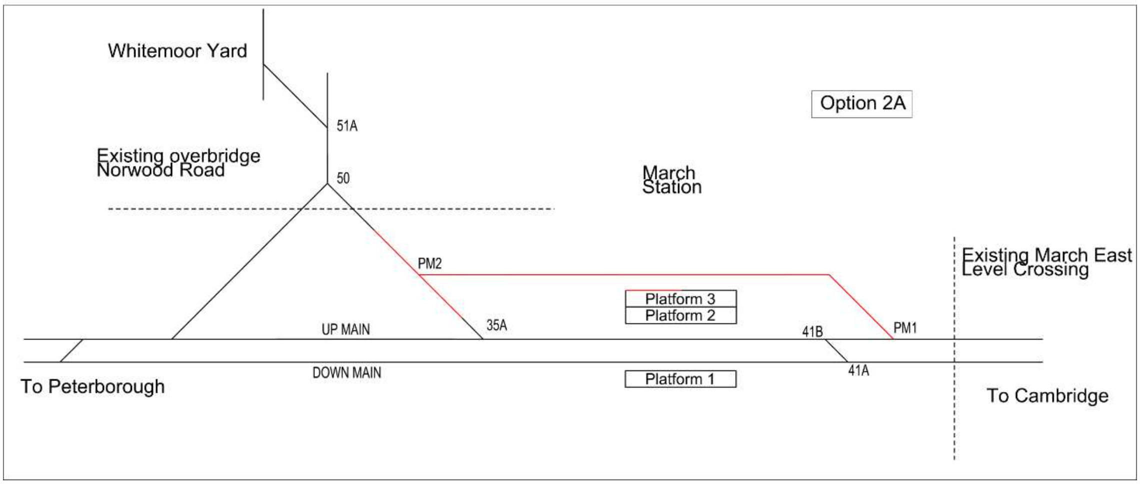
Infrastructure options considered at March are summarised below:

5.1.3.1 March Option 2A

A development of GRIP 2, Option 2. Key features of this option are:

- A new Platform 3 is provided at March Station (a new operational platform at the west end of the old Platform 3).
- The track layout at Whitemoor Junction has the new bi-direction Wisbech single line joining the existing stub 'Wisbech siding' and sharing the existing track between 51A points (exit from/entry to Whitemoor Yard) and 50 points (East Curve/West Curve),
- Just south of Norwood Road overbridge on the East Curve is a new divergence at points PM2, allowing trains to run into the new Platform 3 (Up Passenger Loop).
- The Up-Passenger Loop continues through the new Platform 3 at March Station and joins the Up Main at PM1 Points immediately West of the existing March East Level Crossing.
- Platform 3 is signalled to allow trains from Wisbech to continue towards Ely/Cambridge from, or terminate, reverse and travel back to Wisbech.
- Trains from Cambridge/Ely to Wisbech (and Whitemoor Yard) must pass through the existing Platform 2 on the Down Main using an existing 20mph crossover.

Figure 5.3: Simplified line diagram for Option 2A

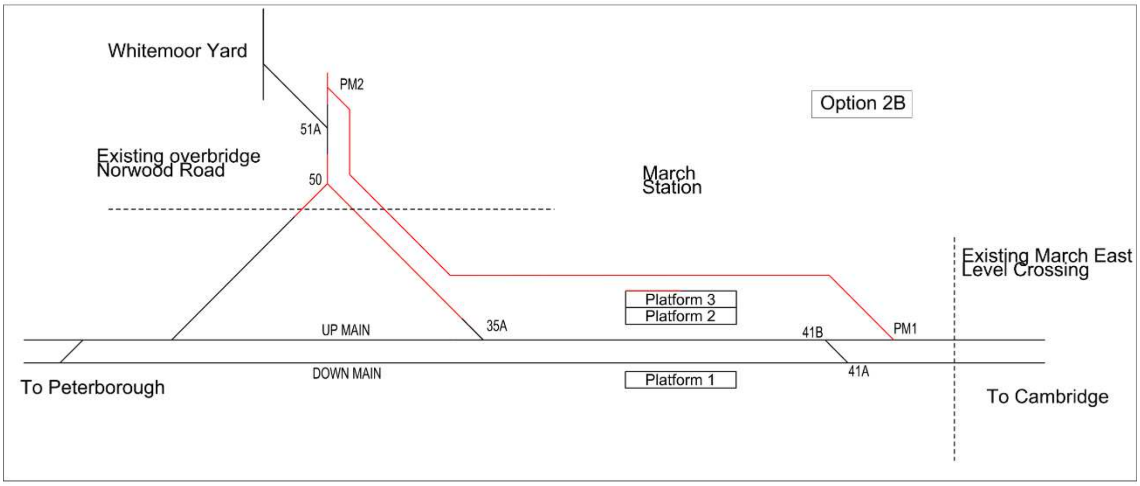


5.1.3.2 March Option 2B

Key features of this option are as Option 2A with the exception of the track layout between the March Station platforms and Whitemoor Junction.

The new bi-direction Wisbech single line joins the existing stub ‘Wisbech siding’ as per Option 2A, but immediately before the connection from Whitemoor Yard has a divergence at PM2 onto a new Up Passenger Loop (UPL) which continues towards March Station. The UPL track runs alongside a realigned East Curve under Norwood Road Overbridge.

Figure 5.4: Simplified line diagram for Option 2B

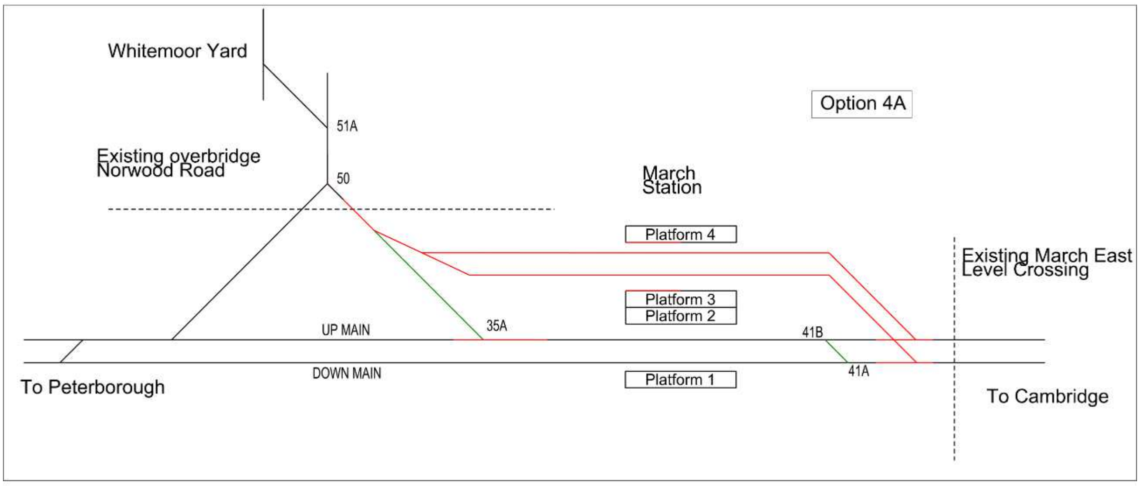


5.1.3.3 March Option 4A

A development of GRIP 2, option 4. Key features of this option are:

- Two new platforms (3 and 4) are provided at March Station
- A double junction with single slip is introduced on the Up and Down main lines to facilitate entry and exit to Platforms 3 and 4.
- A turnout is introduced at the west of Platforms 3 and 4 to feed into a realigned East Curve.
- 35A points and the existing crossover (41A/B) between the Up and Down main lines east of the station are removed.
- The track layout at Whitemoor Junction has the new bi-direction Wisbech single line joining the existing stub ‘Wisbech siding’ and sharing the existing track between 51A points (exit from/entry to Whitemoor Yard) and 50 points (East Curve/West Curve).

Figure 5.5: Simplified line diagram for Option 4A

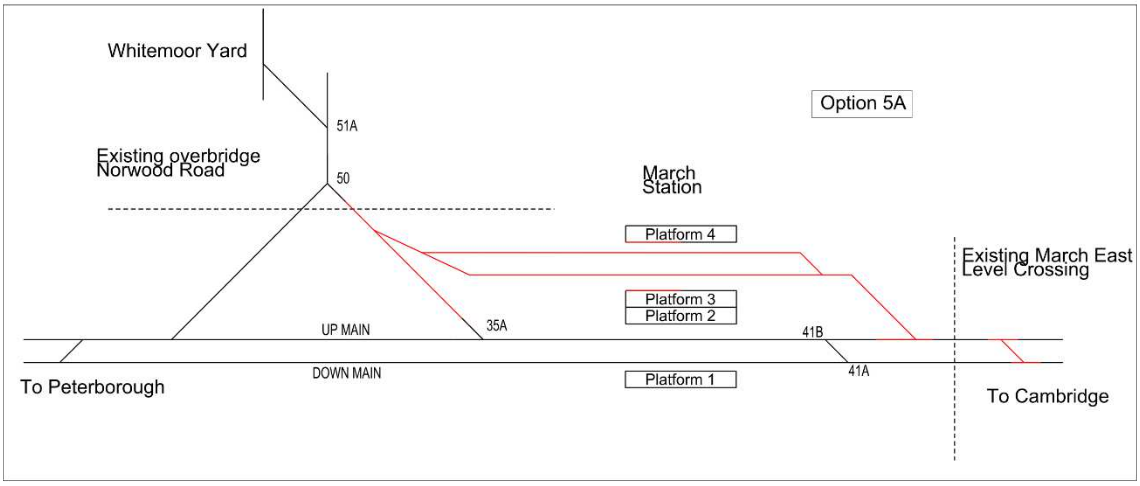


5.1.3.4 March Option 5A

As per Option 4A with the following amendments:

- Turnout added at the eastern ends of Platforms 3 and 4.
- Crossover between the Up and Down mains added east of the March East level crossing.
- 35A points retained.
- Note, the existing crossover (41A/B) between the Up and Down main lines east of the station can potentially be removed.

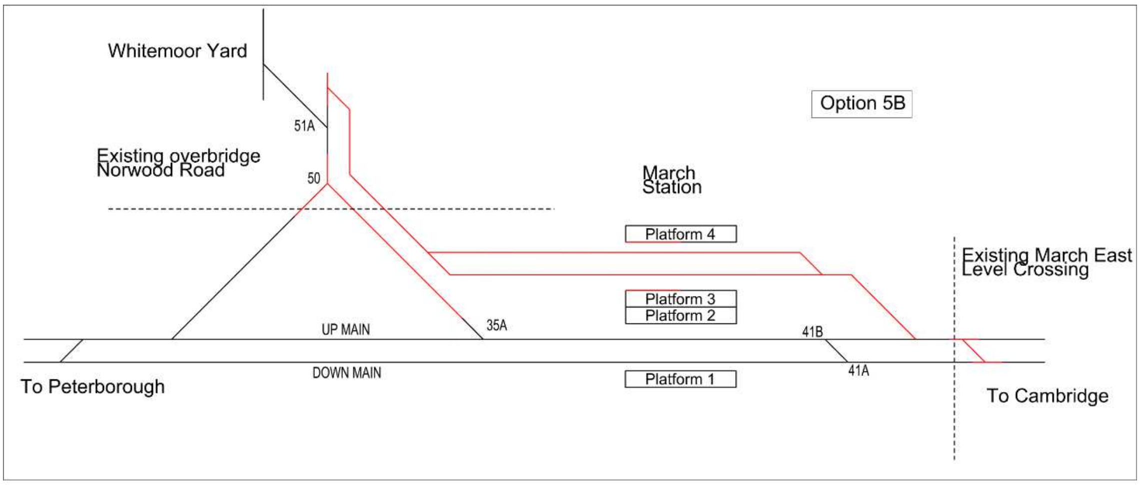
Figure 5.6: Simplified line diagram for Option 5A



5.1.3.5 March Option 5B

This option combines the features of Option 2B around Norwood Road overbridge and Option 4A for the proposed track arrangement through the station platforms and for the connections to the main lines.

Figure 5.7: Simplified line diagram for Option 5B



5.1.3.6 March Option Appraisal

Appraisal of the infrastructure options at March is detailed in Table 5.4.

Table 5.4: Appraisal of March Station track options

Option	Pros	Cons
2A	1. Minimal impact on surrounding infrastructure. 2. Avoids additional infrastructure involved in opening a second new platform at March.	1. Single road on Platform 3. 2. Requires 'Down Trains' from Cambridge to Wisbech use March Platform 2 in the 'Wrong direction', taking up valuable capacity on the 'Up Main' line. 3. "Similar-flexure", tight geometry turnout (PM2) required. 4. Introduces significant operational constraints and conflicts between Network Rail engineering trains arriving and departing Whitemoor Yard and the proposed passenger service to and from Wisbech.
2B	1. Avoids significant operational impact on Whitemoor sidings. 2. Avoids additional infrastructure involved in opening a second new platform at March.	1. Single road on Platform 3. 2. Requires 'Down Trains' from Cambridge to Wisbech use March Platform 2 in the 'Wrong direction', taking up valuable capacity on the 'Up Main' line. 3. Complex track geometry north of Norwood Road Overbridge. 4. Additional possessions and costs (compared to 2A, 4A and 5A) to modify the track north of Norwood Road overbridge.
4A	1. Platforms 3 and 4 re-opened, allowing Cambridge to Wisbech and Wisbech to Cambridge trains to pass at March.	1. Undesirable double junction and single slip arrangement. 2. "Similar-flexure", tight geometry turnout (PM2) required. 3. Introduces significant operational constraints and conflicts between Network Rail engineering trains arriving and departing Whitemoor Yard and the proposed passenger service to and from Wisbech. 4. Additional infrastructure involved in opening a second new platform at March.

Option	Pros	Cons
5A	1. Platforms 3 and 4 re-opened, allowing Cambridge to Wisbech and Wisbech to Cambridge trains to pass at March.	1. "Similar-flexure", tight geometry turnout (PM2) required. 2. Introduces significant operational constraints and conflicts between Network Rail engineering trains arriving and departing Whitemoor Yard and the proposed passenger service to and from Wisbech. 3. Turnouts reduce useable length of platforms 3 and 4. 4. Additional infrastructure involved in opening a second new platform at March.
5B	1. Avoids significant operational impact on Whitemoor sidings. 2. Platforms 3 and 4 re-opened, allowing Cambridge to Wisbech and Wisbech to Cambridge trains to pass at March.	1. complex geometry north of Norwood Road Overbridge. 2. Turnouts reduce useable length of platforms 3 and 4. 3. Additional infrastructure involved in opening a second new platform at March. 4. Additional possessions and costs (compared to 2A, 4A and 5A) to modify the track north of Norwood Road overbridge.

5.1.4 Through Alignment

To the north of Whitemoor sidings the horizontal track alignment adopted the existing, single track alignment based on the OS mapping data. As noted in Table 3.1, it was assumed that the existing track level for vertical alignment purposes is approximately 200mm above the LIDAR surface level. The design adopted the existing track alignment and level to minimise changes to earthworks, underbridges, station platforms etc; with refinement to meet the Network Rail geometry standards, for the adopted speed.

5.1.5 Passing Loop

For infrastructure configuration i (refer Section 5.1.2), a suitable passing loop location needed to be identified. An assessment concluded that the passing loop should be located between the proposed road overbridge at Coldham and the existing rail underbridge, Mulberry drain to for the following reasons:

- Operational input required that the loop be located as centrally as possible between March and Wisbech stations to provide the optimum layout.
- Avoided existing underbridges and new road overbridges
- Included a long, straight section of track
- Sufficient existing rail corridor width to accommodate the additional track

The GRIP 2 heavy rail feasibility report[20] specified a split passing loop arrangement with 280m between fouling points and 40mph turnouts. In conjunction with operational and signalling input, it was concluded that a passing loop separate from the through alignment was preferable and a minimum of 315m between clearance points was required, allowing four-car rolling stock (Class 170 or 755) to use the loop.

5.1.6 Wisbech Station

During the optioneering phase, no additional layouts were proposed at Wisbech.

[20] Reference 2 in Table 2.1

5.1.7 Scheme-Wide Rail Infrastructure Options Appraisal

After initial optioneering (detailed in Sections 5.1.3 to 5.1.6) appraisal of the proposed infrastructure configurations (i and ii, refer to Section 5.1.2) was carried out via a series of multi-disciplinary meetings. The appraisal is summarised below.

5.1.7.1 Cost

Capital cost estimates developed as part of Mott MacDonald's 2015 GRIP 2 feasibility report[21] were used to compare the two configurations. This showed capital costs to be very similar for the two options:

Table 5.5: Infrastructure configuration capital costs

Infrastructure Configuration	Indicative Capital Cost*
i. 1 new through platform at March + 1 new bay platform at Wisbech + Intermediate passing loop.	£14.7m
ii. 2 new through platforms at March + 2 new bay platforms at Wisbech, no passing loop required.	£14.9m

*2015 capital costs excluding risk and optimism bias

Capital cost is therefore not a key consideration in determining the preferred configuration.

5.1.7.2 Operational performance and reliability

Configuration i is considered the best option operationally as it allows:

- Trains to pass between March and Wisbech in the loop during normal operations, keeping the existing Platform 2 at March free for other services passing through on the mainline.
- Resilience in case of delays elsewhere by providing the option for trains to pass each other either in the loop or using the new through platform at March and one of the existing platforms (Platform 2).

Further detail on the operational rationale for this decision is provided in Section 6 of the Assessment of Rail Operations report[22].

5.1.7.3 Feasibility of infrastructure

Following a review of the two options, Configuration i reduces the risk associated with existing infrastructure condition and possession working as it:

- Minimises the track infrastructure (e.g. turnouts, diamond crossings) around March Station where there is already tight and complex track geometry.
- Avoids the need to re-commission March Station Platform 4 where there are limited opportunities to locate the operational platform length on straight track geometry.
- Reduces the land take required for the new Wisbech Station due to the reduced number of platforms (note the infrastructure for the passing loop can be located within the existing NR rail corridor).

Following consideration of the above, Configuration i was identified as the preferred option.

[21] Reference 2 in Table 2.1
[22] Reference 3 in Table 2.1

March Options 4A, 5A and 5B were sifted as they included two platforms at March Station which were not required for infrastructure configuration i. The “Two New Bay Platforms” option was also sifted for Wisbech Station as this was not required for infrastructure configuration i.

5.1.8 March Area Infrastructure Option Development

5.1.8.1 Track

Options 2A, 2B were further developed. Drawings 398128-MMD-00-XX-DR-P-0001, 0002, 0003 show the proposed track geometry for these options. Options 2B is preferable as the track layout, as this option negates the need for a similar-flexure turnout with exceptional track radius.

5.1.8.2 Signalling

March Option 2A

The track layout at Whitemoor Junction has the new bi-direction Wisbech single line joining the existing stub ‘Wisbech siding’ and sharing the existing track between 51A points (exit from/entry to Whitemoor Yard) and 50 points (East Curve/West Curve), then just south of Norwood Road overbridge on the East Curve is a new divergence at points PM2, allowing trains to run into the new Platform 3 (Up Passenger Loop).

The Up-Passenger Loop continues through the new Platform 3 at March Station and joins the Up Main at PM1 Points close to the position of March East Level Crossing. Platform 3 is signalled to allow trains from Wisbech to continue towards Ely/Cambridge from Signal ME302, or terminate, reverse and travel back to Wisbech.

Trains from Cambridge/Ely to Wisbech (and Whitemoor Yard) must use the existing 20mph crossover 41A/B from the Down Main into Platform 2. The crossover is protected by junction signal ME3 which must be approached at red when using this diverging route.

The layout at the Ely end of March station allows parallel moves with trains from Cambridge to Wisbech crossing into Platform 2 when a train from Wisbech to Cambridge is departing.

When a train from Peterborough towards Ely arrives/departs from Platform 2, a train from Wisbech can arrive at Platform 3 (Signal ME302 with 89m overlap).

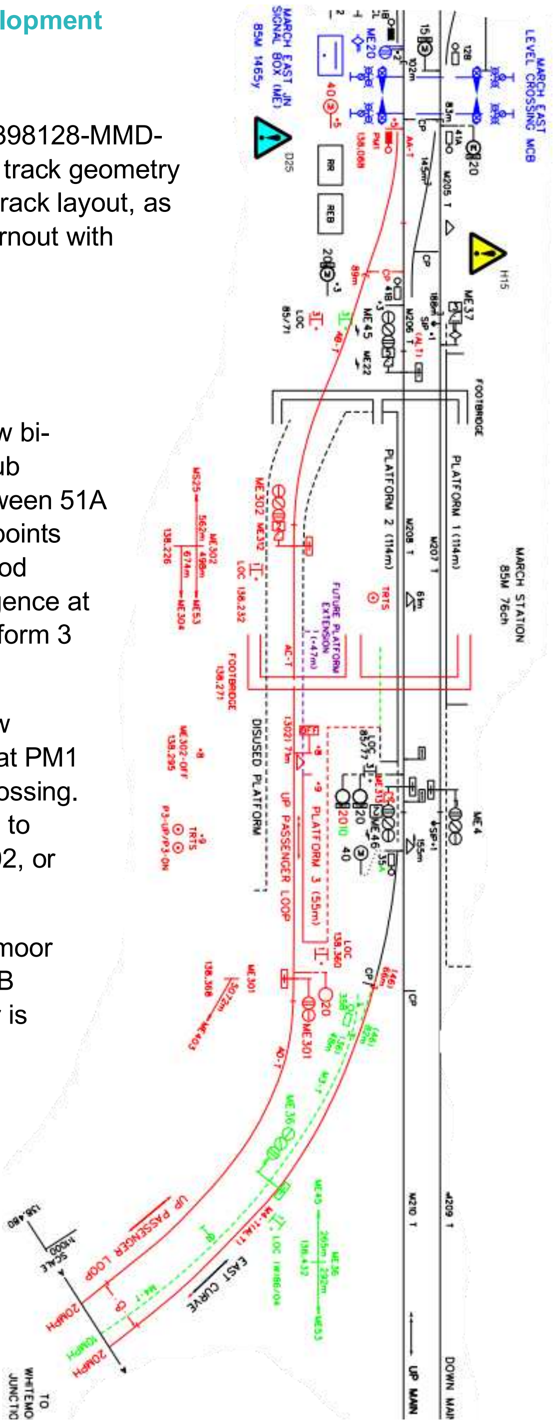


Figure 5.8: Extract from signalling scheme 2A

However, if a train is signalled to depart Platform 3 towards Ely, a train from Peterborough would be delayed at West Junction Signal ME48 and not be able to run into Platform 2 until the first train had departed and cleared the 102m overlap on Signal ME45.

Option 2A also allows non-passenger trains from Whitemoor Yard to run through Platform 3, and shunt class routes (Signal ME312) also give access to the Up Goods and Up Reception Lines.

The proposed signalling at Whitemoor Junction also allows trains from the Wisbech single to run onto the East Curve (towards March Platform 2) and also the West Curve towards Peterborough, although the latter includes trap points 27A and is suitable for non-passenger trains only.

Due to the position of new points PM2 the existing signal ME55 on the East Curve, which controls access to Whitemoor Yard has been removed, consequently trains arriving from the South will be stopped on Platform 2 at Signal ME46/ME313 before being allowed to proceed into the Yard.

The Up direction signal ME36 on East Curve is also shown removed on the Scheme option, as a train stopped there would have blocked Whitemoor Junction for Wisbech services, and without ME55 there is no possibility to make reversing movements.

The track and signalling layout in March Option 2A introduces significant constraints and conflicts between Network Rail engineering trains arriving and departing Whitemoor Yard and the proposed passenger service to and from Wisbech.

March Option 2B

The track layout at Whitemoor Junction has the new bi-direction Wisbech single line joining the existing stub 'Wisbech siding', but immediately before the connection from Whitemoor Yard has a divergence at PM2 onto a new Up Passenger Loop (UPL) which continues towards March Station. The UPL track runs alongside a realigned East Curve under Norwood Road Overbridge,

The Up Passenger Loop continues through the new Platform 3 at March Station and joins the Up Main at PM1 Points close to the position of March East Level Crossing.

Platform 3 is signalled to allow trains from Wisbech to continue towards Ely/Cambridge from Signal ME302, or terminate, reverse and travel back to Wisbech.

Trains from Cambridge/Ely to Wisbech (and Whitemoor Yard) must use the existing 20mph crossover 41A/B from the Down Main into Platform 2. The crossover is protected by junction signal ME3 which must be approached at red when using this diverging route.

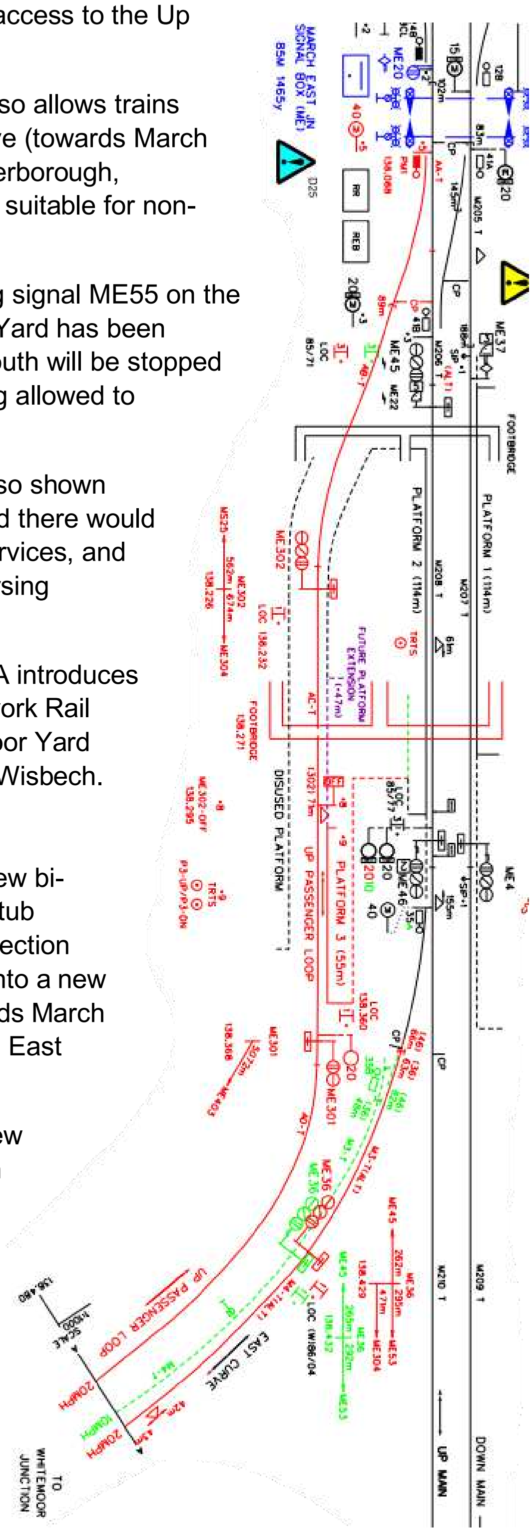


Figure 5.9: Extract from signalling scheme 2B

The layout at the Ely end of March station allows parallel moves with trains from Cambridge to Wisbech crossing into Platform 2 when a train from Wisbech to Cambridge is departing.

When a train from Peterborough towards Ely arrives/departs from Platform 2, a train from Wisbech can arrive at Platform 3 (Signal ME302 with 89m overlap).

However, if a train is signalled to depart Platform 3 towards Ely, a train from Peterborough would be delayed at West Junction Signal ME48 and not be able to run into Platform 2 until the first train had departed and cleared the 102m overlap on Signal ME45.

There is no route from Whitemoor Yard into Platform 3 so all trains to the south would continue to run via the East Curve and Platform 2.

To suit the new East Curve alignment (and proposed 20mph line speed), The existing signals are relocated. ME36 signal protecting the junction into Platform 2, and at the Whitemoor junction end ME55 (for shunt route into the yard) with a new main aspect (drawn ME305) for the route to Wisbech. A 4-car DMU train can be held at either ME36 Signal or ME305 Signal to allow a movement across the junction ahead without blocking the junction behind.

A 4-car train intending to return to Cambridge without visiting Wisbech, should run onto the Wisbech Single and reverse at Signal ME304.

The proposed signalling at Whitemoor Junction allows trains from the Wisbech single to run onto the East Curve (towards March Platform 2) and also the West Curve towards Peterborough, although the latter includes trap points 27A and is suitable for non-passenger trains only.

Option 2B is an improvement over Option 2A in that it provides for passenger trains from Wisbech to enter March station Platform 3 without and conflicting routes with trains arriving and departing Whitemoor Yard. There is also the ability for a train to Wisbech to depart Platform 2 and stop on the East Curve to wait for a conflicting movement (e.g. train from Wisbech) to clear Whitemoor Junction.

5.1.8.3 Option 4C

Development of a further track layout, option 4C, was undertaken for the following reasons:

1. For Options 2A/2B, trains from Cambridge on the Down line would arrive on March Platform 2 via 41A/B Pts crossover. They would then turn right through 35A Points and Up to Wisbech.
2. For Options 2A/2B, on the return leg (south) from Wisbech trains would arrive on Platform 3 before feeding onto the Up Main through the new turnout and continuing on to Cambridge
3. An Operational review of the demand requirements for Ely Area Capacity Enhancements (EACE) project, deemed that more flexibility is required for the layout at March Station to ensure the service from March to Wisbech does not block trains on the main lines i.e. In item 1 (above) the March to Wisbech train on Platform 2 would block through services on the Down Main which limits capacity

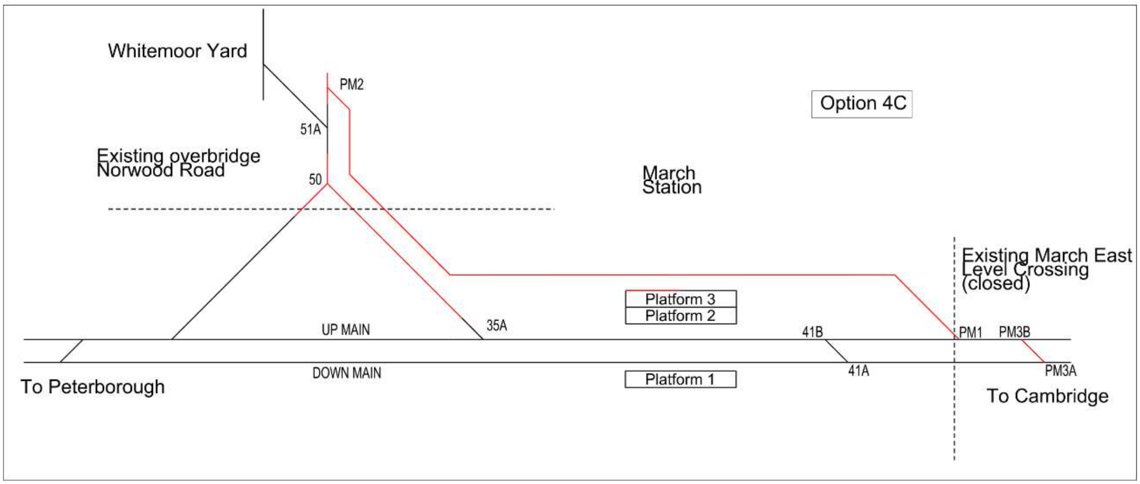
Track

To address the issues identified above, Option 4C, based on preferred Option 2B, was developed with the following track additions:

- Facing crossover added from Down Main to Up Main, to allow trains travelling down from Cambridge to access Platform 3 and therefore avoid holding trains up in Platform 2

- Turnout connecting Up Main to Platform 3 has been pushed east to ensure there is sufficient overlap for a train to pull into Platform 2 in the Up direction whilst a train can enter Platform 3 from the Down Main
- Assumption that the EACE project will close March East Level Crossing to facilitate point b. (above)
- Platform 3 to be made bi-directional to allow March to Wisbech trains to enter/exit via this platform to avoid disruption on Platform 2.

Figure 5.10: Simplified line diagram for Option 4C



Signalling

A consequence of using Platform 3 at March for both directions is that for a 2tph service, trains to and from Wisbech will need to cross at Coldham Loop rather than in March Station.

The previously developed options already allowed for this possibility, so no changes were required.

In developing the Option 4C, to achieve a reduction in the time the Up Main line is occupied, trains from Cambridge to Wisbech should not be unduly restricted by signalling controls when crossing from the Down main line to Platform 3.

To deliver this Option 4C features a 40mph crossover (named PM3A/B) from Down Main to Up Main, 40mph also being the speed on the Down Main in this area.

Access to Platform 3 is through a 25mph turnout. The existing 20mph crossover (named 41A/B) from Down Main to Up Main is retained, primarily because this gives access to the Down Yard Sidings. It also provides parallel movements for trains to and from the branch should the timetable or operating conditions require it.

With a higher speed of approach to the crossover possible, the relocated Down Main Junction Signal ME3 will use a position light route indication (PLJI), readable at a greater distance than Alpha-numeric indicator on the existing layout.

The track spacing between the Down Main and Down Goods No1 line prevents the use of a standard signal post or a ground mounted signal with a PLJI. Therefore, a signal gantry is required for ME3.

To allow sufficient braking distance (for all types of train) to a stop aspect at ME3 signal, the preceding signal MS35, south of Badgeney Road LC, also requires relocation.

To warn train drivers that a route is set from ME3 onto the Wisbech line with its 25mph divergence, MS35 will display a flashing yellow aspect.

Within Option 4C, a second intervention is proposed to minimise delays to Up direction trains from Peterborough towards Ely.

To allow Up direction trains to arrive in Platform 2 while another train is signalled into or out of Platform 3 (Up & Down Wisbech Line), it is necessary to provide an Overlap track section beyond signal ME45 but ending before the clearance point with the Up & Down Wisbech Line.

The recommended minimum length of Unrestricted Overlap permitted for a 40mph line of 80m is not achievable, but it could be possible to get up to 59m allowing a low speed restrictive approach towards ME45 from previous signal ME48.

In this case the train would approach Down Main signal ME48 at red, but by the time it had slowed to around 20mph, 160m from the signal, the signal would clear to a yellow aspect, allowing the train to continue the next half-mile towards Platform 2. This is restricted approach is sometimes known as a Warning arrangement or a 'Delayed Yellow'.

Trains approaching Platform 2 from the West Curve are already limited to 20mph, so further signalling control is not necessary to make use of the restricted overlap.

To give part of the required overlap length, the toes of points PM1 are positioned as close as possible to existing 24B points, taking advantage of the proposed closure of March East Level Crossing.

The additional length is provided by moving signal ME45 12m back towards the end of Platform 2. It is considered this is the maximum possible without reducing the usable length of the platform.

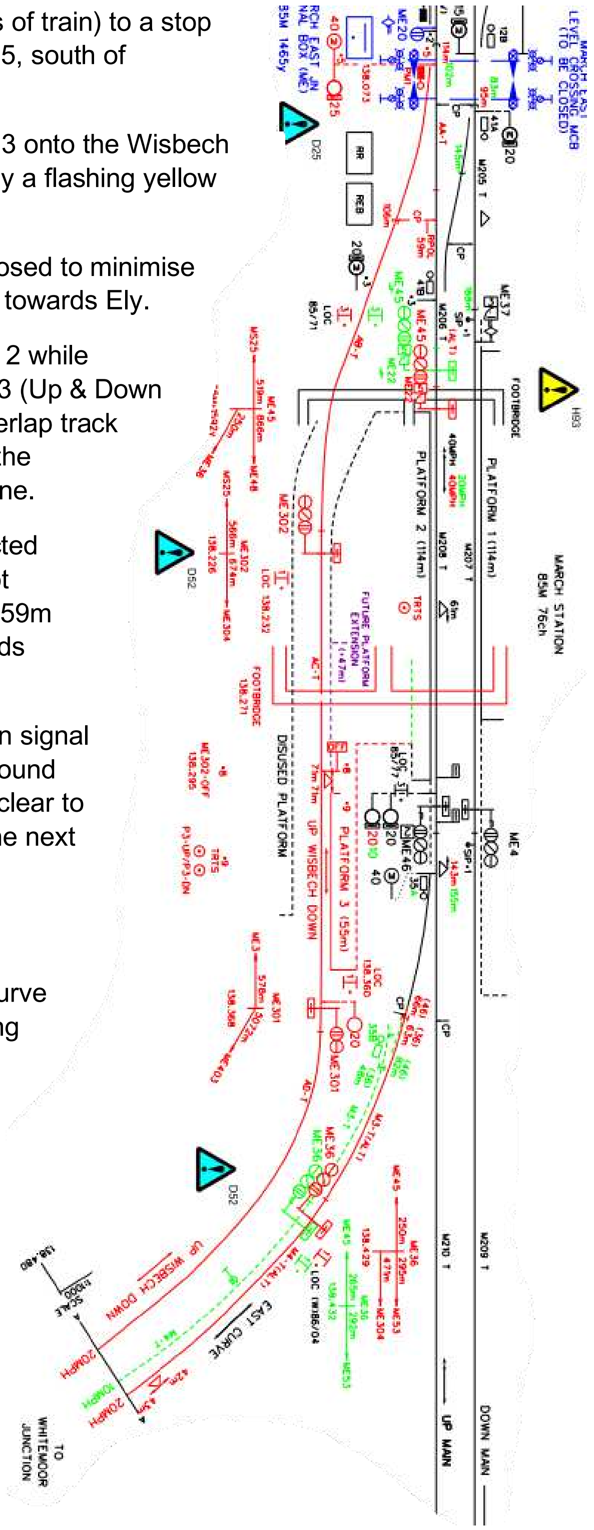


Figure 5.11: Extract from signalling scheme 4C

An alternative mitigation to using the 'Delayed Yellow' and restricted overlap, is to set points 41A/B 'Reverse' for the Down Main – Up Main Crossover and use the alternative 95m overlap from ME45.

This could be used when a train to Wisbech is using PM3A/B crossover, providing flank protection to prevent a potential head-on collision. It wouldn't be practical to use this when a train is departing Platform 3 and the Down Main is being used for a train towards Peterborough.

In other respects, the signalling and track layout at March station and Whitemoor Junction for option 4C is the same as Option 2B.

Option 4C Appraisal

Appraisal of the March Option 4C is detailed in Table 5.6.

Table 5.6: Appraisal of March Station Option 4C

Option	Pros	Cons
4C	1. Bi-directional Platform 3 avoids disruption on the 'Up Main' Line. 2. Avoids significant operational impact on Whitemoor sidings. 3. Avoids additional infrastructure involved in opening a second new platform at March.	1. Additional possessions and costs (compared to 2A, 4A and 5A) to modify the track north of Norwood Road overbridge. 2. Increased complexity of signalling arrangements and increased signalling costs compared to 2A and 2B.

Option 4C has been selected as the preferred track option at March as it delivers the operational flexibility required. A bi-directional Platform 3 to avoid disruption on the 'Up Main' Line through Platform 2 would be particularly important post-EACE when a large increase in the number of through running services on the Up Main and Down Main and March are expected.

5.2 Track

5.2.1 Design Development

5.2.1.1 March Station

For Platform 3 at March station, the western end of the existing platform has straighter geometry, and this was deemed the optimum position to locate the operational platform. To adhere to the requirements of Rail Industry Standard 7016 (refer Table 2.2), straight geometry was applied at the western end of the platform with a 1000m radius curve to connect to the tighter curvature at the eastern end of the platform. The minimum operational platform length was calculated to be:

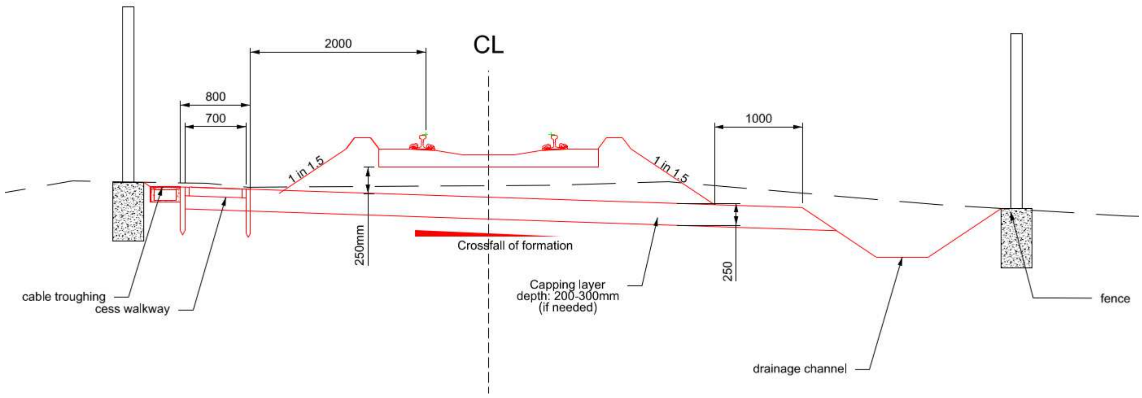
47.22m (two-car class 170 length) + 5m (stopping distance) = 52.22m (rounded up to 55m in the design)

Although not specifically a requirement of the project, a further 47m of operational platform was allowed for to give passive provision for a four-car class 170 or a four-car class 755 train (80.7m) in the future.

5.2.1.2 Through Alignment

Earthworks were developed in conjunction with the track drainage and civil disciplines and further detail is provided in Sections 5.6 and 5.8. The earthworks modelling was based on one drainage ditch with a constant fall in track formation. Typically, the drainage ditch was located on the opposite side of the alignment to the track walkway (with the track formation falling towards the ditch), except where there is an adjacent embankment around Whitemoor junction. Refer to Figure 5.12 below for details.

Figure 5.12: Typical track cross-section with cess walkway and drainage ditch



The proposed walkway location is as per the civils design and generally located to provide the best access to lineside infrastructure (Refer Section 5.6.4.7). The earthworks modelling also allowed for a cycle path within the existing corridor (separated by boundary fence) between Long Drove 145+450km and Crooked bank 147+050km. The drainage ditch has been located to the west of the cycle path alignment.

5.2.1.3 Passing Loop

The passing loop was further lengthened to 350m ensure the most northerly turnout (PL2) was located clear of an existing culvert. The location of the passing loop means that if it is required to be extended in the future for longer rolling stock, the PL2 turnout can be located up to 860m further north. This was identified on the drawings to ensure infrastructure is not located here to facilitate the work in the future.

5.2.1.4 Wisbech Station

Based on infrastructure configuration i (see Section 5.1.2) a single terminal platform was designed for Wisbech station.

The operational platform length was based on two-car class 170 length (47.22m) with the following requirements (Refer Table 2.2 for standards):

- Part 5 of Rail Industry Standard 7016 defines the overrun risk zone as 20m behind the face of the buffer stop.
- Part 8, Table 2 of Rail Industry Standard 7016 defines inaccurate stopping (terminal platforms) as 5m and buffer stop stand back as 2m
- E.1.7 of NR 2049 defines the minimum platform length as max length of train + inaccurate stopping + buffer stop allowance

Therefore, the operational platform length needed to be 47.22m (two-car class 170 length) + 5m + 2m = 55m (rounded up). Adding 20m for the overrun risk zone and then 47.22m passive provision for a 4-car train in the future, means the length of straight at the end of the track needed to be 122m. An overrun risk zone (hatched on the drawings) was added for the buffer stop at Wisbech platform to ensure no infrastructure was located in this area.

5.2.2 Track Category

Track was calculated as category four based on the following parameters and using the guidance of (withdrawn) Railway Group GC/RT5023, Standard Categorisation of Track. The trains per annum us based on four trains running over the track each hour, for 20 hours per day, 365 days per year.

Table 5.7: Determination of Track Category

Parameter	Value
Class of train*	170
Number of cars	2
Trains per hour	2
Trains per annum	29200
Mass of train (t)	91.4
Max axle load (4 axles per car)	11.425
Load and wear coefficient	1
Max timetabled speed (mph)	60
Speed coefficient	1.2
EMGTPA	3.202656
Category	4

**A 3-car Class 755 is approximately 100t and a 4-car is 120t (conservative figures). Using 120t gives an EMGPTA of 4.2 which equates to track category 4 at 60mph.*

5.3 Signalling

5.3.1 Design Development

5.3.1.1 Through Alignment and Passing Loop

The section from Whitemoor Junction to Wisbech station is common to all options.

All existing level crossings are to be closed with equipment recovered. No at grade road/rail crossings will exist on the reopened line.

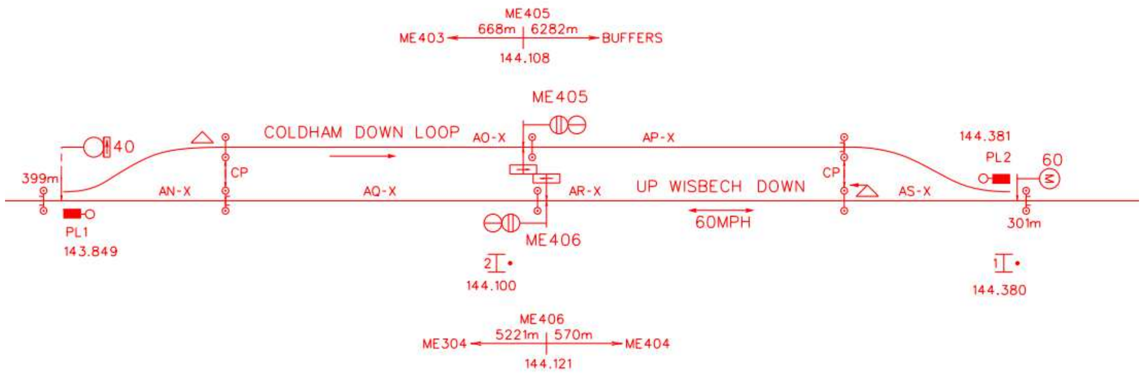
Based on the operational requirements for a 60mph railway to support a two-train per hour passenger service operated by modern trains such class 170 DMUs, the decision was made to space the new signalling and signage for enhanced braked passenger trains. This reduces the distances between caution and stop signals so should contribute to quicker journey times.

Train detection from Whitemoor Junction to Wisbech would use axle counter technology, giving the signaller visibility of train position in the track layout and confirming arrival and departure at Wisbech.

To allow for trains to pass on the reopened section, a crossing loop is provided just north of Coldham, with standage sufficient for a 4-car DMU train. The signalling arrangement allows for trains in either direction to use the 60mph through line to pass without delay. Trains from March to Wisbech can be diverted through 40mph points into the Coldham Down Loop and, if necessary, be stopped at signal ME405, to allow a train to pass towards March. If the train towards March arrives before the Wisbech train has completely entered the Coldham Down Loop, it will be delayed at signal ME406.

In total 6 signals are required for the Coldham Loop, to provide stop signals protecting the points and signals with caution aspects at braking distance.

Figure 5.13: Coldham Loop Signalling Scheme



There are no signals provided at Wisbech, the section from Coldham loop to Wisbech is to operate as “One Train Working”.

Signalling equipment at Wisbech is limited to an axle counter head, Train Protection & Warning System protecting the buffer stop and an ‘Interrupter’ detection at the buffer stop to alert the signaller in case of a train striking the buffers.

5.3.2 Interlocking and Control

The existing signalling in the March area is controlled by Electro-Mechanical signalling, with March South Signal Box adjacent to March South Level Crossing, and March East Signal Box adjacent to March East Level Crossing and controlling the station area, West Junction and Whitemoor Junction.

The main lines and Whitemoor Junction have colour light signals and motor worked points, but mechanical points and shunt signals remain south of the station at March Up Yard and March Down Yard.

It is believed Network Rail’s current policy is for limited life-extension work, before a resignalling and recontrol project for the Ely-March-Peterborough line in CP7 (refer to assumption 126 in Table 3.2)

A possible method to operate the re-opened line to Wisbech might be to control from March East Signal box using Individual Function Switches on a small panel, communicating with a remote relay room at Coldham, and control the local signals and points from the lever frame. This proposal would have many risks such as condition of the existing interlocking for alteration, disruptive possessions for the alterations, Human Factors for the signaller working in March East signal box.

The impending re-signalling scheme would mean any expense spent on the existing box and relay room would likely have a short working life.

The recommended strategy would be to tie in the line reopening and March station alterations with the recontrol and resignalling scheme and include the Wisbech branch in the new Computer Based Interlocking and on the new VDU workstation controlling the Ely-Peterborough line.

5.4 Highways Alignment

5.4.1 Design Development and Changes from GRIP 2

Network Rail's GRIP 2 Level Crossing Closure Feasibility Study[23] defined proposed closure schemes for each of the level crossings. A considerable amount of optioneering was carried out under the Network Rail GRIP 2 study to drive efficiency and provide the lowest possible cost for closure, NR studied the ten public access level crossings holistically and endeavoured to close the maximum number of level crossings with the minimum number of infrastructure interventions.

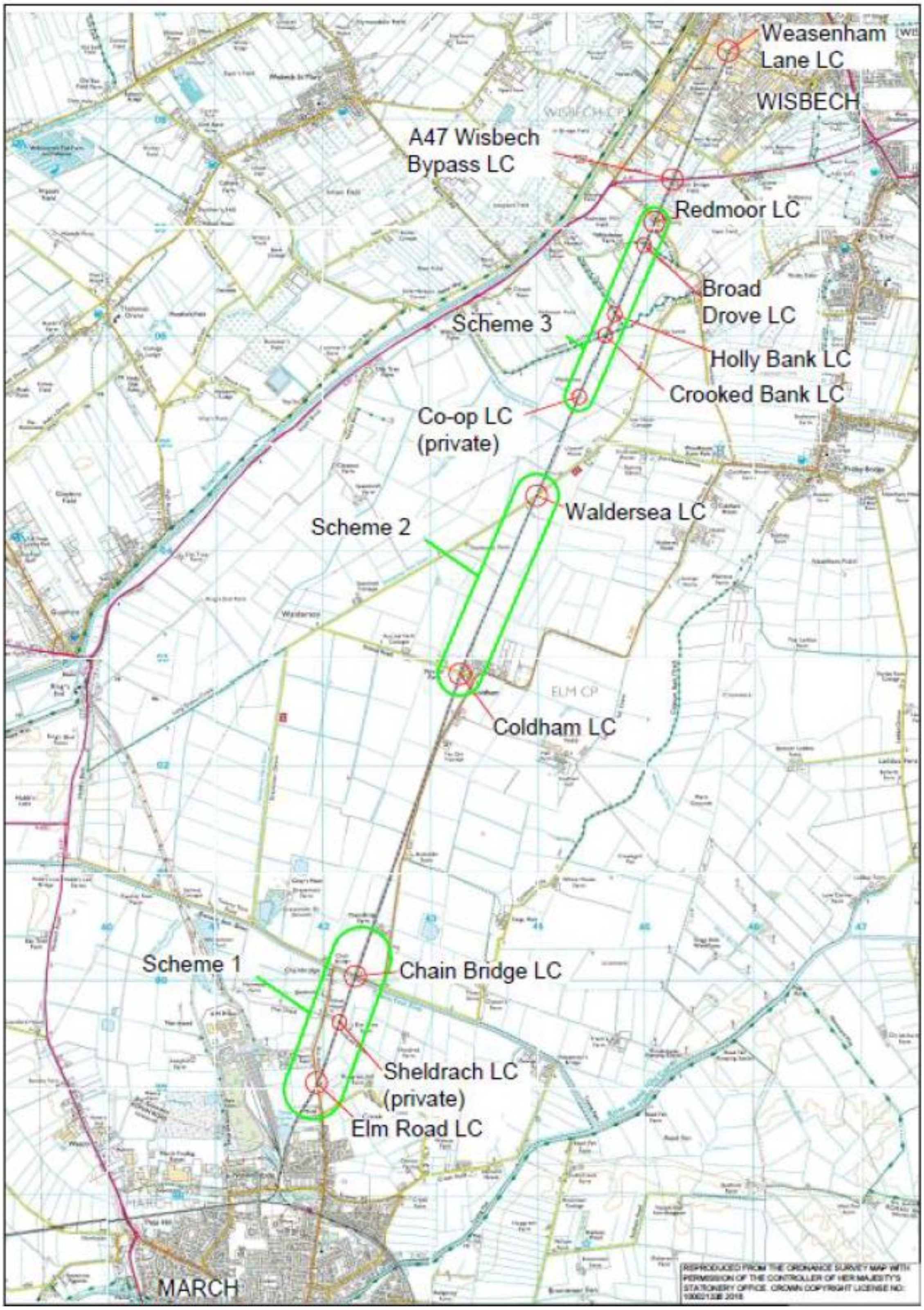
Additionally, consultation with the freehold owners (owner of the fee simple estate) of the private access level crossings was carried out under the NR GRIP 2 study to understand the requirements for closing these level crossings.

Five preferred highways schemes were subsequently identified at GRIP 2, including six new road over rail bridges and new road bridge over Twenty Foot river. The GRIP 3 highways designs are for implementation of the five preferred highway schemes identified by NR at GRIP 2. Generally speaking, further optioneering on the highway schemes has not been carried out at GRIP 3 and minimal changes have been made from the NR GRIP 2 designs. Where minor changes have been made, they are noted below.

Figure 5.14 shows the locations of the 5 level crossing location schemes.

[23] Reference 6 in Table 2.1

Figure 5.14: Level Crossing (Highways and Byways Only) Location Plan - Reference Network Rail 2015



5.4.1.1 Scheme 1

Highways Scheme 1 is illustrated in the figures below.

Figure 5.15: Highways Scheme 1 - Elm Road Overbridge

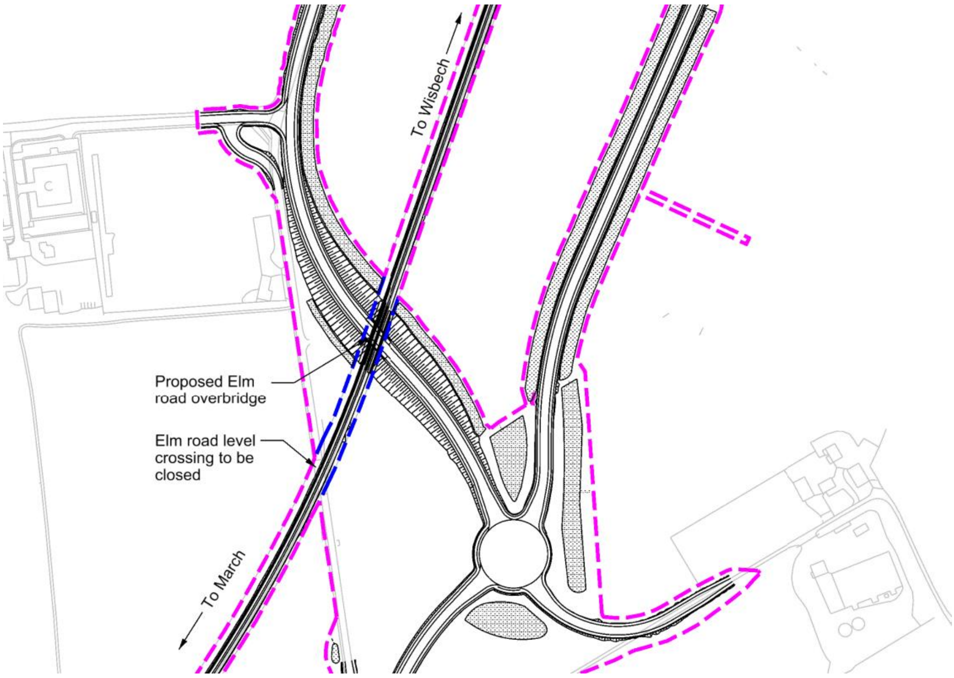
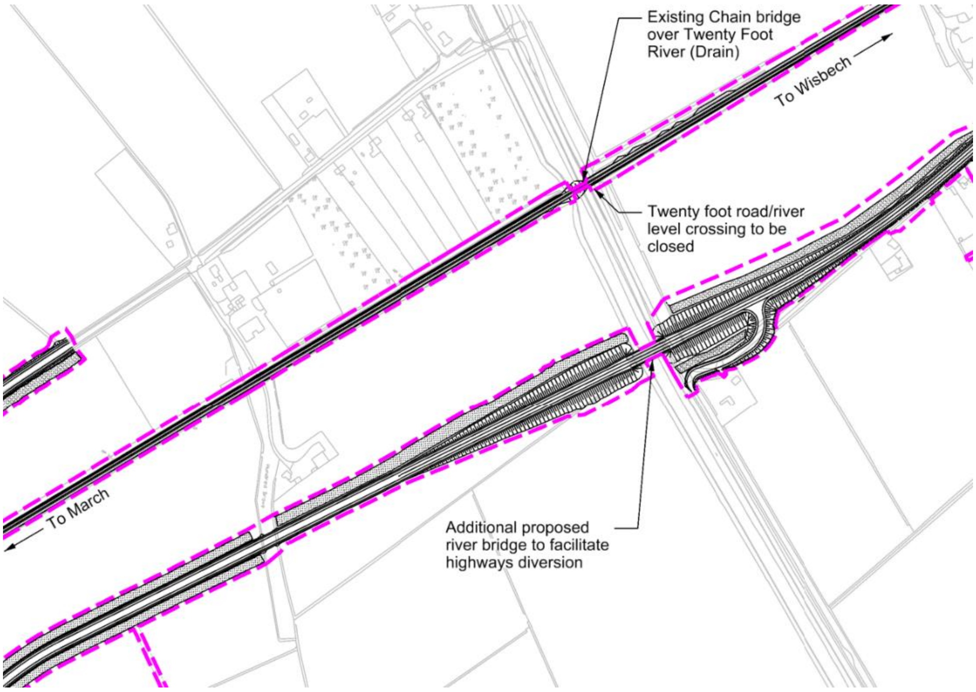


Figure 5.16: Highways Scheme 1 - Twenty Foot River Overbridge



Details of the scheme are provided in drawings 398128-MMD-00XX-DR-H-0101 to 0112 (refer Table 8.3).

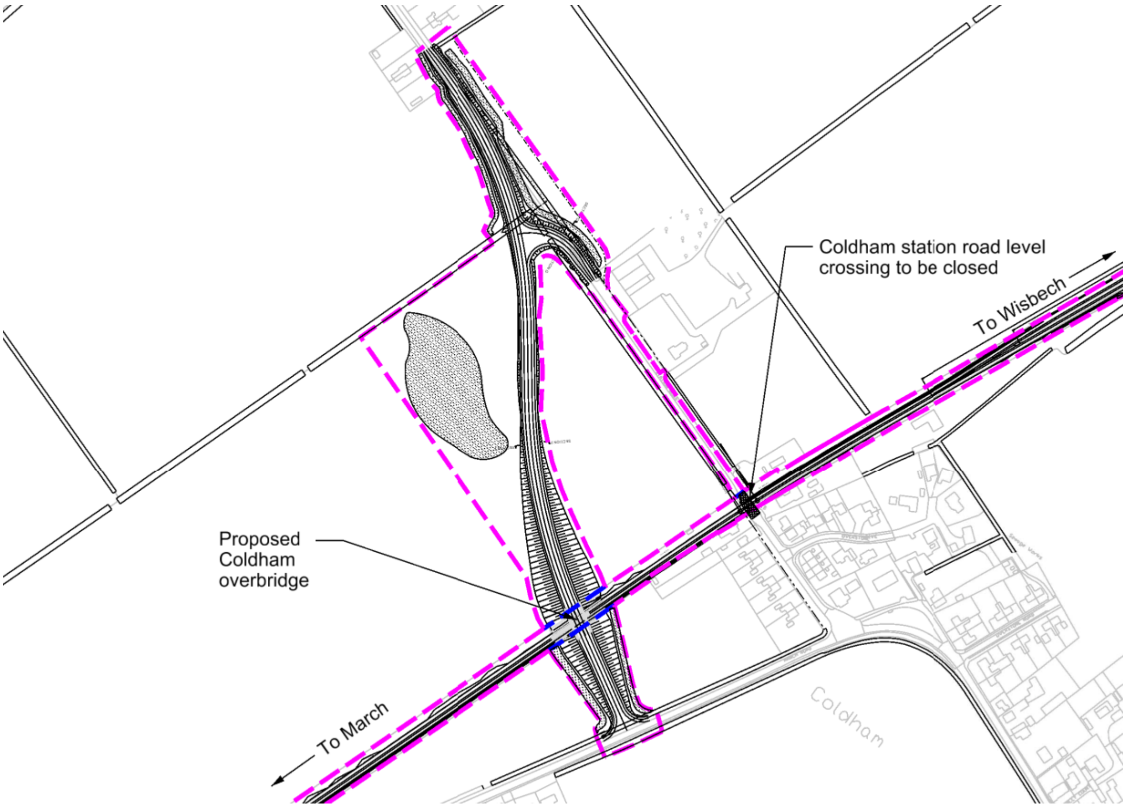
The following changes/developments from the GRIP 2 design have been made:

- At the junction with Elm Road and Longhill Road, a spur has been provided to connect to the existing alignment to maintain access to the car park of the March Rugby and Football club. Consultation should be carried out with the club at the next stage of design to determine the suitability of the proposed connection against user requirements.
- Access to Elm Tree Farm from the proposed B1101 alignment has been developed at the location noted on the GRIP 2 plans.
- The side road access from the proposed B1101 to the north of Twenty Foot River has been developed to provide access to adjacent properties.
- The existing alignment of the B1101 has been shown to be abandoned between the junction with Twenty Foot Road and the tie-in to the proposed alignment, as Chain Bridge level crossing has not been selected as a rail access point, so no access is necessary.

5.4.1.2 Scheme 2

Highways Scheme 2 is illustrated below.

Figure 5.17: Highways Scheme 2



Details of the scheme are provided in drawings 398128-MMD-00XX-DR-H-0201 to 0203 (refer Table 8.3).

The following changes/developments from the GRIP 2 design have been made:

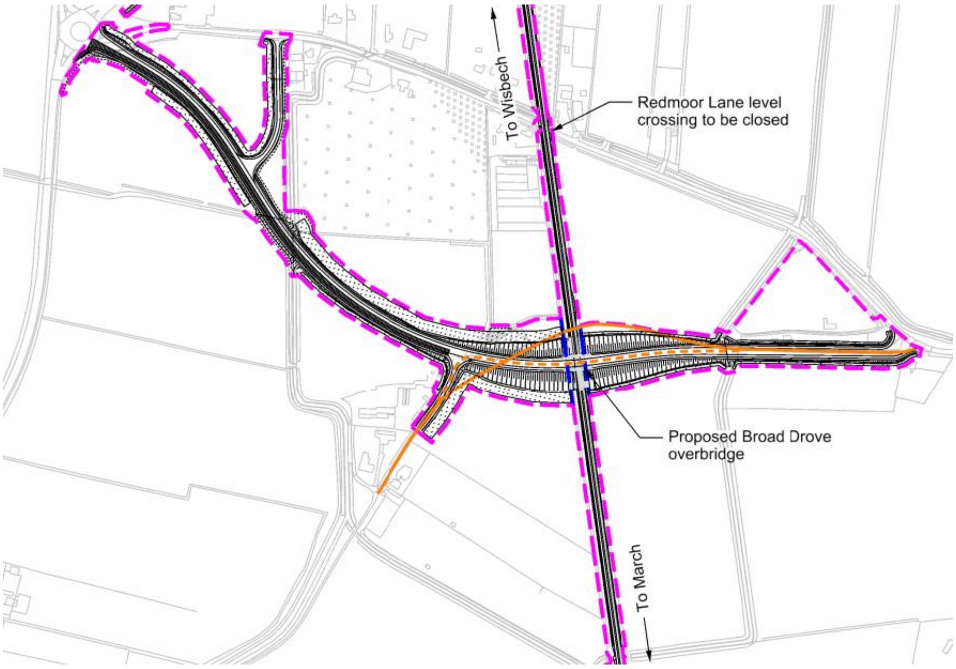
- A road alignment for Option C1, chosen at GRIP 2 stage, has been developed.

5.4.1.3 Scheme 3

Highways Scheme 3 is illustrated below.

Figure 5.18: Crooked Bank Overbridge

Figure 5.19: Broad Drove Overbridge



Details of the scheme are provided in drawings 398128-MMD-00XX-DR-H-0301 to 0302 and 398128-MMD-00XX-DR-H-0321 to 0324 (refer Table 8.3).

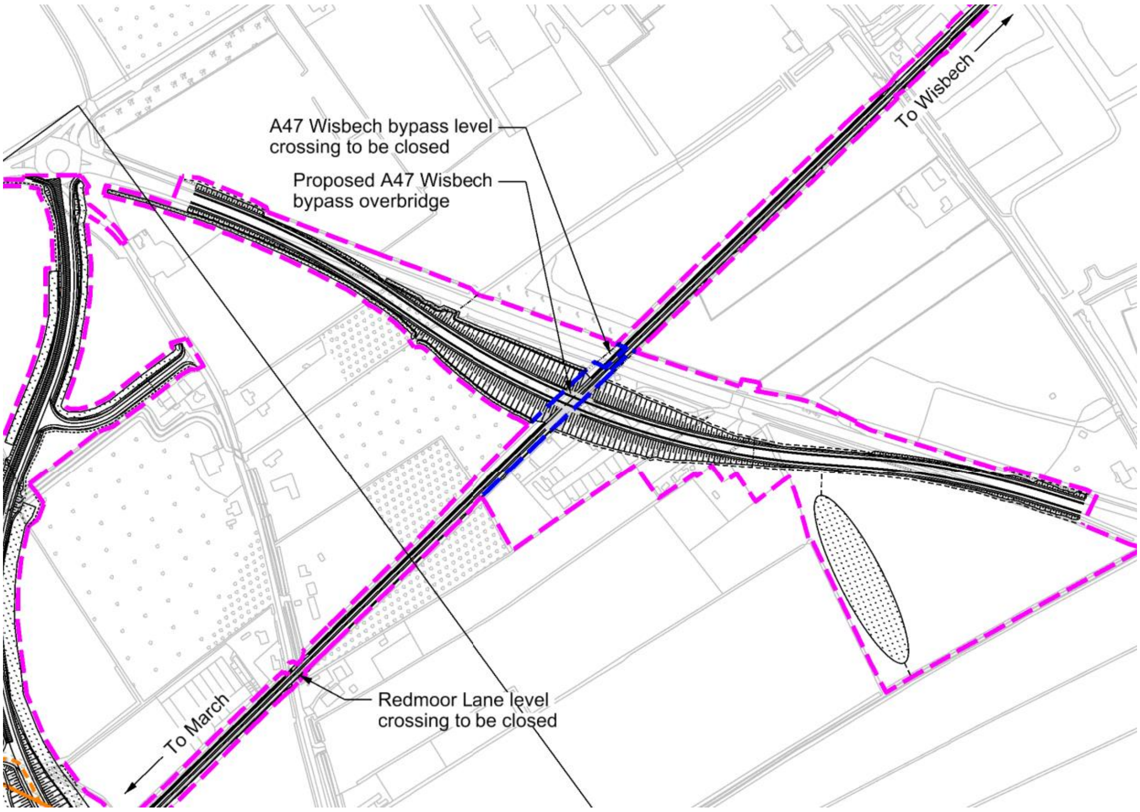
The following changes/developments from the GRIP 2 design have been made:

- The byway connection to Crooked Bank has been modified to incorporate a connection to a proposed cycleway running along the rail corridor between Waldersea level crossing and Crooked Bank level crossing, a diversion of National Cycle Route 63.
- A link between the proposed Broad Drove Road alignment and the section of Redmoor Lane to the north-west of Redmoor Lane level crossing has been added to the design, as no provision for access had been included in the GRIP 2 design.

5.4.1.4 Scheme 4 – Wisbech Bypass (A47)

Highways Scheme 4 is illustrated below.

Figure 5.20: A47 Wisbech Bypass Overbridge



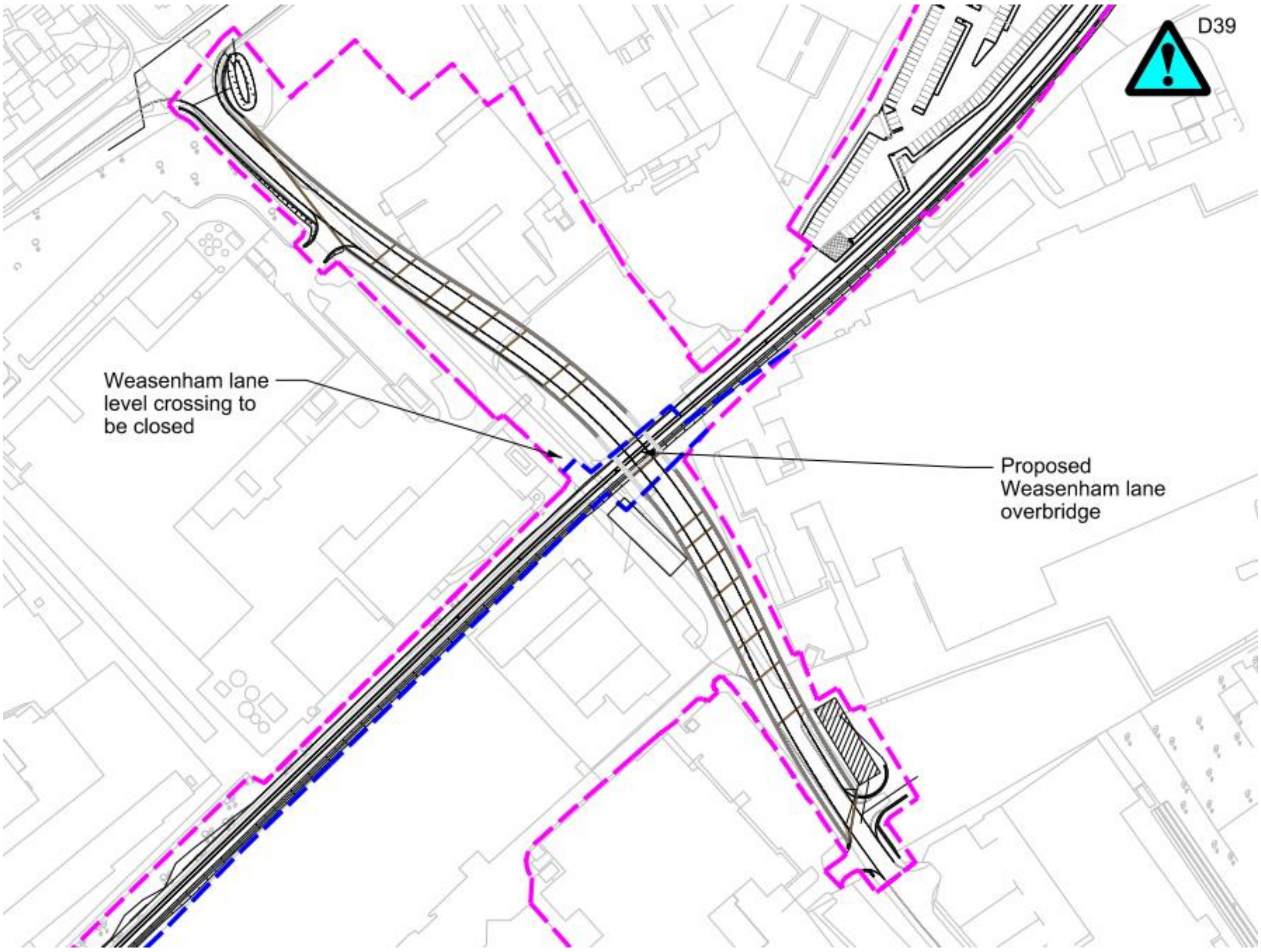
Details of the scheme are provided in drawings 398128-MMD-00XX-DR-H-0401 and 0402 (refer Table 6.3).

No design changes or developments have been made for Scheme 4 – Wisbech Bypass.

5.4.1.5 Scheme 5 – Weasenham Lane

Highways Scheme 5 is illustrated below.

Figure 5.21: Highways Scheme 5 - Weasenham Lane



Details of the scheme are provided on drawing 398128-MMD-00XX-DR-H-0501 (refer Table 6.3).

The following design changes/developments have been undertaken:

- The horizontal geometry has been modified slightly, to maintain as much distance between the bridge and adjacent industrial buildings as possible.

5.4.2 Optioneering

As per the scope to develop the highways designs directly from the GRIP 2 design provided by Network Rail, no optioneering has been undertaken at this stage of design.

5.5 Geotechnical

5.5.1 Design Development, Departures and Changes from GRIP 2

A Geotechnical and Geo-Environmental Desk Study has been carried out to support GRIP 3 design development. Information on ground conditions underlying proposed structures, embankments and stations is very limited. Where information is available it indicates the presence of a significant depth of soft cohesive deposits and peat. These ground conditions make construction of earthworks, retaining walls and foundation structures challenging. A series of developments to the GRIP 2 design have been proposed in order to limit settlements and provide stability to embankments and structures built on the soft compressible underlying soils.

5.5.1.1 Highway schemes - embankments

Highways embankment design was initially proposed to be Class 6N fill as defined in GRIP 2 however due to the anticipated ground conditions throughout the site and to reduce risk of embankment instability the design has been developed.

Highways embankment design has been updated to include the use of band drains, lightweight fill and Vibro Stone columns to reduce risk associated with poor ground. Embankments slopes must be 1 in 3 to provide the stability of the slope face. The final design solutions are presented in drawing ref. 398128-MMD-00-XX-DR-G-0001.

5.5.1.2 Grade Separations – Bridges

Due to poor ground conditions all overbridges will need to be piled to provide stability. Details of pile geometry and lengths are included within bridges drawings ref. 398128-MMD-00-XX-DR-S-1001 to 398128-MMD-00-XX-DR-S-9002.

To reduce the risk of settlement issues, reinforced earth retaining walls will be used throughout the scheme in place of standard concrete wingwalls. A typical detail of this design is included in drawing. 398128-MMD-00-XX-DR-S-1003.

5.5.1.3 Existing Railway Embankments

The 2015 GRIP 2 site walkover identified locations deemed to require potential embankment regrade to stabilise to the track formation. A review of the Network Rail Earthworks Inspection Reports for the line has been undertaken at GRIP 3, in conjunction with visual surveys. This has resulted in a rationalisation of the embankment locations requiring regrade works. Proposed locations requiring regrades have been updated and presented on drawing 398128-MMD-00-XX-DR-G-002. Where areas of embankment could not be inspected at GRIP 3 due to access restrictions or dense vegetation, regrade locations have been based on GRIP 2 observations and NR inspection records.

5.5.1.4 Stations – Wisbech Station

Piled platform foundations are due to anticipated poor ground. Platform foundation details are presented in drawing 398128-MMD-00-XX-DR-C-0001.

Ground conditions beneath the proposed station building have been assumed to provide a bearing resistance of at least 50kPa and hence strip footings have been proposed.

5.5.1.5 Stations – March Station Footbridge

Piled footbridge foundations are proposed due to unknown shallow ground conditions at the site of the footbridge. Pile geometries and lengths are presented in drawings 398128-MMD-00-XX-DR-S-1100 to 398128-MMD-00-XX-DR-S-1105.

5.5.2 Optioneering

5.5.2.1 Highway Embankments

Highway embankments have been developed from the standard 1:3 gradient 6N fill regrades proposed at GRIP 2. Due to the adverse ground conditions on the project (deep soft deposits are expected from March North) further measures were required to provide long term stability of the embankments and reduce settlement to appropriate limits. A number of solutions were explored, including; Band drains, basal reinforcement, lightweight fill and ground improvement techniques.

The preferred solution utilises a number of different techniques with the systems employed varying with requirements relating to increased loading and increasing embankment heights. The intention is to provide the best value for money solution at any given embankment height. As the height of the embankments increase the methods employed change from the use of band drains, to lightweight fill and Vibro Stone columns.

5.5.2.2 Retaining Structures

The wing walls for the grade separations have been changed from conventional reinforced concrete 'L' walls assumed at GRIP 2 to reinforced earth retaining structures. This change was driven by the poor ground conditions on site and the relatively high applied bearing pressures that would be generated below the base of an 'L' wall. It is expected that these pressures would be far in excess of the in situ bearing capacity of the natural soils for a large portion of the project. Reinforced earth faced walls resulting in lower bearing pressures at the base of the structures are expected to provide a more suitable retaining solution.

5.5.2.3 Track Drainage

The proposed location for track drainage conflicts with an existing noise bund located between Knorwood Junction Overbridge and the start of the March to Wisbech single line. Initial proposals including cutting this earthwork to provide adequate space for walkway and proposed ditch drainage. Due to poor ground conditions observed throughout the site it is anticipated that to ensure stability of slopes the cutting would have to be at 1:3. This would result in a large cut through the bund.

Discussions with drainage and track designers it was deemed more feasible to provide a retaining structure and to alter the track drainage system to pipe and catchpit. As per NR standards, NR/CIV/SD/SG/200 Selection Guide for Retaining Walls, a sheet pile solution has been selected due to the variation in retained heights which can be greater than 2m. Sheet piled wall location and typical detail sections are presented in drawing 398128-MMD-00-XX-DR-C-0003.

Track drainage moves to down side from chainage 138km + 800, cutting into an existing bund which separates the WIG line and MSG2 line which leads to Whitemoor Yard. The slope of cutting on this bund should be at 1:3 slopes.

5.6 Ancillary Civil/Stations Civil Engineering

5.6.1 Stations

The GRIP 3 designs for the new station at Wisbech and the upgrade works at March station have been informed by an assessment of station capacity and passenger flow. A pedestrian modelling report is provided in Appendix I.

5.6.2 Wisbech Station

There is no station currently at Wisbech station. The location for the proposed station is to the south of Wisbech town centre (Grid Ref. TF458090), near the Nestlé Purina factory. It is proposed to provide a single platform terminus station. Based on the Department for Transport

(DfT) Better Rail Stations report, 2009, the station can be categorised as a small staffed station, Category E and facilities for the station are proposed based on the guidance in this document.

5.6.2.1 Design Development, Departures and Changes from GRIP 2

Platform

The proposed platform will be of a Crosswall and Plank Type 2 construction. The platform will have a proposed operational length of 55m, with passive provision for a future extension up to circa 102m. The platform will be designed in accordance with Network Rail standard detail drawings NR/CIV/SD/3035 – 3048.

The platform will be of precast plank and crosswall construction. The Engineering blockwork crosswalls will be supported on piled foundations. End of platform stairs will be provided at both ends of the platform.

The platform will be circa 3.8m wide, the width is a function of clause 4.2.1.12 of the Persons of Reduced Mobility, Technical Specifications for Interoperability (PRM TSI), which stipulates the minimum width of the platform without obstacles shall be the width of the danger area (1.5m from coper edge) plus the width of two opposing freeways of 800mm (1600mm) to allow wheelchair users to alight from trains safely with a portable ramp and allow movement along the platform whilst trains are running. The minimum clear width shall be 3.1m.

Lighting columns on the platform will be as per the standard detail in NR/CIV/SD/3042 with root mounted columns in locally widened crosswalls. A similar detail will be used to incorporate CCTV columns and access chambers into the crosswalls, allowing access to cable routes which will pass beneath the platform in a multi-duct running at ground level on a mortar bed. Proposed cable routes will provide the appropriate spare capacity at scheme commissioning. Other lightweight furniture such as platform benches will be founded on top of the precast platform planks.

Passenger access to the platform will be via a ramped or stair access from the car park. The ramp is to have a maximum gradient of 1:20. Both the ramp and stairs will be a minimum of 2.2m wide between handrails, based on requirements from the pedestrian modelling report. The stairs shall have risers between 150 – 180mm and goings between 300 – 450mm. Both the ramps and stairs will be constructed of a series of precast U-section elements, infilled and surfaced to suit the proposed vertical alignment. Tactile paving will be provided at the top of the stairs as required by the DfT standards.

Ticket Office

The station building will act as both a ticket office and waiting shelter for passengers. Welfare facilities will also be provided for staff in the building along with a maintenance storage area. At this stage the building is proposed to be installed at car park level (not at platform level).

The building will be of a modular Macemain + Amsted construction with the layout to be confirmed at a later design stage, following discussions with the proposed maintainer/TOC.

The building will be to the rear of the platform at the northern end. If the ticket office is only open during peak hours, 2no. Ticket Vending Machines (TVM) will also be provided on the station concourse area, at car park level.

It is anticipated the building will be founded on shallow strip / pad foundations.

Details of service connections (power, potable water, foul water) will be confirmed by the relevant disciplines at the next design stage.

Car Parking, Access and Interchange

Circa 210 parking spaces including 13 (min. 6% requirement) blue badge bays for disabled users are proposed on the site of the industrial yard to the west of the proposed station. The proposed car park extends into the proposed rail corridor to optimise available spaces, whilst ensuring sufficient width is available for proposed rail infrastructure.

Bicycle storage facilities, a bus stop and a taxi/kiss and ride area have been provided immediately to the north of the proposed car park.

Due to the tight road geometry to the north of the station it is proposed to provide a new primary access point to the station via an area within the adjacent scrap yard/haulage depot. The existing road will be used only as a one-way road for buses exiting the car park.

5.6.2.2 Optioneering

Platform construction type

An option selection process was undertaken to determine the most suitable platform type for the station based on the constraints at the site. This included consideration of different Network Rail standard platform construction types including:

- Traditional front wall;
- Crosswall and Plank (Type 1 and 2);
- Modular steel;
- Modular FRP; and
- Modular EPS (Expanded Polystyrene).

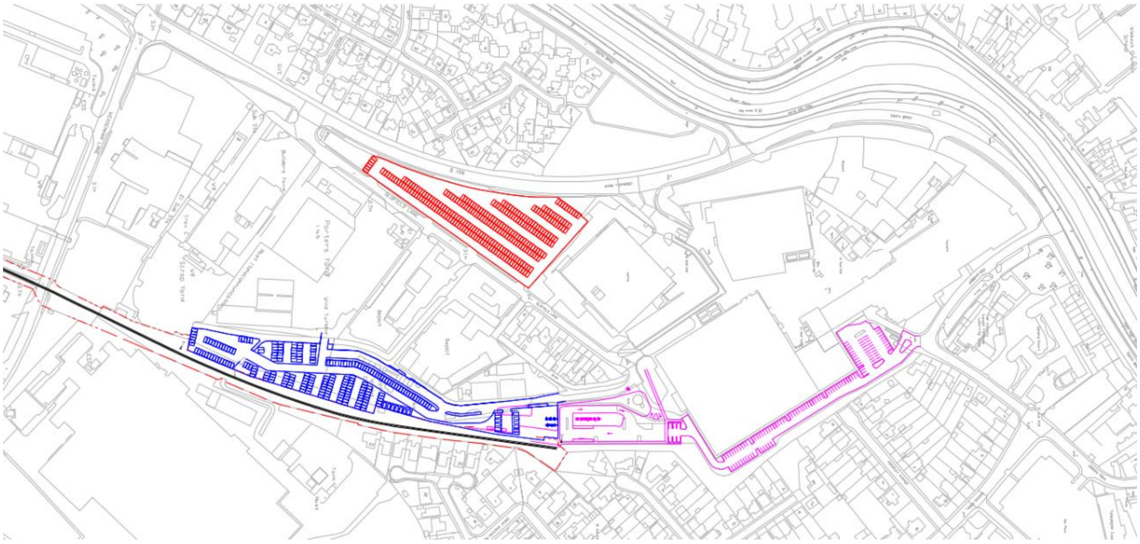
Based on relative constructability, cost and lifetime carbon of the typical construction types the Crosswall and Plank Type 2 construction was selected as the preferred method.

Car Park location

Various options were identified for the car park location. These options were presented and appraised via a telephone workshop with the client. The preferred site involves acquisition of an industrial yard adjacent to the proposed station. The land is directly adjacent to the proposed station and acquisition of the site is considered to be more feasible than the alternatives considered. However, it is noted that option selection for the carpark is subject to discussion/consultation with landowners

Refer to Figure 5.22 for considered car park options; The preferred option in the industrial yard is shown in blue, potential use of a nearby un-used field is shown in red, and the use of the adjacent factory car park is shown in Magenta (note: this was the option shown at the GRIP 2 stage).

Figure 5.22: Wisbech car park options[24]



5.6.3 March Station

March Station formerly had four through lines and two bay (terminus) lines, however only two of the through lines are now in use, which are the Up and Down Main Lines. There are four platforms at the station; platforms 2 and 3 are located on a double sided (island) platform to facilitate the bay lines, which have been in-filled. Platform 1 serves the Down Main and Platform 2 serves the Up Main, Platforms 3 and 4 are currently non-operational.

The preferred option is to re-open part of Platform 3 to the western end of the station (West of the existing station buildings) to provide an operational platform length of 55m, which will re-use the relatively straight section of existing platform. Passive provision has been made for future increases in operational platform length to approximately 110m. The historic track curvature and platform curvature adjacent to and east of the station buildings is quite severe and will not support compliant stepping distances so it is not proposed to reopen this section of the platform retaining the platform in its existing condition. Platform modifications may be required at the eastern end of the platform if site surveys suggest this area poses a hazard to the proposed line.

The current step free access to Platforms 2 and 3 at March station is via an at-grade footpath which crosses the currently disused track bed between platforms 3 and 4. Reinstatement of the track through Platform 3 will therefore sever the existing step free access. A new footbridge with lift shafts to provide step free access is proposed. The new footbridge will be located towards the west of the existing station buildings. The existing footbridge and associated approach steps at the east end of the station will be retained unmodified

[24] Final station location may be subject to change following consultation with landowners, business owners and other stakeholders.

5.6.3.1 Design Development, Departures and Changes from GRIP 2

Platform 3

The existing platform is of a traditional brickwork front wall construction and is typically in a poor condition. The end of the platform (circa 31m) appears to be a more recent extension in good condition with an oversail block detail.

It is proposed to rebuild the front wall of the original platform and provide new foundations in accordance with NR/CIV/SD/3010 to 3019 to match the extension. These platform modifications are only proposed in proximity to the new operational platform up to the point the track is aligned sufficiently clear of the platform to provide suitable lower sector gauge clearance for a 'maintainer recess'. Over the area of the platform extension the copers are to be realigned to match the Permanent Way designed coper string and achieve compliant gauging (to GI/RT/7073). The end of platform ramp will be demolished and replaced with end of platform stairs.

There appears to be no measurable recess or coper overhang on the existing platform which is non-compliant to RIS-7016-INS. This will be rectified by reconstructing the platform front wall and provision of the oversail blocks.

The platform will be resurfaced along the full length. As the majority of the platform forms an island with the disused bay platform, it is not desirable to generate a crossfall that falls across the full platform length. Therefore, falls from both coper edges shall be installed towards the centre of the platform, circa 4m to the rear of the platform 3 coper edge. The crossfall provided shall be 1:50 where possible (or between 1:80 and 1:40 if this is not attainable).

The back of platform fencing shall be positioned a minimum of 1m from the coper edge for the disused bay platform to avoid the foundations, as detailed in NR/CIV/SD/3012, clashing with the existing front wall of the disused bay platform.

Lighting and Telecoms equipment will be provided along the length of the platform along with platform benches and a passenger waiting shelter. Similar to Wisbech Station, all platform infrastructure will be located a minimum 3.1m from the platform edge to provide to meet the requirements of the TSI (PRM).

There is a single canopy bay to the west end of the station buildings within the proposed Platform 3 area. A structural inspection of the canopy is required at the next design stage with any remedial measures noted to confirm the safe continued use of the canopy.

A new duct route will be provided for all new services running through the platform. Any services within the disused platform are currently unknown. Prior to the next design stage, a buried services survey will be required to inform the location of any new services and foundations.

The walkway leading from the bowling club car park, to the north east of the station, will be demolished to allow for the through line at this platform. Access will still be provided from this side of the station via the proposed footbridge.

The proposed footbridge will land in the historic bay platform area between Platforms 2 and 3. This area has been previously filled without removing the bay platform copers and front wall, so the copers will be removed, and new surfacing provided to facilitate a trip free concourse area around the footbridge.

Platform 4

A localised length of the platform, circa 42m, is to be resurfaced to allow a walking route between the car park and the footbridge. Due to the poor condition of the front wall in this area this again shall be rebuilt however no copers or tactile surfacing shall be provided up to the platform edge. The area is to be fenced on all sides to prevent access to the remainder of the non-operational platform. Access gates will be provided at both ends of this fenced area to facilitate maintainer access to the remainder of the disused platform.

There is a station building to the rear of Platform 4. This is to be refurbished and opened up to allow access through between the platform and car park. The internal condition of the station building, is currently unknown however partial demolition would be required to allow pedestrian through access – this is to be inspected prior to the next design stage to inform any remedial / strengthening works necessary.

Platform 1

This platform is to be locally widened to the western end to allow for the proposed footbridge landing. This will involve relocating the existing fence line at the back of the platform and resurfacing some of the existing car park area. It is anticipated that circa 6 no. parking bays will be lost as a result of this. An Armco crash barrier is also proposed in the car park to reduce the chances of vehicles impacting on the proposed footbridge.

Platform 2

Minor works will be required to the eastern end of Platform 2 to allow relocation of an existing signal. This is expected to entail partial demolition of the end of platform ramp and provision of an end of platform fence. This is to be confirmed following a detailed topographical survey of the area, at the next design stage.

Car Park

In agreement with the client, the area to the north of March station is proposed to be converted into a new station car park to accommodate the expected increase in demand. Circa 220 parking spaces including 14 (min. 6% requirement) blue badge bays for disabled users are proposed.

5.6.3.2 Optioneering

An options review was conducted to establish the most appropriate location to position the operational platform and proposed footbridge. A new footbridge was proposed as modifying the existing footbridge to include lift shafts was prevented by a number of constraints such as:

- 2no. of the existing platforms would require extending;
- Modifications would be required to the existing historic bridge which could compromise the appearance of the existing structure;
- A non-compliant platform width would be available adjacent to the proposed lift shafts; and
- Limited space would be available for a Lift Machine Room.

Due to the curvature of the track beyond the station buildings it was agreed to reinstate the platform and provide the new footbridge towards the west of the station.

The footbridge landing on Platform 4 is shown such that it does not clash with the existing back of platform wall which forms a prominent historical feature at the station. There is an opportunity to refine the design in this area at the next design stage considering the following options:

- As shown in drawing 398128-MMD-00-XX-DR-C-0002; In order to prevent demolition of the platform wall and building the footbridge lands completely on Platform 4. A limited walkway circa 1.2m is provided around the footbridge to the lift entrance. This would require a derogation against the PRM TSI which requires an obstacle free width of 1.6m for unobstructed progress. Further survey is also required in relation to the position of the front wall to verify there is sufficient space for the proposed duct routes through the platform.
- Increase footbridge span; This would allow a minimum compliant walkway width of 1.6m and up to 2.5m to provide passive provision should the entire platform ever be re-opened. This would require partial demolition of the existing building and wall behind Platform 4 however it is believed the car park facing façade of the structure could be retained to provide a point of focus to guide passengers to the station entrance.
- Locally widen platform; In the area of the footbridge landing the platform could be locally widened to allow a compliant width. This would not result in a gauging issue to the proposed rail however this would preclude future reintroduction of an additional track serving Platform 4.

Agreement on this approach should be sought with local stakeholders prior to further development to ensure consent on potential demolition of parts of the historic platform.

5.6.4 Lineside Civils

Drawings 398128-MMD-00-XX-DR-C-0100 to 0115 detail the proposed lineside civil engineering assets between March and Wisbech. Additional civils infrastructure is required to facilitate signalling equipment to the east of March East Level Crossing, towards Ely. Drawings 398128-MMD-00-XX-DR-C-0120 and 0121 detail the proposed locations of these additional lineside assets.

5.6.4.1 Signal Structures and Signal Post Telephones (SPTs)

There are a total of 15no. new straight post signals, which will require new foundations along the route, including the relocation of signals around March station.

It is assumed new signal superstructures will comprise lightweight fold-down structures, which will be confirmed following a review of the vandalism risk on the route at the GRIP 4 design stage and to be agreed with NR / TOCs. The signal foundations shall be either reinforced concrete pad footings or steel pile foundations. The steel pile foundations shall be used if the topography of their surroundings makes the construction of the concrete pad footings unachievable or costly.

2 no. structures will be provided to the east of March station comprising twin track cantilever structures spanning circa 8.4m and 9.4m, both structures will have a minimum height of 7.6m to allow passive provision for electrification. A working space shall be provided behind each signal for maintenance purposes including a mesh surround. Piled foundations area proposed to support the structures between the Up Main line and the Up Goods (No.1) line.

All new signals capable of displaying a stop aspect will be provided with a signal post telephone. SPTs will be mounted on proprietary posts mounted on proprietary precast concrete foundations in front of the signal. No SPT will be provided for the signal ME3 due to limited clearance.

SPT walkways shall be provided where required and as recommended by the Signal Sighting Committee (SSC). The walkway is typically 8m long on approach to the SPT and 500mm wide. Walkway construction details will be like the safe cess walkway construction (ref.

NR/CIV/SD/670 to 673), but with a colour contrasting surface finish. The walkway will be aligned at a level between sleeper and rail level.

5.6.4.2 Speed Signs

There are a total of 8 proposed speed signs along the route, as required by the Signalling discipline. The foundations for the speed signs are likely to be root mounted in mass concrete foundations.

5.6.4.3 Location (LOC) Cabinets and Functional Supply Points (FSP)

There are 15no. proposed LOC suites along the route and 7no. LOC suites to be removed and relocated. The foundations are to consist of proprietary pre-cast concrete products assembled on site to support standard apparatus cabinets. Locations cases will be designed in accordance with Network Rail standard drawing NR/CIV/SD/665, which also provides details for the surrounding maintenance hardstanding areas

FSPs are proposed at all LOC suites along the route between March and Wisbech. 3no. LOCs are proposed for the section of line beyond March East Level Crossing, towards Ely. The FSP foundation is similar to the LOC foundation

If the local topography is in cutting or embankment the Location Case cabinets may be mounted on steel staging platforms or cess support / toe of cutting slope retaining structures may be provided to provide standing areas around the cabinets. This will be confirmed following receipt of a topographical survey at the next design stage.

5.6.4.4 Relocatable Equipment Buildings (REB) / Principle Supply Points (PSP)

A REB is to be provided at chainage 143.675km to house signalling and power equipment for the Coldham passing loop. The REB foundation will be designed in accordance with the Network Rail standard drawing NR/CIV/SD/620 and will be located within its own fenced compound with access provided from the proposed Station Road access point. The size of the REB will be confirmed by the Signalling discipline at the next design stage.

The REB foundation will comprise a reinforced concrete slab with cable trough route along each ‘long’ edge of the REB. The REB compound fencing will comprise min. 1.8m high palisade fencing with a min. 2.75m wide clear opening double leaf gate. The REB compound will be located to maximise clearances to the running edge

PSPs are required at circa chainage 150.060km (Wisbech) and 138.341 (March), each of these shall be constructed to the principles in NR/CIV/SD/620. The size of buildings, requirement for a temporary generator slab, compound fencing (typically 3.0m high) and proposed cable routing requirements will be confirmed by the E&P discipline at a later design stage.

5.6.4.5 Distribution Network Operator (DNO) Equipment

4no. new DNO cubicles are to be provided, as part of the works, within the boundary fence at the following locations;

- March car park – Ch.138.300km
- Coldham access point – Ch.143.652km
- Wisbech car park – Ch.150.077km
- Wisbech station – Ch.150.376km

The DNO cubicles will be standard modular prefabricated units, the dimensions of which will be confirmed by the suppliers at the detailed design stage. The foundations will be in-situ reinforced concrete bases and will include cable ducts with minimum bending radii to suit cabling. DNO cubicles are typically located within the NR boundary to facilitate access for the DNO, which will necessitate modification to existing fencing. Hardstanding areas will be required adjacent to cubicle doors and vehicular collision bollards are commonly required where cubicles are located adjacent to trafficked areas.

5.6.4.6 Cable Route

Cable containment is required for proposed electrical and signalling equipment cables adjacent to the track along the length of the project between March and Wisbech. At this stage, surface mounted C.1.10 size cable trough (ID 250mm x 130mm) is proposed to be routed in one cess, typically adjacent to the safe cess walkway and within the opposite cess to the track drainage ditch. The cable route will be located min. 1980mm from the running edge where space permits and will be no closer than 1250mm where constrained. The size of the cable route is subject to change pending finalisation of the cable capacity required. A min. 25% spare capacity will be provided for future cabling.

At local pinch points in the cess the cable trough may form part of the safe cess walkway, with ‘combined walkable trough route’ installed. There may be locations at existing bridge / culvert locations where the available cess width will not accommodate the C.1.10 trough. At these locations trough route will be replaced by cable tray fixed to the structure parapets, subject to achieving lower structure gauge clearances.

At track and road crossing points under track crossings / under road crossings will be provided.

Beyond March East Level Crossing, there is an existing cable route adjacent to the Up Main/Up Goods Line that, it is assumed, can be adopted for any additional cable routes required. This is to be confirmed following site surveys at the following design stage. A short section of new trough will be required between circa 136.275km and 136.762km. A C1-9 cable trough at ground level is proposed between these locations.

5.6.4.7 Cess Walkway

All safe cess and access designs shall be in accordance with Network Rail standard NR/SP/OHS/069.

A new 700mm wide safe cess walkway is proposed for the length of the line between March and Wisbech stations to provide sufficient and safe maintenance access. The safe cess walkway will run parallel to the track and shall have a minimum clearance of 1300mm from the nearest running edge, subject to track curvature and cant. To facilitate track ballast maintenance the minimum clearances may be increased to 1500mm by agreement with NR. Where the width of the cess is suitable, the clearance to the walkway may be increased to 3000mm to avoid users being located ‘on or near the line’.

No additional safe cess walkways are proposed beyond March East level crossing, towards Ely, on the existing main lines. It is proposed the existing Network Rail maintenance strategy (access routes) is retained and no additional walkway is provided in this area.

Where the safe cess walkway cannot be installed due to spatial restrictions (i.e. across or under bridges, limited land, etc.) either a continuous position of safety (CPOS), refuges and / or warning signage are to be installed in accordance with NR/SP/OHS/069. Pinch points and associated signage will be confirmed at a later design stage following receipt of the topographical survey.

The walkway typically comprises a stone compacted fill over a weed suppressing geotextile edged by a timber / concrete edging.

5.6.4.8 Boundary Fencing and Access Points

A boundary risk assessment has been undertaken to determine the requirements of the proposed boundaries along the route. At this stage, new boundary fencing is proposed along the entire route between March and Wisbech assuming the existing is not fit for purpose and dilapidated. New boundary fencing will comprise either post and wire or chain link in accordance with the relevant part of BS 1722. The boundary assessment report also considers the position of authorised access points along the proposed route. Refer to Appendix H for further information.

For the section of line beyond March East Level Crossing, towards Ely, it is assumed the fencing is suitable and is in a good condition as this section of the rail corridor is operational. Additional fencing in this area is not proposed as part of the scope.

5.6.4.9 Under Track Crossings (UTX) / Under Road Crossings (URX)

7no. new UTXs are proposed along the route at the following approximate locations;

- Ch. 137.594km
- Ch. 137.725km
- Ch.138.164km
- Ch.138.164km
- Ch.140.683km
- Ch.143.654km
- Ch.148.996km

1no. UTX is to be extended at circa ch.138.538km. 1no. UTX is to be removed at circa ch.138.211km. Details on the design and installation requirements of the new UTXs will be provided in Form F003 (GRIP 5) and designed and constructed in accordance with the standard NR NR/CIV/SD/610.

2no. new URXs are proposed adjacent to the PSPs at circa 138.310km and 150.069km near to the stations to allow vehicle access past the PSPs. 1 no. new URX is proposed at circa 136.565km to allow the proposed cable route to continue beyond Silt Road level crossing.

Cable management sleepers are also proposed to provide cables from LOCs to the proposed signal gantries on the main line.

5.6.4.10 Points Heating Control Cubicle (PHCC)

There are 4 no. proposed PHCC for the route as proposed by the E&P discipline at the following locations;

- Ch.138.103km
- Ch.138.713km

- Ch.143.846km
- Ch.144.384km

The DNO cubicles will be standard modular prefabricated units, the dimensions of which will be confirmed by the suppliers at the detailed design stage. The foundations will be in-situ reinforced concrete bases and will include cable ducts / trough route connecting with the lineside trough route. Hardstanding areas will be required adjacent to cubicle doors, which are typically located on the boundary side of the cubicle.

5.7 Bridges & Civil Structures

5.7.1 Design Development, Departures and Changes from GRIP 2

5.7.1.1 Grade Separations

As recommended in Network Rail's GRIP 2 Level Crossing Closure Feasibility Study (Reference 6 in Table 2.1) there are six road over rail bridges proposed to facilitate closures of existing level crossings.

The road over rail bridges are:

- Elm Road Bridge – Highways Scheme 1 (Drawings 398128-MMD-00-XX-DR-S-8001 to 8003)
- Coldham Bridge – Highways Scheme 2 (Drawings 398128-MMD-00-XX-DR-S-7001 to 7003)
- Holly Bank/Crooked Bank – Highways Scheme 3 (Drawings 398128-MMD-00-XX-DR-S-4001 to 3003)
- Broad Drove – Highways Scheme 3 (Drawings 398128-MMD-00-XX-DR-S-3001 to 3003)
- Wisbech Bypass (A47) – Highways Scheme 4 (Drawings 398128-MMD-00-XX-DR-S-2001 to 2003)
- Weasenham Lane – Highways Scheme 5 (Drawings 398128-MMD-00-XX-DR-S-1001 to 1003)

The locations and spans of each road over rail bridge are approximately as in Network Rail's GRIP 2 proposals, with 9.5m clear spans (measured perpendicular to the railway). Skew angles for the bridges range from zero to approximately 28˚ and are shown on the design drawings for each bridge.

The bridges comprise of single span reinforced concrete boxes supported on bored concrete piled foundations. Reinforced earth wingwalls will be provided parallel to the track in order to retain the new highway embankments.

Network Rail policy is to provide passive provision for overhead electrification of non-electrified lines and for this reason a bridge soffit height of 4780mm is proposed for each the road over rail bridges.

Typically, the approach ramps to the bridges are constructed on embankments with 1:3 batter slopes. The footprint of the associated embankments increases from approximately 15m wide at grade to 50m wide at the top of the ramps. At Weasenham Lane bridge, spatial constraints of the site mean that constructing the approach ramps on embankments is not feasible. Therefore, the approach ramps are constructed with reinforced earth retaining walls.

A road over river bridge at Twenty Foot River is also required as part of Highways Scheme 1 and comprises a single span integral prestressed concrete bridge supported on bored concrete piled foundations. Drawings 398128-MMD-00-XX-DR-S-9001 to 9003 provide further details of the proposed structure.

5.7.1.2 March Station Footbridge

In order to maintain step free access to all platforms at March Station following, a new footbridge with lift shafts is required.

The new footbridge, including lifts will be provided to the west of the existing bridge. The bridge superstructure will be a 2 span Vierendeel truss. Lift shafts and access stairs will be of steel frames construction. The bridge will be supported on piled foundations at Platform 1, Platforms 2/3 and Platform 4.

5.7.1.3 Existing Underbridges

It was recommended at GRIP 2 that a detailed inspection and assessment including investigation work be carried out to the four existing under bridges to inform GRIP 3 stage. A preliminary assessment was carried out based on a recent Mott MacDonald site inspection supplemented by the previous detailed and visual examinations (Refer to Appendix M for details). Based on this assessment, the following works are required:

Chain Bridge

- Rebuilding high mileage abutment with new reinforced concrete wall and piled foundation to address settlement issues.
- Reconstruction of high mileage abutment involves demolishing of the existing substructure and installing temporary supports during the works.
- Replacement of bearings.
- Re-decking to replace the existing timber deck.
- Modification of existing handrails.

Mulbary Drain, Waldersea Drain and Redmoor Drain

- Local repairs to metal girders and decking
- Repairs to masonry abutments, including heavy stitching of cracks.
- Replacement of bearings.
- Modification of existing handrails.

5.7.2 Optioneering

5.7.2.1 Grade Separations

The spans for the grade separation bridges are small based on a single track and a minimum 2.5 m lateral clearance and walkway access to the continuous abutment walls.

The choice of a reinforced concrete box with the bottom slab supporting the track and the top slab supporting the highway is considered the most economical option for the span.

The earthworks local to the bridges will be retained by reinforced earth wing walls parallel to the track. This is considered a more suitable option than adjusting the earthworks local to the bridge due to the skew of several of the bridges.

5.7.2.2 Twenty Foot River Bridge

The river crossing span has been determined based on the proposed highway alignment and lidar survey information.

The existing disused underline Chain Bridge and the existing highway bridge at Elm road are 2 span structures with a pier in the river. The proposed highway bridge is a single span avoiding the need for a pier in the river and future problems with scour. The water level is not known as there is no detailed topographic survey information or flood data at this stage and hence the deck level is set, conservatively, at approximately 5m clearance over the top of bank level. With more detailed information there may be scope to significantly reduce the height of the abutments and earthworks to match clearance to the adjacent rail over river, Chain Bridge.

5.7.2.3 March Station Footbridge

Two options were considered to meet the requirement for step free access at March Station:

1. Modification of the existing historic footbridge to accommodate new lift shafts
2. Provision of a new footbridge with associated lift shafts.

Although new lifts could potentially be installed and connected to the existing footbridge. An assessment concluded that it is unlikely to be a cost-effective option due to the extensive structural modifications required to the existing footbridge and the potential requirement for alterations of the adjacent station building. The following associated issues were identified:

- The steps at the haunch sections of the existing footbridge presents a challenge to incorporating the new lifts.
- The extent of modifications would significantly affect the appearance of the footbridge.
- The existing footbridge would require significant temporary works to support the spans during the modification, these temporary works could cause disruption to the passengers and the operation of the railway station.

The preferred option is to construct a new footbridge and lift shafts at the west end of Platform 1. It is considered that construction of a new bridge in this location would be less disruptive to passengers than modification of the existing bridge. A new purpose-built structure could also be installed more quickly and in a more cost-effective manner.

5.8 Drainage and Flood Risk

5.8.1 Design Development, Departures and Changes from GRIP 2

5.8.1.1 Track Drainage

The proposed track alignment is predominantly constructed on a small embankment and is higher than the surrounding ground levels by approximately 0.5 to 3 metres. Track drainage provisions at GRIP 2 included a continuous 225ø collector pipe system and catchpits every 30m, discharging into existing outfalls, with no proposed attenuation. During the GRIP 3 stage, the drainage proposals have been revised. The proposed track drainage arrangements are described below and illustrated in drawings 398128-MMD-00-XX-DR-D-1001 to 398128-MMD-00-XX-DR-D-1012.

The drainage collection system along the railway corridor will predominantly comprise ditches located to one side of the track. The proposed ditch position will vary (from one side of the track to the other) depending on the location of the proposed maintenance access path, with piped sections proposed for continuity of the ditches at the overbridge and access point locations. Where an existing track drainage ditch is present and clashes with the proposed ditch it will be preferable to retain and utilise the existing ditch to convey additional design flows from the track area.

Multiple outfalls are proposed along the railway corridor based on the individual catchments identified as part of the drainage design. These outfalls connect to existing culverts via control chambers that outfall to river connections and local Middle Level Commissioners Internal Drainage Boards (IDB) drains. Headwalls are used to transition the ditches to pipe connections at the downstream control chambers with fitted orifices plates down to a minimum diameter of 75mm to control flows. Hydro-brake controlled devices have been proposed for catchments with discharge flow rates impractical for an orifice plate.

The Middle Level Commissioners IDB require the discharged flows not to exceed the estimated existing peak runoff at the respective outfall locations and attenuation of surface water runoff within the site. Due to the site topography, much of the surface runoff, if not intercepted, would impact third party lands generating increased flood risk to adjacent properties. The pipe and ditch sizes have been determined based on a 1 in 100-year return period rainfall event plus 40% climate change allowance. This will apply to all areas within the railway corridor regardless of whether the existing area falls away or into the railway corridor. At this stage of the design, a worse case analysis has been carried out to give the approximate maximum attenuation volumes for each catchment area.

At the Coldham Passing Loop, two separate ditches are proposed, one on either side of the track to convey the surface water runoff with two individual connections to the same existing culvert. This section includes the additional width and surface runoff of the cycle path alignment located adjacent to the track.

It is proposed for the Wisbech station platform surface to drain away from the edge towards a drainage channel at the back of platform and discharge into a separate drainage system to the track drainage. A similar arrangement is proposed for the March station platform 3 and assumed that an existing drainage system is present serving the existing station platforms.

Wisbech Station

The drainage system for the track will be collected using a pipe and catchpit system located along the eastern side of the track. The track formation will have a single cross fall directing the surface water runoff towards the drainage network. Due to the narrow railway boundary, this network crosses to the western side of the track approximately 295m south of the platform via an under track crossing (UTX) where it discharges to an existing culvert that outfalls to an IDB drain. Prior to the outfall a control chamber fitted with a hydro brake flow control device will limit the discharge rate to 5 l/s. All flows exceeding 5l/s will back up into a 218m³ capacity attenuation ditch 125m long immediately upstream of the control chamber.

March Station

The drainage system on the approach to the March station from 138.553km will be collected using a pipe and catchpit system located along either side of the track up to 138.420km. Track drainage on the eastern side is located underneath the proposed cess walkaway with a minimum cover set 0.9m above the pipe soffit. Through the platform area the pipe and catchpits are located along the eastern side only. For Option 2A, only one pipe and catchpit system would be required provided a single crossfall of the rail formation.

The drainage networks are combined at a control chamber positioned in the middle of both tracks via two separate UTXs. The discharge from this large catchment will be regulated by an orifice plate fitted in a control chamber to limit the flow to 48.6l/s. All flows exceeding this flow will back up into a 450m³ capacity attenuation tank.

The attenuation design consists of an underground tank designed to store runoff from approximately 1.46ha made up of mostly ballasted track area and green area. Located to the east of the track near the low point of the track alignment at 138.420km, the tank has been designed as an offline storage feature to attenuate all flows up to a 1 in 100-year storm event plus 40% climate change. From the attenuation tank, the water will outfall back out through the lower level UTX and into the existing catchpit approximately 50m away via a 300mm diameter pipe. Flap valves are fitted to the high level pipes in the chambers upstream of the attenuation tank to prevent water surcharging the upstream drainage network in critical rainfall.

5.8.1.2 Car Park and Station Drainage

No drainage provisions for car parks and stations were included in the GRIP 2 design.

Wisbech

The proposed development site is located south of the Nestlé Purina factory, immediately adjacent to the disused railway corridor. The existing northern access to the proposed development site appears to be made up of a granular unbound material. The main area appears to be made up of concrete pavement, the condition of which is unknown. No existing private or council drainage records were available during the design. IDB records identified the presence ditches only. Details on water levels, sizes of channels and culverts were not included.

The proposed drainage strategy aims to mitigate the rate of runoff from the new impermeable areas and thus flood risk of the proposed development. This includes the platform, external car park and access points. During GRIP 3 these elements of design have been progressed allowing for an initial drainage strategy to be produced.

It is proposed that the main car park area shall be permeable block paving. The road link to the North shall be drained via combined kerb drainage and outfall into permeable sub-base which extends north outside the extent of permeable block paving, as shown on drawing 398128-MMD-00-XX-DR-D-0010. The station platform, external hardstanding and disabled car parking shall be drained, via linear drainage, and outfall into the permeable sub-base.

The junction widening to the North of the site has been omitted from the scope of design. It is assumed this increase in area (approx. 110m²) will be incorporated within the existing drainage system. This is subject to review at the next stage following a CCTV drainage survey of the site.

The connector road to the West of the site shall be drained via combined kerb drainage and outfall into permeable sub-base. Levels indicated by the LiDAR date suggest that a traditional piped system will be too deep to make a gravity connection to the IDB drainage assets in this area.

Due to site constraints, infiltration is not suitable for this development. With reference to the SuDS hierarchy, the next preferred option is to discharge at a controlled rate into a watercourse. Whilst the majority of the site is located on existing hardstanding it is proposed that the off-site discharge rate shall aim to reflect greenfield run-off rates as closely as practicable. This will provide a betterment to the receiving watercourse assuming a free discharge into the same IDB watercourse is approved.

Any off-site outfalls are subject to agreement with the IDB.

The proposed primary outfall serves the permeable block paving system in the car park and discharges to the existing IDB watercourse located to the South-West of the car park, as shown on drawing 398128-MMD-00-XX-DR-D-0010. Due to the size of the site, the greenfield run-off rate is below that was is deemed achievable without creating a blockage risk at the flow control device. Therefore, a flow control chamber and device is proposed (vortex flow control or similar) set at 2.0l/s into the watercourse, this will provide a slightly larger orifice diameter and a means to collect and control debris in the flow, it should also be noted that after percolation through the permeable sub-base system the largest feasibly particle size should be limited.

To accommodate this off-site flow restriction, attenuation will be provided within the permeable sub-base. The estimated required storage volume is 950m³ for the 1 in 100-year +40% climate change event. This has been shown to fit within the 520mm deep sub-base required for a 2% CBR as stated within the Cambridgeshire County Council standard detail.

Due to indicative ground levels and required crossing of an existing culvert, a secondary outfall is required to the West to accommodate drainage the connector road as shown on drawing 398128-MMD-00-XX-DR-D-0010. Taking into account levels and keeping within the proposed road channels, a similar permeable sub-base type system is proposed with a minimum depth of 350mm providing 33m³ of storage. This system will be suitably shallow to provide a gravity connection to the IDB drain and through percolation will provide water quality improvements to the runoff from the access road.

The proposed outfall discharge rate has been restricted based on the available storage within the 350mm sub-base, providing a 50% betterment to the existing run-off from the area. This is calculated as 6.9l/s. There is opportunity for this to be reviewed at the next stage to accommodate a flow restriction of 2l/s when a levels strategy is confirmed. As noted above, any off-site outfalls are subject to agreement with the IDB.

March

As part of the scheme, a new car park and road access is proposed in addition to re-opening and widening of the platform. The proposed drainage strategy has been developed in lieu of existing drainage records or survey information of station and surrounding hardstanding areas.

It is proposed that the new section of widened platform will be drained via a new linear drainage channel and discharge into the new car park.

The car park will drain via permeable block paving and discharge into the IDB ditch to the north of the site as shown on drawing 398128-MMD-00-XX-DR-D-0020. A flow control chamber (vortex flow control or similar) is proposed prior to the outfall providing a flow restriction of 2l/s. This is deemed to be the minimum practicable flow restriction without causing a blockage risk.

The existing drainage to the east shall be modified to discharge into the proposed permeable paving. The modifications shall be determined at the next stage following a topographical and drainage survey.

5.8.1.3 Highways

No drainage provisions for highways were included in the GRIP 2 design.

Refer to drawings 398128-MMD-00-XX-DR-D-0101 to 0501.

During the GRIP 2 and 3 stages, existing level crossings were identified along the historic track for removal and to be and replaced with strategic grade separated road crossings and road links. Typically, the existing highway drainage strategy is indicated to comprise surface water running over the edge into ditches. Kerb outlets and gullies are located where footpaths are present with direct discharges into adjacent ditches. These ditches are connected to the IDB network with no apparent flow restriction.

The proposed drainage strategy aims to maximise the use of SuDS by replicating the over the edge drainage, and utilising drainage swales and basins. Due to site constraints, infiltration is not suitable for the proposed highway works.

At this stage, the proposed drainage is designed to function separately to the IDB network, with a flow control device (orifice plate or flow chamber) set to the lowest practicable flow restriction whilst avoiding the risk of blockages. This was assumed to be a 60mm diameter orifice plate and vortex flow control (or similar device) @ 2l/s. Attenuation storage, as noted on the drawings, are sized to accommodate a 1 in 100 year storm + 40% climate change. Due to the density of IDB ditches across the proposed highway works this has led the 'breaking up' to an increase in the number of outfall and flow control devices.

For the main carriageway water quality is deemed to be low risk and therefore will be managed by over the edge drainage and un-lined swales to treat small hydro-carbon and heavy metal pollutants. At junctions and Elm Road roundabout it's proposed to provide impermeable lining beneath the ditches and basins to provide treatment prior to the outfall and avoid infiltration. As part of the next stage the extent of liner will be calculated to provide a treatment volume in line with CIRIA C753 SuDS Manual.

Granular check dams will be provided within the ditches to help reduce the risk of blockages at the flow control devices, these features will be detailed at the next stage. Currently an assumption has been made regarding the details at the outfalls. This includes a pre-cast headwall into the IDB ditch with a flap valve device to prevent backwater flow in extreme rainfall events and allow the IDB water level to be managed separately when above the proposed outfall level. For smaller attenuation features (typically swales) an orifice plate will be attached to a downstream pre-cast headwall, connecting to the outfall headwall via a short 150ø pipe. For larger attenuation features (basins/large swales) a flow control chamber will be provided with a vortex flow control device (or similar) installed on the downstream end, flowing into the outfall headwall.

As part of the next design stage, the location and size of proposed culverts shall be assessed. This will be carried out after a drainage and topographical survey is undertaken to determine existing flows and falls around the proposed highway. Proposed culverts within the proposed highway embankment will need to be sized based on a hydraulic assessment of the existing catchment.

Weasenham Lane is the only proposed urban highway. The proposed drainage strategy consists of a combined kerb drainage collection system either side of the carriageway draining the road and footway. Proposed drainage on the West side of the bridge will flow to a basin located within an existing soft landscaped area adjacent to the road. Proposed drainage on the East side will flow into geo-cellular storage adjacent to the proposed road. Both attenuation features will have a flow control chamber with a vortex flow control device (or similar). The proposed outfalls will discharge into either Highway Drainage or Anglian Water surface water drainage systems, subject to drainage survey at the next stage.

5.8.2 Optioneering

5.8.2.1 Track Drainage

The proposed track drainage system at the March Station will outfall via an existing NR catchpit located near Ch.138.365km. Subject to a survey of the existing track drainage network, if the proposed outfall connection levels are unfeasible, the attenuation storage volume could be provided using a small pond as an alternative approach . The pond should be in a substantially flat area to reduce the extent of earthworks and excavation required and ease maintenance.

A potential alternative outfall has been identified to the IDB drain approximately 80m away. Subject to further survey of the IDB drains, this outfall would require a control chamber and headwall with a fitted flap valve.

5.8.2.2 Wisbech Station and Car park

Optioneering of the drainage strategy has been limited at this stage due to the lack survey information, limited stakeholder engagement and constraints of the proposed layout. Design assumptions made have driven the design strategy.

An alternative option involves reviewing the proposed layout and incorporating more soft landscaping. This would allow for SuDS features such as tree pits, rain gardens and bioretention features.

5.8.2.3 Highways

Optioneering of the drainage strategy has been limited at this stage due to the lack survey information and limited stakeholder engagement.

An alternative strategy to minimise the number of outfalls, flow control devices and headwalls would be removing segregation from the IDB ditches. This would need to be in agreement with the IDB. This would involve reviewing the proposed project at a catchment wide level and providing an agreed volume of storage within the IDB system.

5.9 Electrical and Plant

5.9.1 Signalling Power

This section summarises three viable signalling power options to support the preferred signalling and permanent way options; reference should be made to general arrangement drawing (398128-MMD-00-XX-DR-E-0001) in support of each proposed option. A preferred option that economically delivers the stakeholders requirements has been selected for further development at GRIP4, Approval in Principle (AiP). Options EP1 and EP3 assume that the line is critical and therefore requires system back-up supplies; it is currently envisaged the UPS autonomy of one to two hours will be sufficient. The criticality will be determined by the client and confirmed by Network Rail at a later GRIP stage. This may affect the requirement for the provision of back-up supplies and/or the required length of autonomy.

5.9.2 Option EP1 - Manual Reconfigurable, Dual End Fed Signalling Power Supply

5.9.2.1 Coldham Principal Supply Point

The proposed signalling REB at Coldham Loop shall be utilised to house a Principal Supply Point (PSP) for both the north and south signalling feeders. The REB shall comprise of two rooms, segregating the Electrical and Plant and Signalling assets. As the proposed rail corridor is short and comprises of mainly a single bi-directional line the signalling load requirements shall not necessitate a large standalone PSP installation. As a result of the proposed multi-purpose REB, the overall footprint of the proposed signalling REB is envisaged to be greater; however, a substantial saving in construction shall be realised due to the reduced Civils works associated with dedicated buildings.

A TP&N DNO supply shall be required at Coldham Station level crossing to supply the 400V busbar housed within the proposed PSP room of the REB. Due to the historic DNO supply at this location, it is understood that a DNO connection shall be feasible and not cost prohibitive to the project; an application for a DNO connection shall be made at GRIP4. The DNO cubicle shall be of GRP construction and comprise of two compartments namely: DNO side and Network Rail side. A separate domestic supply to the REB will also be derived from the DNO supply. The domestic supply will power air-conditioning, heaters, sockets and lighting etc.

The following pertinent E&P equipment shall be installed within the proposed PSP compartment:

- 400V Maintained Switchboard;
- 400V Essential Switchboard;
- UPS module, complete with segregated battery compartment;
- 400/650V signalling power transformers;
- Bender insulation monitor;
- Feeder Protection;
- An external generator connection point will be provided for maintainers in the case of a power outage.

A hard standing in a secure compound shall be installed adjacent to the PSP for the connection of a mobile generator. Additionally, there shall be a requirement for external lighting for access/egress and a luminaire located at the mobile generator connection point; all external lighting shall be timer controlled.

5.9.2.2 March DNO supply (UKPN Substation)

The existing March East DNO supply (UKPN Substation) is proposed to supply the PSP from a separate TP&N DNO cubicle located in the vicinity of the track entrance in the proposed March station car park. It is understood that a DNO connection shall be feasible and not cost prohibitive to the project; an application for a DNO connection shall be made at GRIP4. A separate domestic supply to the PSP will also be derived from the DNO supply. The domestic supply will power air-conditioning, heaters, sockets and lighting etc.

5.9.2.3 March Principal Supply Point

It is proposed to acquire a TP&N DNO supply from existing March DNO for the supply of a small Principal Supply Point (PSP). The domestic supply to the PSP will also be derived from the DNO: this would include heating/ventilation system, heater(s), socket(s) and lighting. Refer to Section 885.9.2.2 for details of the substation.

The proposed PSP will take the form of a small REB.

The following pertinent E&P equipment shall be installed within the proposed PSP:

- 400V Maintained Switchboard;
- 400V Essential Switchboard;
- UPS module, complete with segregated battery compartment;
- 400/650V signalling power transformers;
- Bender insulation monitor;
- Feeder Protection;

- An external generator connection point will be provided for maintainers in the case of a power outage.

A hard standing in a secure compound shall be installed adjacent to the PSP REB for the connection of a mobile generator. Additionally, there shall be requirement for external lighting for access/egress and a luminaire located at the mobile generator connection point; all external lighting shall be timer controlled.

The PSP is to be utilised as a secondary supply point for the March to Wisbech South Feeder in the case of a power outage from the principal supply point. The PSP shall also supply three FSPs, proposed as part of P-Way Option 4C; the FSPs shall be supplied from the PSP in an open-ring type arrangement.

5.9.2.4 650V Trackside Feeders

Emanating from each of the PSPs shall be one Class II radial feeder and one Class II open-ring feeder supplying a number of Class II Functional Supply Points (FSPs). The feeders shall be dual end fed with manual reconfiguration; normal open points of each feeder shall be located at easily accessible locations for maintenance and switching purposes. The final configuration shall be determined at GRIP5.

- The March to Wisbech North Feeder will comprise of an open-ring feeder supplied from the proposed Coldham PSP. The open-ring feeder will supply four FSPs between the PSP and Long Drove level crossing. The total approximate length of the open-ring feeder shall be 3.5km.
- The March to Wisbech South Feeder will comprise of a radial feeder supplied from both the proposed Coldham PSP and March PSP. Existing signalling locations within the March west area shall be resupplied as part of these works from the proposed FSPs. The total approximate length of the feeder shall be 6km.
- The March East Feeder will comprise of an open-ring feeder supplied from the proposed March PSP. The open-ring feeder will supply three FSPs between the PSP and Horsemoor level crossing. The total approximate length of the open-ring feeder shall be 2.6km.

5.9.2.5 Wisbech DNO and PSP

A separate TP&N DNO supply shall be required at Wisbech station to supply the 400V busbar housed within the proposed PSP. It is proposed to locate the DNO cubicle in the proposed car park fence line. Connection shall be feasible and not cost prohibitive to the project; an application for a DNO connection shall be made at GRIP4. The DNO cubicle shall be of GRP construction and comprise of two compartments namely: DNO side and Network Rail side. A separate domestic supply to the PSP will also be derived from the DNO supply. The domestic supply will power air-conditioning, heaters, sockets and lighting etc.

The PSP shall be housed in a small REB or equivalent GRP housing and the following pertinent E&P equipment shall be installed within the proposed PSP:

- 400V Maintained Switchboard;
- 400V Essential Switchboard;
- UPS module, complete with segregated battery compartment;
- 400/650V signalling power transformer;
- Bender insulation monitor;
- Feeder Protection;

- An external generator connection point will be provided for maintainers in the case of a power outage.

A hard standing in a secure compound shall be installed adjacent to the PSP for the connection of a mobile generator. Additionally, there shall be a requirement for external lighting for access/egress and a luminaire located at the mobile generator connection point; all external lighting shall be timer controlled.

General arrangement drawing; 398128-MMD-00-XX-DR-E-0001 outlines Option EP1.

5.9.3 Option EP2 - Localised Signalling Power Supplies

5.9.3.1 Local Supply Point(s)

Multiple DNO supplies shall be utilised along the March to Wisbech rail corridor. The proposed DNO locations have been determined based on initial desktop surveys and should be investigated further at GRIP4; where DNO applications should be submitted. DNO locations have been proposed based on areas which a DNO connection is deemed to be feasible and not cost prohibitive to the project. The supply locations are namely: Coldham Station, Long Drove and Wisbech.

At Coldham Station and Long Drove location it would be proposed to acquire a TP&N DNO supply for the supply Functional Switch Rooms (FSR). The DNO cubicle shall be of GRP construction and comprise of two compartments namely: DNO side and Network Rail side. The domestic supply to the FSR's will also be derived from the local DNO: this would include heating/ventilation system, heater(s), socket(s) and lighting.

The proposed FSR's will take the form of a GRP cubicle.

The following pertinent E&P equipment shall be installed within the proposed FSRs:

- 400V Maintained Switchboard;
- 400/650V signalling power transformers;
- Bender insulation monitor;
- Feeder protection;
- An external generator connection point will be provided for maintainers in the case of a power outage.

A hard standing in a secure compound shall be installed adjacent to the FSR for the connection of a mobile generator. Additionally, there shall be requirement for external lighting for access/egress and a luminaire located at the mobile generator connection point; all external lighting shall be timer controlled.

At Wisbech it is proposed to acquire a SP&N DNO supply, like option EP1 this supply cubicle shall be located in the station car park fence line. The proposed DNO shall supply a single FSP, at the rear of Wisbech station, at 230V. The FSP shall comprise of class II switchgear and a 230/110V hybrid transformer.

5.9.3.2 650V Trackside Feeders

Trackside feeders will emanate from the localised FSR's: feeders will be Class II and will supply a number of Class II FSPs. Both feeders shall be single end fed and shall not incorporate any secondary supply arrangements.

- Coldham Station FSR - The proposed FSR should have 2No. radial feeders. The South Feeder will supply FSPs between Coldham Station level crossing and Elm Road. This feeder would be approximately 0.8km and it is proposed to supply approximately of 2No. FSPs. The North Feeder would supply a signalling REB located south west of the Coldham Down Loop with a cable length of approximately 50m.

- Long Drove FSR - The proposed radial Feeder would supply FSPs between Long Drove and Coldham Down Loop North Junction. This feeder would be approximately 1.2km and it is proposed to supply approximately of 4No. FSPs.
- Wisbech FSP - The proposed radial Feeder would supply an FSP located at Wisbech. This feeder would be approximately 350m and it is proposed to supply approximately of 1No. FSP.

The proposed FSP's south of Elm Road should be supplied from the modified signalling power arrangement to the north-west of March station.

5.9.4 March Area – Option EP2

5.9.4.1 Supply Point(s)

For the supply of the additional FSPs required it is proposed to acquire a TP&N DNO supply from the existing March East DNO for the supply of a Functional Switch Room (FSR). The domestic supply to the FSR will also be derived from the DNO: this would include heating/ventilation system, heater(s), socket(s) and lighting. Refer to Section 885.9.2.2 for details of this supply.

The proposed FSR's will take the form of a small REB or equivalent GRP housing.

The following pertinent E&P equipment shall be installed within the proposed FSRs:

- 400V Maintained Switchboard;
- 400/650V signalling power transformers;
- Bender insulation monitor;
- Feeder protection;
- An external generator connection point will be provided for maintainers in the case of a power outage.

A hard standing in a secure compound shall be installed adjacent to the FSR for the connection of a mobile generator. Additionally, there shall be a requirement for external lighting for access/egress and a luminaire located at the mobile generator connection point; all external lighting shall be timer controlled.

5.9.4.2 March Area Trackside Feeders

It is proposed to 'lift and shift' existing supply cables emanating from March East REB to re-supply the March Area junction LOCs namely; 86/04 (W), 00/06 (W) and 86/10 (W). It is proposed to have an FSP04 retro-fitted in each LOC for supply cable termination. It is understood, based on record drawings that the supply is 230V and is a relatively recent installation. The cable condition and LOC internals should be confirmed by trackside survey at a later GRIP stage.

Emanating from the proposed FSR shall be two new Class II radial feeders:

- The North Feeder will supply five Class II FSPs north from the FSR to Elm road level crossing. The total approximate length of the radial feeder shall be 1.5km. This feeder will be single end fed and shall not incorporate any secondary supply arrangements.

- The March East Feeder will supply three Class II FSPs east from the FSR to Horsemoor level crossing. The total approximate length of the radial feeder shall be 1.3km. This feeder will be single end fed and shall not incorporate any secondary supply arrangements.

General arrangement drawing; 398128-MMD-00-XX-DR-E-0001 outlines Option EP2 and March Area - Option EP2.

5.9.5 Option EP3 – Single End Fed Signalling Supply

5.9.5.1 Principal Supply Point

The main signalling supply shall be derived from a PSP at Coldham loop; reference shall be made to Option EP1 for details regarding the proposed PSP.

In contrast with the proposed feeder arrangement in Option EP1 the proposed FSPs in the vicinity of March Station and Whitemoor junction area will be supplied from an additional supply point; reference shall be made to Section 5.9.6 regarding this supply configuration.

5.9.5.2 650V Trackside Feeders

Emanating from the proposed PSP at Coldham Loop, it is proposed to have two Class II radial feeders supplying a number of Class II FSPs. Both feeders will be single end fed and shall not incorporate any secondary supply arrangements.

In contrast to the south feeder proposed as part of Option EP1; the feeder proposed as part of Option EP3 shall be segregated into two feeders; one supplied from the proposed Coldham PSP and the other from the proposed March station PSP.

- The North Feeder will comprise of a radial feeder supplied from the Coldham PSP. The radial feeder will supply four FSPs between the PSP and Long Drove level crossing. The total approximate length of the open-ring feeder shall be 1.7km.
- The South Feeder will comprise of a radial feeder supplied from the Coldham PSP. This feeder would be approximately 0.8km and supply two FSP's between the PSP and Elm Road level crossing. This reduces the south feeder length in comparison to Option EP1 by approximately 5.3km.

The proposed FSP's south of Elm Road are to be supplied from the March Station PSP. Refer to Section 5.9.6 for the proposed option that aligns with Option EP3.

5.9.5.3 Wisbech DNO and PSP

A separate SP&N DNO supply shall be required at Wisbech to supply the 230V busbar housed within the proposed PSP. It is proposed to locate the DNO cubicle in the proposed car park fence line. It is understood that the DNO connection shall be feasible and not cost prohibitive to the project; an application for a DNO connection shall be made at GRIP4. The DNO cubicle shall be of GRP construction and comprise of two compartments namely: DNO side and Network Rail side. A separate domestic supply to the PSP will also be derived from the DNO supply. The domestic supply will power heating/ventilation, heaters, sockets and lighting etc.

This option differs to option EP1 as the small compact PSP shall be housed in GRP housing and will be derived from a single phase (230V) DNO supply. The following pertinent E&P equipment shall be installed within the proposed PSP:

- 230V Maintained Switchboard;

- 230V Essential Switchboard;
- UPS module, complete with segregated battery compartment;
- 230/110V signalling power transformer;
- Bender insulation monitor;
- Feeder Protection;
- An external generator connection point will be provided for maintainers in the case of a power outage.

A hard standing in a secure compound shall be installed adjacent to the PSP for the connection of a mobile generator. Additionally, there shall be requirement for external lighting for access/egress and a luminaire located at the mobile generator connection point; all external lighting shall be timer controlled.

A 110V supply shall emanate from this PSP and shall supply the signalling assets located within the Wisbech Station area.

5.9.6 March Area – Option EP3

5.9.6.1 Supply Point

The main signalling supply shall be derived from a PSP at March; reference shall be made to Option EP1 for details regarding the proposed March PSP.

5.9.6.2 March Area Trackside Feeder

Two trackside feeders will emanate from the March PSP:

- The North Class II feeder will supply eight Class II FSPs between March Station and Elm Road; with the cable approximately 1.6km in length.
- The East Class II feeder will supply three Class II FSPs between March Station and Horsemoor level crossing; with the cable approximately 1.3km in length.

General arrangement drawing; 398128-MMD-00-XX-DR-E-0001 outlines Option EP3 and March Area - Option EP3.

5.9.7 Assumptions

1. All signalling supplies within the March West & East junctions' area requiring a UTX shall have sufficient capacity for proposed cables. This should be assessed by the appointed principle contractor.
2. Options EP1 & EP3; the route is categorised as critical and thus warrants a UPS with a mobile generator connection at each PSP. These options can both be progressed without the inclusion of a UPS if this is not required.
3. Option EP2; is assuming that a UPS is not required and mobile generator at each FSR is satisfactory. The maintainability of these FSRs will be discussed with the RAM at GRIP4 and conclusion will be drawn on how critical each supply is. Subject to these discussions the FSRs shall be housed in a GRP cubicle reducing cost.

5.9.8 Option Summary

Table 5.8: Option Summaries

Option	Total New Feeders	Total Cable Distance	Total FSP/ REB No.	Total FSP04 No. (retrofit)	Total PSP No.	Total FSR No.	Total DNO Supplies Required
EP1	5	12250m	19	0	3	0	3
EP2	6	5409m	16	3	0	3	4
EP3	5	5671m	18	0	3	0	3

5.9.8.1 Option EP1 - Manual Reconfigurable, Dual End Fed Signalling Power Supply

Manual reconfigurable, dual end fed gives the most maintainable supply in the case of a fault.

Table 5.9: Option EP1 pros and cons

Pros	Cons
Provides good supply availability with diverse supplies.	Large cable distance in comparison to other options.
PSP and Signalling assets housed within the same building reduces the cost in comparison to a singular bespoke PSP REB.	Manual reconfigurable, dual end fed is an expensive option with the addition of a secondary supply point ASP.
Combined REB also reduces associated civils design and installation costs.	The load at the PSP will be much greater than Option EP3. Thus, shall require a considerably larger UPS to achieve the required autonomy.
Staging purposes; all FSP's and cabling can be installed, and soak tested prior to decommissioning of the existing signalling supply.	

5.9.8.2 Option EP2 - Localised Signalling Power Supplies

This option assumes that the route is categorised as non-critical and thus does not warrant a UPS at each supply point. There will be an FSR cubicle providing the signalling power supply at Coldham and Long Drove; the FSP at Wisbech station shall be supplied at 230V from a local SP&N DNO. It is proposed to 'lift & shift' signalling supplies to existing signalling assets supplied from March East REB. The additional signalling power assets between March Station and Elm Road will be supplied from an FSR cubicle located at March Station.

Table 5.10: Option EP2 pros and cons

Pros	Cons
Approx. 6.8km reduction in cable length in comparison with Option 1 (cost reduction).	The supply availability is less diverse compared to Option EP1 as each feeder is radial and supplied from a single supply point
Reuse of cables supplying existing assets in March junction area (cost reduction & sustainability).	Increase in operational downtime in the event of a power outage due to the lack of UPS.
No requirements of UPS at supply points (cost reduction), also reduces maintenance time.	Additional assets and subsequently additional maintenance activities.
Retro-fitting FSP04's internally to the existing LOCs in March Area. Reduction in full LOC FSPs.	Additional requirement for DNO supply.
All FSR supply points should be of GRP construction. This reduced footprint reduces civils and installation costs in comparison to the use of a REB.	Potential interruption to the mainline at March due absence of back-up supply systems.

5.9.8.3 Option EP3 - Single End Fed Signalling Supply

This option shall utilise PSPs to supply the signalling power feeders. The main difference to Option EP1 is there will be three PSPs and all signalling power feeders are radial. March Station to Elm road is supplied from a feeder emanating from a small PSP at March Station. The PSP at Coldham is the same as the proposed PSP in option EP1 and Wisbech Station PSP will be a small compact PSP housed in a GRP cubicle and shall be supplied at 230V.

Table 5.11: Option EP3 pros and cons

Pros	Cons
Approx. 6.5km reduction in cable length in comparison with Option EP1 (cost reduction).	Less resilient to loss of supply/feeder faults than option EP1.
The design of a small compact PSP at Wisbech Station will greatly reduce the cost than the proposed PSP for Wisbech in option EP1, while still providing a reliable supply.	
Staging purposes; all FSP's and cabling can be installed, and soak tested prior to decommissioning of the existing signalling supply.	
All PSPs are backed up with UPS and mobile generator providing a more reliable supply compared to option EP2.	
Potential for future upgrades in the March area with the installation of a new PSP.	
The load requirements of the signalling power feeders are spread between separate PSPs resulting in a reduction to the number of batteries required for the UPS system and a reduction in the size of feeder cables.	
The number of new DNO supplies required is less than that in comparison to option EP2.	

5.9.9 EP3 Selected Option

Option EP3 along with March Area - Option EP3 should be progressed at GRIP4. These options provide the most resilient signalling power system whilst minimising capital expenditure and ongoing maintenance requirements.

5.9.10 Points Heating

This section details the proposed points heating requirements, as a result of the re-instatement of the March to Wisbech rail corridor. The requirements for points heating installations can be split into four areas; March East, Whitemoor, Coldham Loop North and Coldham Loop South Junctions.

As part of the reinstatement of the March to Wisbech rail corridor, Platform 3 of March station shall be brought back into use. The preferred Permanent Way option (Option 4C) at March station is for the installation of a new passenger loop. This passenger loop will consist of an additional point end (PM1) at March East junction, two point ends (PM3A & B) of the crossover east of March East level crossing and point end (PM2) at Whitemoor Junction.

5.9.10.1 March East Junction

Point PM1 will join the passenger loop to the main line at the east end of March Station and will be a CV point. The crossover east of the existing March East level crossing shall be designated with point end numbers PM3A and PM3B; the crossover shall traverse the Up main and Down Main lines. The crossover shall consist of EV points.

Points heating shall be required to the proposed point end at March East junction and the crossover. It is understood that the existing points heating installation has sufficient spare capacity both to the LV supply and the PHCC internal equipment to facilitate the additional load and supply arrangements.

Table 5.12 summarises the proposed additional points heating installation.

Table 5.12: March East Junction PHCC No.2

ID	Switch Type	Total Load	Current @ 230V	Tx Rating
PM1	CV	6kW	26A	10kVA
PM3A	EV	9.6kW	41.7A	10kVA
PM3B	EV	9.6kW	41.7A	10kVA
Total Additional Load	-	-	109.4A	-

Source: MML

5.9.10.2 Whitemoor Junction

Point PM2 will join the passenger loop onto the proposed March to Wisbech line at the north side of Whitemoor junction and will be a CV point type configuration.

Additionally, to the proposed passenger loop the East Curve line will be re-aligned; the East Curve line runs from Platform 2 at March Station onto the proposed March to Wisbech line. This re-alignment will involve the reinstatement of Point No.50 which joins the March to Wisbech line at Whitemoor Junction and will be a BV point type configuration.

Points heating shall be required to the proposed point end at Whitemoor junction. It is understood that the existing points heating installation has sufficient spare capacity both existing LV supply and the PHCC internal equipment to facilitate the additional load and supply arrangements.

Table 5.13 summarises the proposed additional points heating installation.

Table 5.13: Whitemoor Junction PHCC

ID	Switch Type	Total Load	Current @ 230V	Tx Rating
Point No.50	BV	3.2kW	14A	5kVA
PM2	CV	6kW	26A	10kVA
Total Additional Load	-	-	40A	-

Source: MML

5.9.10.3 Coldham Loop North/South Junctions

North of Coldham Station Level Crossing the preferred Permanent Way option (Option 2B) is to install a passing loop designated Coldham Down Loop. This passing loop shall join the March to Wisbech single bi-directional line at Point No. PL1 (south end) and at Point No. PL2 (north end). The total length of the Coldham Loop is 500m and the proposed point types are EV configuration.

The proposed points installed at either end of the Coldham Down Loop shall be heated from a single points heating control cubicle. The supply will be derived from the proposed TP&N DNO at Coldham station road and would supply the PHCC at 230V single phase. The PHCC is proposed to be located at the South end of the Passing Loop at PL1 and would supply 2No. 10kVA 230/110V transformer(s) located at the respective point locations.

Table 5.14 summarises the proposed points heating installation.

Table 5.14: Coldham Loop PHCC

ID	Switch Type	Total Load	Current @ 230V	Tx Rating
PL1	EV	9.6kW	41.7A	10kVA
PL2	EV	9.6kW	41.7A	10kVA
Total Load	-	-	83.4A	-

Source: MML

5.9.10.4 General

The Points Heating design shall be developed at GRIP4 in line with NR NR/L2/ELP/40045 - Electric Point Heating, NR/GN/ELP/45002 - Installation of Electric Points Heating and NR/SP/ELP/27242 - Specification for Low Voltage Electrical Installations on Railway Premises.

5.9.11 Earthing and Bonding

GRIP 4 and 5 designs should include for passive provision for earthing and bonding associated with potential future electrification. Where passive provision for E&B is specified, as part of future designs, this should not adversely affect the design and construction costs.

5.10 Telecommunications

Refer to Telecoms Option Selection Report (Appendix K)

5.11 Utilities Diversions

To facilitate construction of the proposed rail and highway infrastructure, it will be necessary to divert existing utilities in several locations.

Existing utilities in the vicinity of the proposed infrastructure are illustrated on drawings 398128-MMD-00-XX-DR-H-3001 to 398128-MMD-00-XX-DR-H-3019.

Utility providers affected have been identified as Anglian Water, Cadent Gas, UK Power Networks, Openreach and Virgin Media. C3 estimates have been made by each utility provider. These include a preliminary assessment of the utility diversion work required and an estimate of the associated costs. C3 returns are provide in Appendix W.

6 Constructability

6.1 Overall Construction Sequence

It is envisaged that the following construction sequence would be required:

1. Vegetation and site clearance in rail and highway corridors
2. Establish site compounds
3. Installation of temporary haul road, using existing rail corridor
4. Construction of bridges/highway diversions offline
5. Rail infrastructure work (non-possession working at March/Wisbech Station) in parallel with 4.
6. Open new highway bridges to traffic
7. Closure of existing level crossings and rail alignment construction (north of Whitemoor junction)
8. Rail systems installation
9. Station carparks
10. Possession working at March Station (to connect to the existing operational railway)
11. Final commissioning

Depending on the preferred construction and a logistics methodology, there is the opportunity for additional elements of the works to be staggered/overlapped so that more of the rail infrastructure can be installed in conjunction with the bridges and highways diversions.

6.2 Track

6.2.1 March Station

For Option 2A the majority of the Up Passenger Loop track could be constructed alongside disused Platform 3 whilst the Up and Down Mains stay open. Possessions would be required to install turnout PM1 on the Up Main and to replace the March East Curve track and install new turnout PM2. The March West Curve track could be kept open during this work to facilitate train entry and exit to Whitemoor sidings. Materials storage and laydown areas can be located in the Network Rail land to the North of the station where the new carpark is proposed.

For Option 2B, additional possessions will be required (compared to 2A) to modify the track north of Norwood Road overbridge. This will also require relocation of lineside infrastructure and modification to an embankment and noise wall. It may be feasible to retain some functionality of Whitemoor sidings during this work by routing trains through March West curve.

Option 4C is similar to 2B; it is envisaged that the new crossover (PM3A/B) can be installed at the same time as turnout PM1

6.2.2 Through Alignment and Wisbech Station

The track to the north of Whitemoor sidings is not currently operational and therefore can be constructed offline. Materials could be fed from Whitemoor sidings and then the existing level crossings can be used as vehicle access points. Potential compound locations include the

Waldersea depot - heritage railway trust sidings located at the existing Long Drove level crossing and at the proposed location of the new station at Wisbech.

6.3 Signalling

Signalling installation works between Whitemoor Junction and March Station and on the Line South/East of March will require disruptive possessions of the railway.

The commissioning of the new signalling will also require a disruptive possession, ideally this activity would be combined with main line resignalling work, to reduce the number of occasions on which the railway through March is closed.

6.4 Highways

Constructability has been considered in the design development, and potential issues identified in Section 12.1.3. Key constructability issues for the highways schemes are detailed below.

A key constructability issue is the location of the proposed Weasenham Lane bridge, as it is less than five metres from adjacent industrial buildings, in places. There is also the potential for delays to through-traffic and impact on businesses during construction. In order to mitigate this, it will be necessary to provide temporarily access routes to affected businesses (e.g. via the existing frontages of Del Monte, Hutchinsons and Lamb Weston). It may also be necessary to provide a temporary bypass road (e.g. via the above frontages or via New Bridge Lane). The work will have to be considered in sequence with the proposed Wisbech Bypass (A47) scheme to minimise disruption to traffic flows. The development of detailed proposals to mitigate these issues and the design of the associated temporary works solutions will be dependent on the outcome of consultation with affected business and other key stakeholders.

6.5 Geotechnical

Construction of the highway earthworks will require the drainage and ground improvement measures (band drains and Vibro Columns) to be installed first, with the fill activities for the embankment earthworks taking place afterwards. As the design is developed further it would be prudent to explore the potential of allowing settlement periods for the embankments and earth retaining structures. Should the construction programme allow for lengthy settlement periods (between embankment construction and subsequent elements of the work such as highway surfacing and bridge deck installation) it could be possible to accept a higher level of overall settlement. This would reduce the quantity and cost of hard engineering solutions required.

6.6 Ancillary Civils

6.6.1 Wisbech Station

Constructability has been considered in the design development, and potential issues identified in Table 12.5.

6.6.2 March Station

Constructability has been considered in the design development, and potential issues identified in Table 12.5

The main risks in terms of constructability of the proposed solution arise as a result of limited information of the location and construction of existing infrastructure. Additional re-design may be required once existing services and drainage running through the platforms are identified.

6.7 Bridges and Civil Structures

6.7.1 Grade Separations

Construction of the reinforced concrete box structures for the new road over rail bridges will require road closures where the new bridges are brought online. It is anticipated that the construction sequence will be:

1. Piling,
2. Cast base slab,
3. Install ballast and track,
4. Construct abutments,
5. Cast deck slab,
6. Place fill and reinforced earth walls
7. Place deck finishes.

6.7.2 Twenty Foot River Bridge

It is anticipated he construction sequence for Twenty Foot River Bridge will be:

1. Piling for each abutment,
2. Construct abutments
3. Install bridge beams
4. Cast deck slab
5. Place fill and reinforced earth walls
6. Place deck finishes.

The single span solution for this bridge has been selected as it avoids the need for a pier in the river and temporary cofferdams.

6.7.3 March Station Footbridge

The construction and erection of the new footbridge will require several overnight possessions of the railway.

Construction of new foundations which includes excavation and piling work will have a significant effect on the number of possessions required, particularly for works at Platform 1 and 2.

Access for piling rigs, cranes and other plant for Platform 1 could be from the existing car park at the south. Access to Platform 2/3 and 4 would from the site of the proposed car park to the north of the station.

The proposed construction sequence would be:

1. Excavation through existing platforms,
2. Piling,
3. Cast base slabs and lift pits,
4. Install steelwork for footbridge towers and lift towers,
5. Lift in footbridge superstructure and stairs.

6.7.4 Existing Underbridges

6.7.4.1 Chain Bridge WIG 2314

The proposed works include construction of new reinforced concrete wall and piled foundation to replace high mileage abutment, replacement of all bearings, blast cleaning of steelwork, steelwork repairs and painting, replacement of the existing deck with a lightweight stiffened steel deck and patch repairs to abutments and piers. The existing gas main will require protection or diversion during these works.

6.7.4.2 Mulberry Drain WIG 2315, Waldersey Drain WIG 2317 and Redmoor Drain WIG 2319

The proposed works include replacement of all bearings, blast cleaning of steelwork, steelwork repairs and painting and patch repairs to abutments.

6.8 Drainage

Constructability has been considered in the design development, and potential issues identified in Table 12.7.

6.9 Utilities Diversions

The requirement for diversions of numerous existing buried utilities (gas, water, electricity and telecoms) to facilitate construction of the new Weasenham Lane bridge and approach ramps introduces constructability challenges. As described in sectionHighways 6.4, Weasenham Lane is a constrained urban site. Options for phasing of these works will require analysis at the next design stage. The possibility of coordinating diversions (e.g. via combined routes) to minimise programme, cost and disruption on adjacent business will require careful consideration.

7 Maintainability

For the purposes of developing the GRIP 3 design it has been assumed that Network Rail will be the Infrastructure Manager and Owner for the railway infrastructure delivered by this scheme. Therefore, it also assumed that Network Rail will also operate, maintain and renew the railways infrastructure following its handover. For the highway's infrastructure, associated with the grade separation schemes, it has been assumed that maintenance of the assets will be adopted by Cambridgeshire County Council as the Highway Authority.

7.1 Track

A safe cess access walkway has been provided throughout the alignment, refer to Section 5.6.4.7 for details. Authorised access points have also been considered throughout the alignment, refer to Section 5.6.4.8 for details.

The key track maintenance consideration will be the tight track geometry around March station. As discussed in Section 5.1.8.1, Options 2B and 4C provide preferable geometry from a maintenance perspective but exceptional track radii is still required. It is recommended that the following interventions are considered at the next design state. The NR RAM (Track) should be consulted regarding the acceptability of these interventions.

1. Head hardened rail to reduce potential wear (check rails and gauge widening will mitigate some wear).
2. Applied cant on the 150m curve to manage some of deficiency and help reduce angle of attack of the outside rail
3. Rail lubrication (may not be acceptable due to the proximity of S&C and the Station; this is a potential over run risk and will need Signalling input to assess feasibility)

The March East curve (where the exceptional track geometry is located) will have good access for maintenance as a road rail access point has been considered, as part of the new carpark design.

7.2 Highways

The maintainability of the proposed highways has been considered by specification of pavements in line with Cambridgeshire County Council standards, and the provision of adequate verges and footways adjacent to the highways.

7.3 Geotechnical

Seeded Highway embankments for grade separations will require vegetation management as part of the maintenance regime.

Earthwork inspections will be required as per the Network Rail 5 Chain inspection report for rail embankments on the through alignment.

7.4 Ancillary Civils

7.4.1 Wisbech Station

The majority of the platform infrastructure will be accessible from the platform surface. Access chambers will be located at a distance greater than 1.5m from the platform edge. Lighting columns will all be base hinged and will fall at a distance greater than 1.5m from the platform edge. The station building will be provided with a min. 500mm clearance to all sides.

Access to the underside of the platform for maintenance / inspection purposes from the rear of will be restricted by the platform access ramp, stairs and ticket office. This means that access will be required from the front of the platform and working on or near the line. A further review of access arrangements is recommended at the next design stage. Access from the rear will be restricted by the platform access ramp, stairs and ticket office.

Stairs will be provided at each end of the platform to allow trackside access for authorised personnel. Access to the cable routes beneath the platform will be achieved from the platform, from within the proposed access chambers, without the need to access the lineside.

7.4.2 March Station

Maintenance requirements in the existing station areas will remain largely as existing, although following introduction of the lifts regular maintenance will be required to these, including the fire, communication and control systems.

Stairs will be provided at the western end of platform 3 to allow trackside access for authorised personnel. Access to the cable routes within the platform will be achieved from the platform, from within the proposed access chambers, which will be located min. 1500mm from the coper edge.

An access gate will be provided in the fence line at the eastern end of Platform 3 and at both sides of Platform 4 to allow access to the dis-used platform areas.

7.5 Bridges and Civil Structures

7.5.1 Grade Separations

The proposed structural form, type and arrangement presents a low maintenance solution. Concrete bridge structures typically require less maintenance than steel bridges. In addition, making the structure integral removes the requirement for future maintenance and replacement of bearings.

7.5.2 Twenty Foot River Bridge

The superstructure is integral with the abutments, which will reduce maintenance and inspection requirements through elimination of bearings.

Maintenance works to the deck soffit and access for major inspections will require underbridge units. This will also allow outer faces of the parapets to be inspected.

Inspection of the abutments and parapet ground beams can be undertaken without lane closures.

Inspection of the deck, parapets will require traffic management. Maintenance platforms shall be provided in front of both abutments for access (1.50m minimum width).

The proposed structural form, type and arrangement presents a low maintenance solution compared with alternative options. Concrete structures typically require less maintenance than steel composite structures as there is no requirement for maintenance painting. In addition, making the structure integral removes the requirement for future maintenance and replacement of bearings.

7.5.3 March Station Footbridge

The new steel bridge will require maintenance painting. A long-life glass flake paint system is recommended to achieve a protective coating life to first maintenance of 20 years.

7.5.4 Existing Underbridges

The existing bridges should be refurbished and should be protected with a long-life paint system which requires no further maintenance for 20 years.

7.6 Drainage

7.6.1 Track Drainage

The deeper collector pipes are still maintainable with modern jetting equipment as the depths of the pipes are between 1.5m and 3.0m. For maintenance of the drains, catchpits will be positioned at nominal 30m centres along the drainage runs.

Regular vegetation clearance would be required to maintain the ditch profiles and drainage performance.

7.6.2 Wisbech and March Station and Car Parks

Permeable block paving will require regular maintenance to maintain functionality. Combined kerb drainage is proposed for the main access roads to prevent direct vehicle traffic loading whilst providing a shallow drainage system. The channel will require jetting and silt traps emptying to maintain functionality. For other hard standing areas where direct vehicle loading is a low risk linear channels are proposed. Channels will have an integral lid for durability with rodding access from the top of the run.

7.6.3 Highways

Over the edge drainage reduces the maintenance requirement within the carriageway, eliminating risk and traffic management requirements.

The proposed swales and basins will require vegetation and debris clearance to maximise flow capacity and attenuation storage and reduce blockage risks at the outfall or prevent localised flooding. Access arrangements are to be reviewed at the next stage.

At Weasenham Lane combined kerb drainage is proposed to eliminate carrier pipework and manhole within the carriageway. A shallow drainage solution is proposed at this stage prior to surveying of the existing outfall. Combined kerb drainage benefits from not being directly trafficked, unlike a linear channel alternative.

8 Design Outputs

8.1 Drawings

The following drawings have been produced to address the scope items detailed in Section 2.5.

8.1.1 Track

Table 8.1: Track Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-P-0001	PLAN AND PROFILE	OPTION 2A
398128-MMD-00-XX-DR-P-0002	PLAN AND PROFILE	OPTION 2B
398128-MMD-00-XX-DR-P-0003	PLAN AND PROFILE	OPTION 2B
398128-MMD-00-XX-DR-P-0004	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0005	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0006	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0007	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0008	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0009	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0010	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0011	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0012	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0013	PLAN AND PROFILE	
398128-MMD-00-XX-DR-P-0014	PLAN AND PROFILE	OPTION 4C

8.1.2 Signalling

Table 8.2: Signalling Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-SK-SG-0001	MARCH OPTION 2A	SIGNALLING SCHEME SKETCH (GRIP 3)
398128-MMD-00-XX-SK-SG-0002	MARCH OPTION 2B	SIGNALLING SCHEME SKETCH (GRIP 3)
398128-MMD-00-XX-SK-SG-0003	MARCH OPTION 4C	SIGNALLING SCHEME SKETCH (GRIP 3)

8.1.3 Highways

Table 8.3: Highways Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00XX-DR-H-0101	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0102	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0103	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1

Drawing Number	Title	Sub-Title
398128-MMD-00XX-DR-H-0104	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0105	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0106	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0107	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0108	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0109	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0110	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0111	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0112	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 1
398128-MMD-00XX-DR-H-0201	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 2
398128-MMD-00XX-DR-H-0202	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 2
398128-MMD-00XX-DR-H-0203	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 2
398128-MMD-00XX-DR-H-0301	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 3 HOLLY BANK / CROOKED BANK
398128-MMD-00XX-DR-H-0302	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 3 HOLLY BANK / CROOKED BANK
398128-MMD-00XX-DR-H-0321	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 3 BROAD DROVE
398128-MMD-00XX-DR-H-0322	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 3 BROAD DROVE
398128-MMD-00XX-DR-H-0323	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 3 BROAD DROVE
398128-MMD-00XX-DR-H-0324	HIGHWAYS GENERAL ARRANGEMENT	SCHEME 3 BROAD DROVE
398128-MMD-00XX-DR-H-0401	HIGHWAYS GENERAL ARRANGEMENT	A47 WISBECH BYPASS
398128-MMD-00XX-DR-H-0402	HIGHWAYS GENERAL ARRANGEMENT	A47 WISBECH BYPASS
398128-MMD-00XX-DR-H-0501	HIGHWAYS GENERAL ARRANGEMENT	WEASENHAM LANE
398128-MMD-00-XX-DR-H-1000	WISBECH STATION	CAR PARK
398128-MMD-00-XX-DR-H-1001	MARCH STATION	CAR PARK
398128-MMD-00XX-DR-H-1201	HIGHWAYS TYPICAL CROSS SECTIONS	
398128-MMD-00XX-DR-H-1202	HIGHWAYS TYPICAL CROSS SECTIONS	
398128-MMD-00XX-DR-H-3000	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3001	COMBINED C2 UTILITIES PLAN	

Drawing Number	Title	Sub-Title
398128-MMD-00XX-DR-H-3002	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3003	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3004	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3005	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3006	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3007	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3008	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3009	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3010	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3011	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3012	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3013	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3014	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3015	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3016	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3017	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3018	COMBINED C2 UTILITIES PLAN	
398128-MMD-00XX-DR-H-3019	COMBINED C2 UTILITIES PLAN	

8.1.4 Geotechnical

Table 8.4: Geotechnical Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-G-0001	TYPICAL EMBANKMENT DETAILS	GRADE SEPARATIONS
398128-MMD-00-XX-DR-G-0002	EXISTING RAILWAY EMBANKMENT	PROPOSED REGRADE LOCATION AND TYPICAL DETAIL
398128-MMD-00-XX-DR-G-0003	RETAINING STRUCTURE	GENERAL ARRANGEMENT AND TYPICAL DETAIL

8.1.5 Ancillary Civil/Stations Civil Engineering

Table 8.5: Civil Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-C-0001	WISBECH PROPOSED STATION	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0002	MARCH STATION PROPOSED WORKS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0100	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0101	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0102	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0103	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0104	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0105	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0106	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0107	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0108	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-C-0109	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0110	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0111	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0112	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0113	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0114	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0115	LINESIDE ANCILLARY CIVILS	GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0120	LINESIDE ANCILLARY CIVILS	OPTION 4C GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-C-0121	LINESIDE ANCILLARY CIVILS	OPTION 4C GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-TP-0001	INDICATIVE BOUNDARY PLAN	
398128-MMD-00-XX-DR-TP-0002	INDICATIVE BOUNDARY PLAN	
398128-MMD-00-XX-DR-TP-0003	INDICATIVE BOUNDARY PLAN	
398128-MMD-00-XX-DR-TP-0004	INDICATIVE BOUNDARY PLAN	
398128-MMD-00-XX-DR-TP-0005	INDICATIVE BOUNDARY PLAN	
398128-MMD-00-XX-DR-TP-0006	INDICATIVE BOUNDARY PLAN	
398128-MMD-00-XX-DR-TP-0007	INDICATIVE BOUNDARY PLAN	

8.1.6 Bridges & Civil Structures

Table 8.6: Structural Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-S-1001	WEASENHAM BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-1002	WEASENHAM BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-1003	WEASENHAM BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-2001	A47 WISBECH BYPASS BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-2002	A47 WISBECH BYPASS BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-2003	A47 WISBECH BYPASS BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-3001	BROAD DROVE BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-3002	BROAD DROVE BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-3003	BROAD DROVE BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-4001	HOLLY BANK / CROOKED BANK BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-4002	HOLLY BANK / CROOKED BANK BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-4003	HOLLY BANK / CROOKED BANK BRIDGE	PROPOSED GENERAL ARRANGEMENT

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-S-7001	COLDHAM BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-7002	COLDHAM BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-7003	COLDHAM BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-8001	ELM ROAD BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-8002	ELM ROAD BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-8003	ELM ROAD BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-9001	TWENTY FOOT RIVER BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-9002	TWENTY FOOT RIVER BRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-1100	MARCH STATION FOOTBRIDGE	FOOTBRIDGE VISUAL ARRANGEMENT
398128-MMD-00-XX-DR-S-1101	MARCH STATION FOOTBRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-1102	MARCH STATION FOOTBRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-1103	MARCH STATION FOOTBRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-1104	MARCH STATION FOOTBRIDGE	PROPOSED GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-S-1105	MARCH STATION FOOTBRIDGE	PROPOSED LIFT STEELWORK

8.1.7 Drainage and Flood Risk

Table 8.7: Drainage and Flood Risk Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-D-0101	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 1 - ELM ROAD ROUNDABOUT
398128-MMD-00-XX-DR-D-0102	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 1 - B1101 + ELM ROAD
398128-MMD-00-XX-DR-D-0103	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 1 - B1101 + ELM ROAD
398128-MMD-00-XX-DR-D-0104	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 1 - B1101
398128-MMD-00-XX-DR-D-0201	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 2 - COLDHAM BRIDGE
398128-MMD-00-XX-DR-D-0301	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 3 - HOLLY BANK / CROOKED BANK LINK

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-D-0302	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 3 - BROAD DROVE ROAD
398128-MMD-00-XX-DR-D-0303	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 3 - BROAD DROVE ROAD
398128-MMD-00-XX-DR-D-0401	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 4 - A47 WISBECH BYPASS
398128-MMD-00-XX-DR-D-0501	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT	SCHEME 5 - A47 WEASENHAM LANE
398128-MMD-00-XX-DR-D-0010	WISBECH STATION CAR PARK	PROPOSED DRAINAGE STRATEGY
398128-MMD-00-XX-DR-D-0020	MARCH STATION CAR PARK	PROPOSED DRAINAGE STRATEGY
398128-MMD-00-XX-DR-D-1001	TRACK DRAINAGE	MARCH STATION OPTION 2B
398128-MMD-00-XX-DR-D-1002	TRACK DRAINAGE	MARCH STATION OPTION 2B
398128-MMD-00-XX-DR-D-1003	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1004	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1005	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1006	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1007	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1008	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1009	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1010	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1011	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-1012	TRACK DRAINAGE	PLAN AND PROFILE
398128-MMD-00-XX-DR-D-0020	MARCH STATION CAR PARK	PROPOSED DRAINAGE STRATEGY

8.1.8 Electrical and Plant

Table 8.8: E&P Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-E-0001	E&P SIGNALLING POWER	OPTION SELECTION GENERAL ARRANGEMENT

8.1.9 Telecommunications

Table 8.9: Telecommunications Design Drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-T-0001	MARCH STATION	PROPOSED SISS GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-T-0002	MARCH STATION	PROPOSED SISS BLOCK DIAGRAM
398128-MMD-00-XX-DR-T-0003	WISBECH STATION	PROPOSED SISS GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-T-0004	WISBECH STATION	PROPOSED SISS BLOCK DIAGRAM
398128-MMD-00-XX-DR-T-0005	WISBECH STATION	PROPOSED SISS GENERAL ARRANGMENT - CAR PARK

8.2 Documents (Reports, Technical Notes and Assessment)

The following documents have been produced to address the scope items detailed in Section 2.5.

8.2.1 Track

Not applicable

8.2.2 Signalling

Table 8.10: Signalling Design Documents

Document Number	Title	Reference
398128-MMD-00-XX-RP-SG-0001	Signalling Design Specification	Appendix R
398128-MMD-00-XX-RP-SG-0003	Initial Signal Sighting	Appendix S

8.2.3 Highways

Not applicable.

8.2.4 Geotechnical

Table 8.11: Geotechnical Design Documents

Document Number	Title	Reference
398128-006-A	March to Wisbech Transport Corridor – Geotechnical and Geo-Environmental Desk Study	Appendix G

8.2.5 Ancillary Civil/Stations Civil Engineering

Table 8.12: Civil Design Documents

Document Number	Title	Reference
398128-MMD-00-XX-RP-C-0001	Lineside Boundary Risk Assessment and Access Strategy	Appendix H
398128-MMD-00-XX-RP-C-0002	Assessment of Station capacity and Passenger Flow (Pedestrian Modelling Report)	Appendix I

8.2.6 Bridges & Civil Structures

Table 8.13: Structural Design Documents

Document Number	Title	Reference
398128-MMD-00-XX-TN-S-0001-A	Technical Note Culvert Risk Assessments	Appendix L
398128-MMD-00-XX-TN-S-0002-A	Preliminary Assessment of 4 NR Underbridges	Appendix M

8.2.7 Drainage and Flood Risk

Table 8.14: Drainage and Flood Risk Design Documents

Document Number	Title	Reference
398128-MMD-00-XX-RP-D-0001-A	Desktop Flood Risk Appraisal	Appendix Q

8.2.8 Electrical and Plant

Table 8.15: E&P Design Documents

Document Number	Title	Reference
398128-MMD-00-XX-RP-E-0001-A	E&P Station Report	Appendix J

8.2.9 Telecommunications

Table 8.16: Telecommunications Design Documents

Document Number	Title	Reference
398128-MML-REP-TL-0001	Telecoms Option Selection Report Addendum	Appendix K

8.3 Calculations

The following calculations were used to develop the design detailed in Section 5.

8.3.1 Track

Refer to Appendix F.1 for track speed calculations.

8.3.2 Signalling

No Signalling calculations have been produced as part of the GRIP 3 design. This should be conducted at the next stage of the design.

8.3.3 Highways

Refer to Appendix F.2.

8.3.4 Geotechnical

Non applicable

8.3.5 Ancillary Civil/Stations Civil Engineering

Non applicable

8.3.6 Bridges & Civil Structures

Non applicable

8.3.7 Drainage and Flood Risk

Non applicable

8.3.8 Electrical and Plant

No electrical calculations have been produced as part of the GRIP3 design. Outline and detailed calculations should be produced at GRIP stages 4 & 5.

8.3.9 Telecommunications

No Telecoms calculation have been produced as part of the GRIP 3 design. This shall be conducted at the next stage of the design.

9 Design Assurance

9.1 Interdisciplinary Design Check (IDC)

During design development, ten design coordination meetings were held to address design issues. Individual three-dimensional coordination models of the proposed infrastructure were developed (and shared weekly) for the key disciplines and these were amalgamated into a federated model. The federated coordination model was utilised during the design coordination meetings to identify clashes and issues for resolution during design development.

The following interdisciplinary design check meetings were held:

- Grade Separations IDC: 09/12/2019
- Through Alignment and Stations IDC 16/12/2019
- Option 4C and Ancillary Drawings 28/02/2020
- Post Survey Findings 14/04/2020

An IDC certificate, detailing attendees, drawings presented, issues raised, and closure of issues is provided in Appendix D.

9.2 Derogations

The following sections detail potential derogations to the standards for the proposed design. Approval in principle for the derogations has not been sought at this stage of the design and consultation will be required with the standard owners, going forward.

9.2.1 Track

Table 9.1: Track Design Derogations

Standard	Clause	Derogation
NR/L2/TRK/2102	Table 6	Exceptional track radius of <200m and flexed turnout with exceptional track radius at March station requires approval by the NR RAM [Track]

9.2.2 Signalling

No derogations to standards are proposed for this part of the design, based on currently available information.

9.2.3 Highways

Table 9.2: Highways Design Derogations

Scheme	Standard	Clause	Departures from DMRB
Scheme 1	DMRB CD109	Section 2	On Elm Road (south) the SSD is One step below the desirable minimum. of 90m on the approach to the junction with Elm Road Spur, which will require a departure from the standard. Scope to change the alignment within the existing design is limited by existing road geometry.
Scheme 1	DMRB CD109	Section 2	On the proposed B1101, crest and sag K values and SSD are One step below the desirable minimum, which will require a departure from standard.

Scheme	Standard	Clause	Departures from DMRB
Scheme 2	DMRB CD109 and DMRB CD123	Section 2 Section 3	On the Coldham Bridge alignment, the K value at the crest of bridge is Three steps below the desirable minimum and is located only 100m from a junction. This is combined with an SSD which is unlikely to be achieved at the junction. Scope to change the alignment within the existing design is limited by existing road geometry and adjacent properties, although the situation could be improved slightly by adopting lower speed limits. It is recommended that the design is reviewed in detail at the next stage of the project as there are significant potential issues with the current alignment that will require agreement with the Council prior to next stage of design commencing.
Scheme 3	DMRB CD109	Section 2	The crest K-value on Holly Bank/Crooked Bank bridge is Two steps below the desirable minimum. However, this is an accommodation bridge for a byway so an application for a departure is not required.
Scheme 3	DMRB CD109	Section 2	On Broad Drove Road, the K value is One step below the desirable minimum in combination with a side road, which will require a departure from the standard.
Scheme 4	DMRB CD109	Section 2	On A47 Wisbech Bypass, a horizontal curve of 720m radius is present, which is not recommend for FOSD. The K value and SSD which are One step below the desirable minimum, which will require a departure from standard.
Scheme 5			NONE

9.2.4 Geotechnical

No derogations to standards are proposed for this part of the design, based on currently available information.

9.2.5 Ancillary Civil/Stations Civil Engineering

Table 9.3: Ancillary Civil/Stations Design Derogations

Standard	Clause	Derogation
NR/CIV/SD/610	Note C3	Proposed UTX at ch. 137.725km does not achieve minimum 1410mm clearance to rail for ballast cleaning. Circa 1150mm achieved either side. Requires approval from NR RAM (Civils).
PRM TSI	4.2.1.2.1	Proposed walkway on Platform 4, leading to lift shaft provides 1.2m width however minimum of 1.6m is required. Opportunities for design refinement captured in Section 12.2.5.

9.2.6 Bridges & Civil Structures

No derogations to standards are proposed for this part of the design, based on currently available information.

9.2.7 Drainage and Flood Risk

No derogations to standards are proposed for this part of the design, based on currently available information.

9.2.8 Electrical and Plant

No derogations to standards are proposed for this part of the design, based on currently available information.

9.2.9 Telecommunications

No derogations to standards are proposed for this part of the design, based on currently available information.

10 Safety Assurance

10.1 Hazard and Risk Analysis

During design development a designers' hazard elimination and management record (DHEMR) was populated by the individual disciplines to record hazards and risk control measures associated with the design.

Hazards were classified according to the following criteria:

- Design risk (D) - (Risks due to lack of information where assumptions have been made),
- Environmental risk (E) – e.g. flood risks, endangered species, heritage risks etc),
- Hazard (H) - safety hazards during construction and operation e.g. buried services, manual handling, large excavations, etc.

A HAZID meeting was held on 26 November 2019, with all disciplines in attendance to review and further populate the DHEMR. Hazards without significant residual risk were closed out in this meeting and the DHEMR updated.

Many of the hazards with a residual risk have been added to the relevant drawings with an appropriate hazard warning triangle, (according to the criteria above) and including a reference relating to the entry in the DHEMR. These hazards have been subsequently closed in the DHEMR with the corresponding drawing reference added to provide an audit trail. Those hazards with a residual risk, that have not been added to the drawings remain active in the DHEMR for consideration at the next stage of the design.

The DHEMR and attendance sheet for the HAZID meeting are provided in Appendix C.

11 Environmental

11.1 Environmental Report

The Environmental Report is issued separately (398128-MMD-00-XX-RP-EN-0001-A). Environmental constraints mapping for input to the design is included in Appendix O.

11.2 Preliminary Ecological Appraisal

The Preliminary Ecological Appraisal report records the findings for the phase 1 habitat survey and is issued separately (398128-MMD-00-XX-RP-EN-0003-A).

11.3 Mott MacDonald Carbon Portal Tool

The Carbon Portal is Mott MacDonald's in-house carbon assessment tool. It is an optioneering tool designed to assess capital and operational carbon in projects, potentially helping to cut carbon and cut costs for the project.

Equivalent carbon dioxide was assessed using the Carbon Portal for infrastructure configurations i and ii (Refer Section 5.1.2). The GRIP 2 bill of quantities was used as the basis of this carbon assessment (for GRIP 2 bill of quantities see Reference 2 in Table 2.1). The results of the carbon assessment are detailed in Table 11.1.

Table 11.1: Comparison of Tonnes of Equivalent Carbon Dioxide for Infrastructure Configurations 1 and 2

Infrastructure Configuration	Equivalent Carbon Dioxide (Tonnes)
i	11409
ii	11488

The initial assessment shows that the preferred configuration emits slightly less carbon.

The outputs from the carbon assessment, including assumptions made are included in Appendix T. Note, the carbon portal tool is constantly being developed and multiple assumptions are required during its use. Results are therefore to be considered indicative and comparative only, and not as a comprehensive analysis of the projects carbon footprint.

12 Risks and Opportunities

12.1 Risks

The following key engineering risks were identified during the GRIP 3 design process.

12.1.1 Track

Table 12.1: Track Design Risks

ID	Risk	Impact
RA01	Use of inaccurate OS mapping and LIDAR data	Changes required to track design alignment at next stage leading to increases in earthworks volumes and additional project costs
RA02	Approval of tight radius curves (<200m, exceptional in NR/L2/TRK/2102, table 6) around March station by NR RAM [Track]	Major changes to track design and March station platforms with additional project costs
RA03	Approval for raised track speed (10mph to 20mph) around March station and Whitemoor sidings	Increase in speed is not accepted by Network rail and therefore impacts the timetable of the scheme. Initial analysis suggests that with a speed limit of 10mph imposed at western end of Platform 3 (138,355m) until turnout PM2 (138,713m), where the Platform 3 line meets the single line, equates to a time penalty of 40 seconds (compared to 20mph). This would be rounded up to 60 seconds when compiling a timetable.
RA04	The existing (single) track is in close proximity to the eastern pier at Norwood Road Overbridge. A new track alignment is proposed under the bridge for options 2A and 2B/4C (which incorporates two tracks). This could lead to a potential clash between a train and the bridge.	Sufficient clearance should be checked at the next stage through detailed Gauge Assessment and if cannot be achieved under the bridge then bridge reconfiguration could be required. This could introduce significant additional project costs.

12.1.2 Signalling

Table 12.2: Signalling Design Risks

ID	Risk	Impact
RB01	Uncertainty over proposed systems, infrastructure and timescale for re-control of March East Signal Box (The Ely and Cambridge area re-signalling project)	To inform signalling design proposals for the March to Wisbech scheme it has been assumed that March East Signal Box will have re-control to Cambridge prior to re-opening of the WIG line. Existing signal positions have been assumed to be unchanged by the resignalling project. If these assumptions are incorrect additional signalling infrastructure may be required and project costs may increase
RB02	Signal Over run Risk Assessment and Drivability Assessment	These results of these assessments could introduce changes to the proposed signalling scheme. It is possible that this may result in additional project costs.

12.1.3 Highways

A full list of the hazards and design risks identified during this stage of the design can be found in Appendix C.

The agreed scope of the highways design in GRIP 3 was limited to development of the GRIP 2 options provided by Network Rail. The following are highlighted as areas which should be re-visited at the next stage of design, as hazards arising from the selected option design have been identified:

Table 12.3: Highways Design Risks

ID	Risk	Impact
RC01	Use of inaccurate OS mapping and LIDAR data	Changes required to alignment design at next stage leading to increases in earthworks volumes and additional project costs
RC02	The location of Coldham Bridge selected at the previous stage of the design constrains the geometry such that the K value at the crest of bridge is Three steps below the desirable minimum required by the DMRB. Because of the close proximity of the rail line and parallel B1101, the SSD for the junction cannot be achieved. The junction between the Coldham Bridge alignment and the B1101 is also less than 200m from a sharp bend in the B1101.	Changes to alignment design and potential for additional project costs
RC03	The location of the proposed Weasenham Lane bridge raises concerns in terms of constructability and maintainability, as it is less than five metres from adjacent industrial buildings in places. These hazards are in addition to the project risks of this bridge due to the severance of access to at least three businesses.	Changes to alignment design and potential for additional project costs
RC04	The construction of Weasenham Lane Bridge is likely to require temporarily access routes to affected businesses (e.g. via the existing frontages of Del Monte, Hutchinsons and Lamb Weston). It may also be necessary to provide a temporary bypass road (e.g. via the above frontages or via New Bridge Lane). The development of detailed proposals to mitigate these issues and the design of the associated temporary works solutions will be dependent on the outcome of consultation with affected business and other key stakeholders.	Relocation of a storage tank at Lamb Weston and demolition of a disused overbridge. Impact on businesses due to loss of parking and changes to accesses.
RC05	RSA recommendations (Refer to Appendix P) adopted which require changes to the proposed highways schemes with subsequent impact on other infrastructure	Potential for increase in design/construction costs for highways schemes, utilities diversions and rail infrastructure. A parallel work stream is currently being undertaken for additional highways feasibility design work, to address key RSA comments on highway schemes 1 and 2. One of the outputs of the work will be capital cost estimates for preferred alternative highways options (schemes 1 and 2), produced to a GRIP 2 level of accuracy.
RC06	Further stakeholder engagement will be required before the development of detailed designs for the highway schemes. There is a risk that stakeholder engagement results in changes or additions to the proposed highway schemes	Potential for capital cost increases

12.1.4 Geotechnical

Table 12.4: Geotechnical Design Risks

ID	Risk	Impact
RD01	There are sections of embankment which could not be inspected due to access restrictions or dense vegetation.	Additional locations may require regrading throughout the site. This could result in additional project cost.
RD02	Unknown ground conditions throughout the site.	Ground models and characteristic parameters for design may change resulting in design being re-worked. This could result in additional project cost.
RD03	Potential deep slips within 1 in 3 highways embankment slopes.	Further GI may indicate softer materials on site and hence a slacker slope may be required. This will interact with locations of drainage, cycle path and potentially result in additional land take. This could result in additional project cost.
RD04	Incorrect modelling of existing embankments from LIDAR data.	Following a topographical survey, existing embankment heights and widths may be wider which will interact with locations of drainage, cycle path and potentially result in additional land take. This could result in additional project cost.
RD05	Potentially infilled land located at Weasenham Lane associated with historical fishponds.	Further GI may indicate softer materials on site resulting in the requirement for additional design and potential ground improvement methods required. This could result in additional project cost.
RD06	Peat deposits located within stone column alignment.	Location of peat within stone column alignment may reduce ground improvement betterment resulting in additional design work and solutions. This could result in additional project cost.
RD07	Unknown bund materials.	Constituents of Bund fill are not well understood at this stage of the project and there remains a risk that the pile size length may change.
RD08	Incorrect modelling of existing bund from LIDAR Data	Following a topographical survey, existing bund heights and widths at Norwood Bridge may alter requiring longer piles. This could result in additional project costs.

12.1.5 Ancillary Civil/Stations Civil Engineering

A full list of the hazards and design risks identified during this stage of the design can be found in Appendix C. The major civils design risks are outlined in Table 12.5 below,

Table 12.5: Civil Design Risks

ID	Risk	Impact
RE01	Unknown location of buried services within March station platforms	There are currently no records of known services within the proposed platform areas. The design may have to be revised to account for existing infrastructure within the platform once this information is made available. This could result in additional project cost.

ID	Risk	Impact
RE02	Existing construction and condition of building on Platform 4 at March Station	There is a small building to the rear of Platform 4 at March station. As part of the design it is proposed to open up this building to allow through access from the proposed car park to the new footbridge. Additional strengthening/repair works may be required to enable this solution, following further detailed survey of the structure. This could result in additional project cost.
RE03	No level data at March station	The proposed works on Platform 3 involves relocating the existing coper position. In ensuring compliant crossfalls on Platform 3, this may worsen the crossfalls on Platform 2 and potentially introduce non-compliances to the existing platform. Without further topographical information for the station it is assumed no works are required to the existing platforms however additional works may be required following further survey information. This could result in additional project cost.
RE04	Unknown extent of existing lease boundary	Changes to the design/land acquisition may be required following confirmation of the existing NR lease boundary.
RE05	Unknown location of existing assets – no topographical survey	The position of existing assets, particularly around March station, have been shown based on OS maps and limited aerial imagery. The design will have to be revised once the exact position of these assets are known from a topographical survey. This includes 2 large ponds near March station, some assets are relocated towards this pond and if the pond is larger than shown on OS maps, this may not be possible. Additionally, the available space on underbridges, where cable routes/walkways are proposed, may be less than assumed from OS maps – this would lead to a review of the cable route/walkway solution in those areas.
RE06	Increased risk at level crossings	The increased train frequency and passenger use at March station increases the risk of the level crossings between March and Cambridge. The current assumption is that EACE or other NR projects will resolve the level crossing issues where the increased risk requires an intervention. It may not be possible to deliver 1tph between Wisbech and Cambridge ahead of the EACE scheme.
RE07	No current accessible route from Wisbech station to the town centre	Proposed infrastructure is limited to the station, car park and transport interchange. A further, more detailed assessment of onwards connectivity is likely to identify wider transport improvement requirements (e.g. to bus routes, cycle routes and walking routes). This could lead to additional project cost.
RE8	Platform 4 width – March Station	Due to the proposed footbridge landing, the width of the existing Platform 4 does not provide a compliant width. There is also restricted space to install new duct routes in the platform between the footbridge and platform front wall (To be confirmed with further surveys). There is an opportunity to refine the design in this location to remove this risk. Refer to Section 12.2.5.
RE9	Further stakeholder engagement will be required before the development of detailed designs for Wisbech Station and the station car park. There is a risk that stakeholder engagement results in changes or additions to the proposed infrastructure.	Capital cost increases

12.1.6 Bridges & Civil Structures

Table 12.6: Structural Design Risks

ID	Risk	Impact
RF01	Detailed inspection has not been possible as limited access has been granted by Network Rail at this stage. The structural assessment is therefore carried out in a conservative manner based on information from the latest visual inspection and previous examination reports. The assessments and strengthening/remedial works should be revisited once further detailed inspections, including intrusive investigations, are carried out.	Incorrect assumptions regarding assessed rating could result in overly optimistic or conservative assessment. More detailed assessment may identify additional strengthening requirements. This could result in additional project cost.

12.1.7 Drainage and Flood Risk

Table 12.7: Drainage and Flood Risk Design Risks

ID	Risk	Impact
RG01	Limited existing information. Existing culverts, rivers or local IDB drains are potentially at a shallower depth and pose a constraint to the ditch construction and outfall connection	Additional outfalls and control chambers required where constraints are found subject to further survey of all existing culverts, rivers connections and local IDB drains. This could result in additional project cost.
RG02	Unknown construction and condition of some existing culverts	Potential work to correct structural or serviceable defects to facilitate drainage connections. This could result in additional project cost.
RG03	Limited information. Existing catchpit potentially at a shallower depth than the proposed March Station track drainage network and outfall connection	Additional work may be required to facilitate a new attenuation storage system, potentially with small pond if outfall connection levels are unfeasible. Redesign drainage network to accommodate shallower levels. The pond must be in an area substantially flat to reduce the extent of earth cutting required and to ease maintenance. This could result in additional project cost.
RG04	Proposed ditch located in close proximity to railway boundary and adjoining residential properties. There could be insufficient space to allow access for ditch maintenance. Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage following detailed topographical survey.	Additional land take required or design change. This could result in additional project cost.
RG05	Fluvial/tidal hydraulic modelling has not been undertaken at this stage of design and thus a design flood level has not been agreed. Wisbech station and associated hardstanding areas and track-side equipment have not been designed to take into account potentially necessary flood resistance and/or resilience measures e.g. raising levels. Raising levels at Wisbech station may have a knock-on effect on the proposed vertical alignment of the railway.	Potential design changes at Wisbech station and to track side equipment. This could result in additional project cost.

ID	Risk	Impact
RG06	Fluvial hydraulic modelling has not been undertaken at this stage of design and thus the capacity of existing ditches receiving third party lands and track run-off has not been assessed. Potential earth bunds required at locations without an existing ditch cannot be designed to consider necessary flood resistance e.g. rising levels.	Additional project cost to determine bund heights and installation locations.
RG07	Visual survey identified that there is insufficient existing infrastructure to prevent run-off from third party land into the rail corridor. No specific allowance has been made for mitigating this in the current drainage design.	Risk that design changes are required to address third party run-off issues and these result in increased capital costs to the scheme
RG08	Visual survey identified that several of the assumed outfall locations were not in fact outfalls. Design changes will be required to mitigate this.	There is a risk that design changes result in increased capital costs.
RG09	Visual survey identified clashes between existing and proposed ditches in some areas. Design changes will be required to address this. A detailed assessment of impacts has not been carried out that this time.	There is a risk that design changes result in increased capital costs.

12.1.8 Electrical and Plant

Table 12.8: E&P Design Risks

ID	Risk	Impact
RH01	Proposed DNO locations are not feasible or are cost prohibitive.	Alternative signalling power supply options to be determined following discussions with UK Power Networks as to feasible DNO connection locations. This could result in additional project cost.
RH02	Insufficient spare capacity of existing supply points.	Significant additional costs and programme delay due to requirements for additional/upgraded LV supplies.
RH03	Existing UTXs unfit for use due to lack of spare capacity or collapsed/blocked/degraded cable ducts.	Jetting required to existing block cable ducts prior to installation works or additional UTXs to be installed. This could result in additional project cost.

12.1.9 Telecommunications

Table 12.9: Telecommunications Design Risks

ID	Risk	Impact
RJ01	Insufficient to expand the GSM-R	Insufficient GSM-R coverage
RJ02	Life expired or insufficient spare capacity of existing Telecoms infrastructure	Unable to expand the existing system to support the project. This could result in additional project cost.

12.2 Opportunities

The following opportunities were identified during the design process.

12.2.1 Track

Table 12.10: Track Design Opportunities

ID	Opportunities	Impact
OA01	Value Engineering Opportunity - drainage ditch located on inside of curve on approach to Wisbech to save on formation	Reduction in formation and construction costs
OA02	Reuse track components around March station based on full condition assessment	Reduction in construction costs
OA03	Major redesign of March Station platforms to improve alignment between March station and Norwood road overbridge (refer risk RJ02)	Significant increase in CAPEX costs for project but reduced OPEX costs due to lower maintenance costs

12.2.2 Signalling

Table 12.11: Signalling Design Opportunities

ID	Opportunities	Impact
OB01	The Network Rail Ely-March-Peterborough resignalling project introduces ETCS Level 2 technology including in-cab signalling without lineside signals.	Reduced project costs as signals are replaced by marker boards.
OB02	The Network Rail Ely-March-Peterborough resignalling project can provide sufficient interlocking and control capacity for the March to Wisbech project with negligible additional cost/complexity	Reduced project costs. The current cost estimate allows for £1M of direct construction costs for new interlocking and control work

12.2.3 Highways

Table 12.12: Highways Design Opportunities

ID	Scheme	Opportunities	Impact
OC01	Scheme 1	Opportunity identified by CCC to reinstate Longhill Road as a through-road. It is currently closed to general traffic at the Hundred Road end as part of the layout of Whitemoor Prison.	This could remove the need to construct a grade separation at Elm Road level crossing, as traffic from March could access the old alignment of the B1101 Elm Road via Hundred Road/Longhill Road, with traffic bound for Wisbech diverted via the new B1101 alignment. This could offer a considerable cost reduction.
OC02	Scheme 4	In the Wisbech Access Study produced for CCC, the A47 alignment is shown to the north of the level crossing, rather than to the south as selected in the NR GRIP 2.	This could improve the alignment, as there are fewer property constraints. It also minimises impact on orchards, which are located to the south of the A47, and removes the need to demolish mobile homes. This could offer a cost reduction.

ID	Scheme	Opportunities	Impact
OC03	Scheme 5	An opportunity was identified to implement a rail-over-road bridge, rather than a road-over-rail bridge at the Weasenham Lane level crossing, subject to feasibility design.	This would remove the severance and visual impact issues associated with the currently proposed highway bridge. Whilst a rail bridge would be just as high, these are far fewer windows facing onto the railway corridor than onto the street meaning the impact would be lower. This opportunity could also be linked with locating Wisbech station on an elevated viaduct

12.2.4 Geotechnical

Table 12.13: Geotechnical Design Opportunities

ID	Opportunities	Impact
OD01	Revisit sections of embankment which could not be inspected due to access restrictions or dense vegetation	Complete site walkover will allow a full review of embankment conditions and may result in a reduced length of section requiring regrading. This could result in a capital cost saving.
OD02	Ground investigation to confirm ground conditions on site.	A targeted GI at locations of proposed highways works, grade separations, stations and bridges will allow for site specific ground models and parameters which could reduce pile lengths and need for improvement methods. This could result in a capital cost saving.
OD03	Settlement period for Embankments during construction – dependent on construction programme constraints	Reduced need for ground improvement and hard engineering associated with highway embankments. This could result in a capital cost saving.

12.2.5 Ancillary Civil/Stations Civil Engineering

Table 12.14: Civil Design Opportunities

ID	Opportunities	Impact
OE01	There is an opportunity to buy additional land around the proposed Wisbech station to provide a more favourable car park and “station quarter” area as part of a wider redevelopment of the area.	This would involve a revision to the design at the following design stage and additional land purchase for the area surrounding the proposed station location. Potential additional capital cost but improved connectivity for onwards travel and increased rail service demand
OE02	Fenland Council masterplan suggests a new car park area adjacent to the proposed car park at March station. There is an opportunity to, in agreement with Fenland Council, reduce the size of the proposed car park at March station	This would involve a revision of the design at the following design stage but may provide a lower overall construction cost for the project.

OE03	The proposed works involves diverting the cycle route parallel to the rail, within the assumed NR boundary, however separated from the rail corridor itself. It would be possible to relocate this diversion along the boundary fields adjacent to the NR land instead.	This would involve additional land take along the border properties. The additional land would be circa 4.8 square kilometres of additional agricultural land to the west of the rail corridor.
OE04	There is an opportunity at the following design stage to review the level crossing closures. If alternate options are found to be grossly disproportionate, there is a possibility to retain some of the existing crossings as open crossings.	This would require a review of the design but would reduce the overall capital cost of the scheme.
OE05	There is an opportunity at the following design stage to refine the position of the footbridge landing onto Platform 4 at March station. The current proposal provides a non-compliant walkway width however this could be avoided by demolishing part of the existing masonry wall behind the platform. Further information on the potential design alterations are detailed in Section 5.6.3.2.	As shown the design would require a derogation to standards however alternate options would involve partial demolition of parts of the historic station. It is expected this proposal would face strong opposition and so agreement with local stakeholders should be sought prior to design development being undertaken.

12.2.6 Bridges & Civil Structures

Table 12.15: Structural Design Opportunities

ID	Opportunities	Impact
OF01	Detailed topographic survey and flood study at Twenty Foot River Bridge at the design stage.	Potential reduction in abutment height and earthworks. This could result in a capital cost saving.

12.2.7 Drainage and Flood Risk

Table 12.16: Drainage and Flood Risk Design Opportunities

ID	Opportunities	Impact
OG01	Provide attenuation volume at March station using a pond.	This would involve a revision to the design at the following design stage and may result in a reduction to the depth of construction to connect the proposed drainage network to the outfall point. This could result in a capital cost saving. Opportunity CLOSED: Validated by survey data
OG02	Provide more planting outside Wisbech Station/March Station and incorporation of SuDS features.	This would involve a revision to the proposed layout at the next stage. Any planting would need to be included within the maintenance routine.
OG03	Potential to provide biodiversity and amenity benefits at Weasenham Lane with the proposed basin.	Ecologist/Environmentalist to be co-ordinated with at next stage.

ID	Opportunities	Impact
OG04	Weasenham Lane. Replace proposed geo-cellular attenuation with SuDS attenuation feature subject to purchasing of land.	Design would be revised to incorporate SuDs attenuation feature. This would provide improved water quality, biodiversity and amenity against underground storage.
OG05	Opportunity at the next stage to agree with IDB a catchment wide strategy to provide volume to the IDB network allowing for free discharges.	This has the potential to reduce land take adjacent to the proposed highways. This could result in a capital cost saving.
OG06	Potential to be retain and utilise existing drainage ditch within the railway boundary at locations that clash with the proposed ditch.	This would require a detailed topographical survey and assessment during the next design stage to confirm ditch capacity to receive additional track surface run-off. Potential to reduce the excavation quantity associated with track drainage
OG07	Outfall to existing ponds near chainage 138+450	This would involve redesign drainage network to outfall to the nearby existing pond via a control chamber positioned after underground attenuation tank. A new headwall will be required at the pond to accommodate the new outfall. Removes need for undertrack crossing for current outfall to existing catchpit.

12.2.8 Electrical and Plant

Table 12.17: E&P Design Opportunities

ID	Opportunities	Impact
OH01	Conduct a site survey to inspect PHCC's and determine existing spare capacity.	Re-utilise existing infrastructure to supply proposed points heating. This could result in a capital cost saving.
OH02	Combined E&P and Signalling assets within a single REB at Coldham station road, subject to NR agreement.	Reduced civils design and installation requirements. This could result in a capital cost saving.
OH03	Electric vehicle charging points at both March and Wisbech proposed station car parks.	With the two large car parks proposed this allows ample space for the inclusion of Electric Vehicle charging points. This provides future provision for what will be a far more common vehicle and sought-after utility at car parks.

12.2.9 Telecommunications

Table 12.18: Telecommunications Design Opportunities

ID	Opportunities	Impact
OJ01	Conduct a site survey to inspect cable route capacity to determine spare capacity.	Re-utilise existing infrastructure for new/amended cables. This will reduce the civils works. This could result in a capital cost saving.
OJ02	Utilise existing GSM-R REB / Node to support the scheme, following detailed survey and condition assessment.	Reduces Cabling, Civils, GSM-R, E&P works by reducing new GSM-R REB's / Nodes. This could result in a capital cost saving.

13 Full Business Case Cost Estimate

The full business case cost estimate been developed based on the preferred infrastructure option 4C as described in Section 5 and the GRIP 3 engineering drawings detailed in Section 8.1. The complete estimate breakdown is provided in Appendix A.

13.1 Assumptions and Exclusions

The following assumptions and exclusions have been used to develop the cost estimate

13.1.1 General Assumptions

1. Base date of the estimate is 4Q19
2. Works generally expected to be carried out in normal working hours 08:00 to 18:00, Monday to Friday. Possession working has been allowed for any items associated with connecting to the existing infrastructure and on operational station platforms
3. Allowances have been included where sufficient information is not currently available to allow us to estimate the works. These have been clearly identified in the estimate and will require validation when further information becomes available
4. All excavated and disposed material is assumed as inert unless noted otherwise.
5. Land deemed relatively flat
6. No hard excavation required for any element of the scheme
7. Topsoil can be reused - no imported topsoil needed
8. Where possible budget quotations have been used from specialist subcontractors
9. Allowance (2.5% of the Base Cost Estimate) for environmental mitigation measures is included.
10. No inflation has been applied. Appropriate allowances for inflation will be made in the economic and financial cases
11. Unless noted otherwise, desktop data such as OS and Google maps has been used to assess the existing site assets. This information may be out of date.
12. All Civils works including Rail Systems to be self-delivered by the Main Contractor (no sub-contractor preliminary or OH&P costs allowed).
13. Risk, contingency and optimism bias has been excluded on the basis that appropriate allowances will be made in the economic and financial cases of the Business Case.
14. Quantities have been provided by the design team for the major elements of the work and a spot check has been made to high value items. A full measurement has been undertaken by the Estimating team for the bridge structures, March Station footbridge, March and Wisbech Station car parks, drainage to the highway works, signalling and permanent way.
15. The costs for the remedial works to Chain Bridge WIG 2314, Mulbary Drain WIG 2315, Waldersey Drain WIG 2317 and Redmoor Drain WIG 2319 have been provided by the MM Design team and reviewed by the cost estimating team. The remedial costs for the deck replacement to Chain Bridge WIG 2314 includes for bridge repairs, replacement of waybeams and timber decking and high mileage abutment reconstruction
16. 10% of the direct works cost has been included to cover all Temporary works

13.1.2 General Exclusions

1. Risk and contingency (to be applied in the economic and financial cases as appropriate)
2. Optimism Bias (to be applied in the economic and financial cases as appropriate)
3. VAT
4. 3rd party compensation costs
5. Planning, consents, approval charges etc.
6. Land purchase or rental
7. Costs associated with Statutory Fees (e.g. HMRI, Local Authority, etc.)
8. Costs associated with taxes, levies and licences
9. Costs associated with changes in legislation and any form of applicable standards
10. Allowances for unforeseen ground conditions / provisions for ground stabilisation unless specifically stated
11. Christmas, Easter and Bank Holiday working
12. Archaeological digs
13. Re-location of affected businesses
14. Planting of new trees
15. Contaminated land unless noted otherwise
16. Cost of Work done

13.1.3 Discipline Specific Assumptions and Exclusions

13.1.3.1 Railway Control Systems

1. Estimate includes a cost for SSI, but interlocking will be delivered by a different resignalling scheme at a later date, for example the Network Rail Ely-March-Peterborough resignalling project as identified in Table 12.11.
2. Train detection systems; relocatable building - Type 7
3. Abandonment, recovery and disposal of redundant equipment; REB Type 7 - 9.6 x 2.4. 3m high
4. Allowance for new interlocking and control works including data preparation, train describers etc £1,000,000

13.1.3.2 Permanent Way

1. Disposal of existing ballast is to be 90% inert, 10% hazardous

13.1.3.3 Civil Engineering

1. 1nr streetlight located every 20m
2. No allowance has been made for traffic signals to be installed or replaced
3. Existing highway assumed to be 450mm thick
4. New ditches to be 0.5m wide and 1m deep
5. Road markings based on m2 of new surface area
6. Traffic signs located every 100m
7. All assumptions for March Station footbridge are included in the estimate
8. Tensar TW3 or similar for blockwork wingwalls to bridges

9. C32/40 concrete to all foundations
10. Allowance of 15% of steelwork value for footbridge and lift steelwork at March station for miscellaneous items, connections, etc.
11. Reinforcement to piles, pile caps, base slabs, walls and piers allowed at 175kg/m3.
12. Vibro Stone Column priced for 500mm dia.
13. Track drainage will be laid before track installation.
14. Track drainage - new structures will make allowance for new pipe run
15. Imported Topsoil; Class 5B will be used for embankment regrade slopes
16. Flow control chamber 2.5m deep
17. Seeding to embankment regrade slopes

13.1.3.4 Enabling Works

1. Allowed for general site and vegetation clearance based on the Highways GA drawings.
2. March Station Clearance of woodland assumed 1 tree every 10m2
3. Utility diversionary costs received from Open reach, Virgin Media, UK Power Networks, Cadent Gas and Anglian Water

13.2 Cost Estimate

The estimated cost of the proposed scheme is £178,323,600 excluding risk, contingency and optimism bias. A breakdown of the estimate in terms of individual scheme components and cost items is provided in Table 13.1 and Table 13.2 below.

Table 13.1: Cost estimate for proposed scheme components

Scheme Component	Project Cost Estimate
Highway Scheme 1 Elm Road	£26,652,405
Highway Scheme 2 Coldham Grade	£8,742,837
Highway Scheme 3 Holly Bank/Crooked Bank & Broad Drove	£15,394,536
Highway Scheme 4 A47	£11,072,201
Highway Scheme 5 Weasenham Lane	£3,327,409
March Station Car Park	£2,944,128
Wisbech Station Car Park	£3,259,041
Weasenham Bridge	£2,981,247
A47 Wisbech Bridge	£1,232,589
Broad Drive Bridge	£1,238,288
Holly - Crooked Bank Bridge	£922,998
Coldham Bridge	£1,240,446
Elm Road Bridge	£1,238,527
Twenty Foot River Bridge	£1,548,558
Rail Underbridges	£3,059,503
March Station Footbridge	£3,836,290
Track Embankment Regrade & Track Drainage	£4,927,990
March Station Ancillary Civils	£1,353,932
Wisbech Station Ancillary Civils	£1,295,707
Lineside Ancillary Civils	£6,618,466

Scheme Component	Project Cost Estimate
Heavy Rail Option 4C: • Railway Control Systems • Electric Power and Plant • Permanent Way • Operational Telecoms	£56,426,088
Lineside Ancillary Civils 4C	£916,578
C3 Utility Costs	£18,093,836
Project Total	**£178,323,600 ***

* excluding risk, contingency and optimism bias

Table 13.2: Cost estimate by item

Cost Item	Project Cost Estimate
DIRECT CONSTRUCTION COSTS	**£94,647,705**
Railway Control Systems	£4,064,436
Electric Power and Plant	£2,303,234
Permanent Way	£19,490,606
Operational Telecommunications Systems	£577,778
Buildings and Property	£747,130
Civil Engineering	£66,624,394
Enabling Works	£840,127
INDIRECT CONSTRUCTION COSTS	**£46,140,792**
Contractors Preliminaries	£23,661,926
Contractors Method Related Temporary Works	£9,464,771
Contractors Overhead and Profit	£13,014,095
BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£140,788,497**
DESIGN COSTS	**£17,463,705**
Stated Project Phase Design Fees	£17,463,705
PROJECT MANAGEMENT COSTS	**£16,211,236**
Client Project Organisation	£16,211,236
OTHER PROJECT COSTS	**£3,860,162**
Environmental Mitigations (2.5% of Base Cost Estimate)	£3,519,712
Schedule 4 costs (on Possession Working only) - 11%	£267,496
Possession Management and Isolations (on Possession Working only) - 3%	£72,954
Project Total	**£178,323,600 ***

*excluding risk, contingency and optimism bias

14 Conclusions and Recommendations

14.1 Conclusions

To reinstate a 2 trains per hour heavy rail passenger service between March and Wisbech with provision for future services operating through to Cambridge, it is necessary to build a large amount of new infrastructure. Key recommendations for infrastructure are:

- At March Station an additional operational platform is needed. A new operational platform at the West End of the old platform 3 is recommended, with an available capacity for a 2-Car Class 170 train and passive provision for a 4-car train;
- A revised track layout at March is required to serve the reinstated platform 3. The preferred option is to re-open a bi-directional platform 3 with the track diverging from the Up Main at the approximate location of the existing March East level crossing;
- To maintain step free access at March a new station footbridge is required.
- A new signalling layout at March including provision of nine new signals
- A single bi-directional line between Whitemoor Junction and Wisbech
- A passing loop at Coldham approx. 350m long
- A new signalling infrastructure between Whitemoor Junction and Wisbech including provision of eight new signals
- A single end fed signalling power supply should be implemented
- A new Wisbech Station with a single platform to accommodate a 2-car Class 170 train with passive provision for a 4-car train,
- Closure of the 22 existing level crossings through construction of 5 highway diversion schemes. These schemes include 7 new overline bridges.

The estimated capital cost of the proposed infrastructure is approximately £178m, excluding optimism bias, risk and opportunity.

14.2 Recommendations

The following sections document the key recommendations to enable the following:

- Complete the Network Rail GRIP 3 stage gate approval;
- Provide inputs required for GRIP 4 design;
- Consideration of key items for design development at GRIP 4

14.2.1 Site Surveys

Prior to the development of the design, it is recommended that the following surveys are undertaken to facilitate all designs:

- Detailed bridge inspection and post-blast inspection
- Topographical survey
- Cable route (Utilities) tag and trace survey
- Drainage survey
- Ground investigations
- Station buildings condition survey

- Lux level survey for existing platforms at March station
- Baseline lighting survey
- Passenger count survey
- Road Sign survey
- Buried services survey
- Site walkout to areas which could not be inspected due to access restrictions or dense vegetation

14.2.2 Stakeholder consultation

Engagement with numerous stakeholders will be required to inform GRIP 4 design development. Examples of key areas of stakeholder engagement include consultation with:

- Network Rail regarding various aspects of the proposed rail infrastructure.
- Landowners, business owners and community interest groups regarding proposals for Wisbech Station.
- Fenland District Council, the current SOC (Abelio Greater Anglia), landowners, business owners, and community interest groups regarding proposals for March Station.
- Cambridgeshire County Council, Highways England, landowners, business owners, developers and community interest groups regarding proposed highway schemes.
- Cambridgeshire County Council, the ORR, landowners, and community interest groups regarding proposed level crossing closures.

A detailed stakeholder mapping exercise should be undertaken as part of the GRIP 4 work. A list of key stakeholders already identified is provided in Appendix H of the Full Business Case.

14.2.3 Assurance

Prior to further development of the design the following key project assurance activities need to be undertaken

- Complete GRIP 3 process and deliverables (refer to Section 14.2.4 below)
- Draft preliminary system definition
- Common Safety Method (CSM) significance assessment
- Interoperability assessment
- Appoint Authorised Body (AsBo) and Notified Body (NoBo) as required

14.2.4 GRIP 3 Deliverables

A definitive list of deliverables to complete the GRIP 3 stage gate approval will need to developed in conjunction with Network Rail subject to project characterisation and the assurance activities detailed above in Section 14.2.3.

Section 14.2.4 defines the key engineering management documents that are anticipated to complete the GRIP 3 process. Sections 14.2.6 (Track), 14.2.7 (Signalling), 14.2.10 (Telecommunications), 14.2.11 (Ancillary Civil/Stations Civil Engineering) and 14.2.14 (Electrical and Plant) provide details of the key rail engineering documents that are anticipated to complete the GRIP 3 process. These items were previously discussed in Section 4 (Assumptions and

Exclusions) of the Scoping Note[25] and Section 4 of the Network Rail - March to Wisbech Report Review[26]

14.2.5 Engineering Management

- Maintenance Strategy
- System Migration Plan
- Route Requirements Document (Network Rail)
- Security Plan
- Project Survey Strategy
- EMC Strategy
- Systems Engineering Management Plan (SEMP)
- Requirements Management Plan
- Verification and Validation (V&V) Strategy
- Constructability Report
- Operations Migration Plan
- Inter Disciplinary Design Check (IDC)/ Inter Disciplinary Design Review (IDR) with Network Rail
- Testing & Commissioning Plan

14.2.6 Track

- Redesign based on accurate (topographical) survey information
- Early engagement with NR required to determine feasibility of the geometry around March Station. This will be a key risk to the scheme as this proposal imports ongoing issues and may require some level of whole life costing to be undertaken to support it.
- Confirm rolling stock design in consultation with potential operators as input to station platforms and passing loop lengths.
- Anticipated deliverables required to complete the Network Rail GRIP 3 stage gate approval:
  - Remote condition monitoring plan (if required by Network Rail)

14.2.7 Signalling

- Early engagement with NR required to determine interface with main line (Ely – Peterborough) signalling strategy.
- Driveability assessment of proposed signalling layout
- Anticipated deliverables required to complete the Network Rail GRIP 3 stage gate approval:
  - Interlocking Data Development Plan
  - Signalling Test Strategy
  - (Emergency) Alarm Strategy
  - Braking Calculations
  - Correlation Reports or Waivers
  - Equipment Housing Form
  - Prevention and Mitigation of Overruns Risk Assessment

[25] Reference 1 in Table 2.1
[26] Reference 5 in Table 2.1

- Train Protection and Warning System Fitment Criteria and Effectiveness report
- Automatic Route Setting specifications
- Operator Screen Layout

14.2.8 Highways

14.2.8.1 Level Crossing Risk Assessment

It is recommended that level crossing risk assessments are undertaken to determine whether the cost of any of the proposed level crossing closure schemes is disproportionate to the safety benefit achieved and whether alternative open level crossing solutions achieve ALARP risk levels.

14.2.8.2 Sub-option review

As discussed in Section 12.1.3, it is recommended that the selection of sub-options for Schemes 2 and Scheme 5 be reviewed prior to any further design development being undertaken due to hazards identified.

In Section 12.2.3, opportunities have been identified for option improvements for schemes 1, 4 and 5. It is recommended that the feasibility of the alternatives proposed is explored, and compared against the currently proposed option prior to further design development being undertaken.

As noted previously a parallel work stream is currently being undertaken for additional highways feasibility design work, to address key RSA comments on Schemes 1 and 2 (Refer to Table 12.3: Highways Design Risks and Appendix P).

14.2.8.3 Design Development

Design development at the next stage, will include:

- Carrying out a Walking, Cycling and Horse Riding Assessment (WCHAR) in incorporating any relevant findings.
- Alignment review and update, based on topographical and utilities survey results
- Updated pavement design based on ground investigations.
- Road signs and markings design
- Street lighting design
- Updated VRS design

14.2.9 Geotechnical

14.2.9.1 Ground Investigation

At the next stage a project specific Ground Investigation should be completed to categorise ground conditions at each design location to inform ground models and characteristic parameters for design.

14.2.9.2 Design Development

Design development at the next stage would include:

- Specification of Ground investigation – to vastly reduce ground risks related to uncertainty of conditions due to lack of information.

- Update to geotechnical designs following confirmation of ground conditions from the ground investigation – Ancillary civils foundations, structure foundations, pile length sizes and spacings for bridge separations, earth retaining structures, highways embankments and settlement control measures and through alignment embankment remedial works.
- As the design is developed further it would be prudent to explore the potential of allowing settlement periods for the embankments and earth retaining structures. Should the construction programme allow for lengthy settlement periods (between embankment construction and subsequent elements of the work such as highway surfacing and bridge deck installation) it could be possible to accept a higher level of overall settlement. This would reduce the quantity and cost of hard engineering solutions required.

14.2.10 Telecommunications

14.2.10.1 Surveys and outstanding tasks

Prior to the development of the next design stage, it is recommended that the following surveys and outstanding tasks are undertaken:

- Trackside survey of Telecoms infrastructure in the March/Whitemoor Junction Area
- Survey of GSM-R base station at March East following receipt of propagation surveys/As-builts form NRT
- Survey in the Coldham area for a new repeater location and any infill sites
- Survey March East Signal Box and TOC Control Centre
- Intrusive Tag & Trace survey of March station
- Requirements of TVMs to be agreed with TOC
- Establish spare capacity of the SISS head end equipment

14.2.10.2 Design Development

Design development at the next stage, will include:

- Development of Telecoms AIP design
  - Utilising FOV software
  - Acoustic modelling
- Production of drawings; site layouts and schematics
- Engage with Network Rail

14.2.11 Ancillary Civil/Stations Civil Engineering

It is recommended that an agreed location is confirmed for the station and car park area at Wisbech station to tie in with the master planning strategy, prior to any further design development.

Design development at the next stage will include:

- Review of preferred location to land footbridge at March station Platform 4
- A diversity impact assessment for the stations
- A microsimulation pedestrian modelling analysis for the stations
- Review and development of the GRIP 3 design, based on additional survey information
- Confirmation and incorporation of NR/TOC requirements at the stations including the ticket office/waiting area at Wisbech

- Assessment of existing infrastructure at March station and suitability for modification
- Developing a fire strategy for the stations
- Developing a signage strategy for the stations
- Review gauging clearances through station including structure gauge for existing canopies
- Investigate pedestrian routes south of the Wisbech station as far as Weasenham Lane to improve connectivity

14.2.12 Bridges & Civil Structures

Further detailed inspections, including intrusive investigations, will be beneficial in terms of developing more efficient designs of remedial and strengthening works. Repair schedules shall be produced based on the detailed inspections, which include detailed measurement of defects, i.e. precise dimensions, location and severity of the defect. This information will be used to confirm the viability of the proposed remedial and strengthening works.

For all metallic elements of the structures, it will be beneficial to carry out detailed inspections following blast cleaning. With rust and loose materials removed, more defects may be revealed after the blast cleaning. Alternatively, the severity of the defects could be lower than what was considered during the visual inspection.

For Chain Bridge, the top side of the structure was not accessible during previous visual inspections due to missing timber decking. Therefore, temporary access will be required for the detailed inspection. The high mileage abutment shall be inspected thoroughly, for example core sampling shall be included, before any detailed design of the reconstruction works is carried out. Vegetation surrounding the low mileage abutment needs to be adequately removed for the additional span bearings and bankseat to be inspected in detail.

A detailed topographic survey should be carried out at all new structure locations. A flood study should be carried out at Twenty-Foot river.

14.2.13 Drainage and Flood Risk

14.2.13.1 Surveys

Prior to the development of the design, it is recommended that the following surveys are undertaken to facilitate all designs:

- Full Detailed Survey of all drainage features associated with the existing culverts, river connections and IDB drains upstream and downstream of the railway corridor within the NR boundary extents.
- Drainage CCTV survey and topographical surveys at the proposed Wisbech Station site and external works sites at March Station, including local ponds south of the Norwood overbridge
- CCTV drainage survey of the existing drainage in March Station, including track drainage network

14.2.13.2 Design Development

Design development at the next stage, will include:

- Assessing the drainage condition of all existing culverts
- Prepare a preliminary drainage hydraulic model
- Review and update of the GRIP 3 design, based on additional survey information

- Liaise with IDB on discharge flow rates and connection points
- Production of design details (e.g. UTXs, outfall connections, typical sections, collection and attenuation systems)
- Hydraulic model and assessment of existing ditches receiving third party lands and track run-off based on additional survey information
- Assessment of flooding conditions at catchments identified for potential earth bund installation
- Potential amendment to outfall location subject to positive survey of nearby ponds at March Station

14.2.14 Electrical and Plant

14.2.14.1 Surveys

Prior to the development of the GRIP 4 design, it is recommended that the following surveys are undertaken:

- Trackside survey of electrical infrastructure in the March/Whitemoor Junction Area
- A site walkover at the pertinent areas for DNOs and PSPs is required.

14.2.14.2 Design Development

Design development at the next stage, will include:

- Development of Signalling Power single option 'EP3'
- Engage with Network Rail
- Engage with DNO
- Production of outline electrical calculations for;
  - Signalling Power
  - Points Heating
  - Station M&E
  - Car park lighting
- Production of drawings; site layouts and schematics
- Production of individual specification reports for each design output

14.2.15 Utilities Diversions

C3 returns have been provided separately by each affected utility provider Design development at the next phase will include:

- Coordination of utilities diversion proposals
- Consideration of sequencing of utilities diversions
- Assessment and development of maintenance access provision for utilities during and after construction

15 Appendices

A. Full Business Case Cost Estimate

MOTT MACDONALD

Mott MacDonald

March to Wisbech

Proposed Transport Corridor

May 2020

Issue and Revision Record:

Rev.	Date	Originator	Checked	Approved	Description
00	14-Feb-20	J. Cullen, N. Gillam, S. Stallwood	M Jones	R Walker	Issued for internal review
01	27-Feb-20	J. Cullen, N. Gillam, S. Stallwood	M Jones	R Walker	Issued for internal review
02	28-Feb-20	J. Cullen, N. Gillam, S. Stallwood	M Jones	R Walker	Issued for internal review
03	4-Mar-20	J. Cullen, N. Gillam, S. Stallwood	M Jones	R Walker	Issued for client review
04	29-Apr-20	J. Cullen, N. Gillam, S. Stallwood	M Jones	R Walker	Incorporates changes from Design Survey
05	15-May-20	N. Gillam	M Jones	R Walker	Incorporates C3 utility budget estimates.
06	31-May-20	N. Gillam	M Jones	R Walker	Gas C3 utility budget estimate added.

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35 Newhall Street
Birmingham B3 3PU

General Assumptions

1 Base date of the estimate is 4Q19
2 Works generally expected to be carried out in normal working hours 08:00 to 18:00, Monday to Friday. Possession working has been allowed for any items associated with connecting to the existing infrastructure and on operational station platforms
3 Allowances have been included where we have not received sufficient information to allow us to price the works
4 All excavated and disposed material is assumed as inert unless noted otherwise
5 Land deemed relatively flat
6 No hard excavation required for any element of the scheme
7 Topsoil can be reused - no imported topsoil needed
8 Where possible budget quotations have been used from specialist subcontractors
9 Allowance (2.5% of the Base Cost Estimate) for environmental mitigation measures is included.
10 No inflation has been applied. Appropriate allowances for inflation will be made in the economic and financial cases of the Business Case.
11 Unless noted otherwise, desktop data such as OS and Google maps has been used to assess the existing site assets. This information may be out of date.
12 All Civils works including Rail Systems to be self delivered by the Main Contractor (no sub-contractor preliminary or OH&P costs allowed).

13 Risk, contingency and optimism bias has been exlcuded on the basis that appropriate allowances will be made in the economic and financial cases of the Business Case.

14 Quantities have been provided by the design team for the major elements of the work and a spot check has been made to high value items. A full measurement has been undertaken by the Estimating team for the bridge structures, March Station footbridge, March and Wisbech Station car parks, drainage to the highway works, signalling and permanent way.

15 The costs for the remedial works to Chain Bridge WIG 2314, Mulbary Drain WIG 2315, Waldersey Drain WIG 2317 and Redmoor Drain WIG 2319 have been provided by the MM Design team and reviewed by the cost estimating team. The remedial costs for the deck replacement to Chain Bridge WIG 2314 includes for bridge repairs, replacement of waybeams and timber decking and high mileage abutment reconstruction
16 10% of the direct works cost included to cover all Temporary works

17 Please see estimate sheets for further comments

Specific Option Exclusions and Assumptions

1.01 Railway Control Systems

1 Estimate includes a cost for SSI but interlocking will be delivered by a different resignalling scheme at a later date.
2 Train Detection Systems; Relocatable Building - Type 7
3 Abandonment, Recovery and Disposal of Redundant Equipment; REB Type 7 - 9.6 x 2.4. 3m high
4 Allowance for new interlocking and control works including data preparation, train describers etc £1,000,000

1.03 Electric Power and Plant

1.04 Permanent Way

1 Disposal of existing ballast is to be 90% inert, 10% hazardous

1.05 Operational Telecommunications Systems

1.07 Civil Engineering

1 1nr street light located every 20m
2 No allowance has been made for traffic signals to be installed or replaced
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4 New ditches to be 0.5m wide and 1m deep
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7 All assumptions for March Station footbridge are included in the estimate
8 Tensar TW3 or similar for blockwork wingwalls to bridges

9 C32/40 concrete to all foundations
10 We have allowed 15% of steelwork value for footbridge and lift steelwork at March station for miscellaneous fixtures and fittings.
11 Reinforcement to piles, pile caps, base slabs, walls and piers allowed at 175kg/m3.
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13 Track drainage will be laid before track installation
14 Track drainage - new structures will make allowance for new pipe run
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16 Flow control chamber 2.5m deep
17 Seeding to embankment regrade slopes

1.08 Enabling Works

1 Allowed for general site and vegetation clearance based on the Highways GA drawing.
2 March Station Clearance of woodland assumed 1 tree every 10m2
3 Utility diversionary costs received from Open reach, Virgin Media, UK Power Networks, Cadent Gas and Anglian Water

General Exclusions

1 Risk and Contingency (to be applied in the economic and financial cases as appropriate)
2 Optimism Bias (to be applied in the economic and financial cases as appropriate)
3 VAT
4 3rd party compensation costs
5 Planning, consents, approval charges etc.
6 Land purchase or rental
7 Costs associated with Statutory Fees (e.g. HMRI, Local Authority, etc.)
8 Costs associated with taxes, levies and licences
9 Costs associated with changes in legislation and any form of applicable standards
10 Allowances for unforeseen ground conditions / provisions for ground stabilisation unless specifically stated
11 Christmas, Easter and Bank Holiday working
12 Archaeological digs
13 Re-location of affected businesses
14 Planting of new trees
15 Contaminated land unless noted otherwise
16 Cost of Work Done

DRAWINGS REGISTER

MOTT MACDONALD

Ref:	Title	Revision
398128-MMD-00-XX-DR-H-0101 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 1 of 11	P03
398128-MMD-00-XX-DR-H-0102 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 2 of 11	P03
398128-MMD-00-XX-DR-H-0103 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 3 of 11	P03
398128-MMD-00-XX-DR-H-0104 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 4 of 11	P03
398128-MMD-00-XX-DR-H-0105 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 5 of 11	P03
398128-MMD-00-XX-DR-H-0106 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 6 of 11	P03
398128-MMD-00-XX-DR-H-0107 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 7 of 11	P03
398128-MMD-00-XX-DR-H-0108 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 8 of 11	P03
398128-MMD-00-XX-DR-H-0109 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 9 of 11	P03
398128-MMD-00-XX-DR-H-0110 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 10 of 11	P03
398128-MMD-00-XX-DR-H-0111 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Sheet 11 of 11	P03
398128-MMD-00-XX-DR-H-0112 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 1 Junction Modications Sheet 12 of 12	P01
398128-MMD-00-XX-DR-H-0201 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 2 Sheet 1 of 3	P03
398128-MMD-00-XX-DR-H-0202 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 2 Sheet 2 of 3	P03
398128-MMD-00-XX-DR-H-0203 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 2 Sheet 3 of 3	P03
398128-MMD-00-XX-DR-H-0301 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 3 Holly Bank/ Crooked Bank Sheet 1 of 2	P03
398128-MMD-00-XX-DR-H-0302 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 3 Holly Bank/ Crooked Bank Sheet 2 of 2	P03
398128-MMD-00-XX-DR-H-0321 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 3 Broad Drove Sheet 1 of 4	P03
398128-MMD-00-XX-DR-H-0322 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 3 Broad Drove Sheet 2 of 4	P03
398128-MMD-00-XX-DR-H-0323 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 3 Broad Drove Side Sheet 3 of 4	P03
398128-MMD-00-XX-DR-H-0324 (1)	March to Wisbech Transport Corridor Highways General Arrangement Scheme 3 Broad Drove Link Sheet 4 of 4	P03
398128-MMD-00-XX-DR-H-0401 (1)	March to Wisbech Transport Corridor Highways General Arrangement A47 Wisbech Bypass Sheet 1 of 2	P03
398128-MMD-00-XX-DR-H-0402 (1)	March to Wisbech Transport Corridor Highways General Arrangement A47 Wisbech Bypass Sheet 2 of 2	P03
398128-MMD-00-XX-DR-H-0501 (1)	March to Wisbech Transport Corridor Highways General Arrangement Weasenham Lane Sheet 1 of 1	P03
398128-MMD-00-XX-DR-H-1000-A1-000 (1)	March to Wisbech Transport Corridor Wisbech Station Car Park Sheet 1 of 1	P02
398128-MMD-00-XX-DR-H-1001-A1-000 (1)	March to Wisbech Transport Corridor March Station Car Park Sheet 1 of 1	P02
398128-MMD-00-XX-DR-H-1201 (1)	March to Wisbech Transport Corridor Highways Typical Cross Sections Sheet 1 of 2	P02
398128-MMD-00-XX-DR-H-1201 (3)	March to Wisbech Transport Corridor Highways Typical Cross Sections Sheet 1 of 2	P02
398128-MMD-00-XX-DR-H-1202 (1)	March to Wisbech Transport Corridor Highways Typical Cross Sections Sheet 2 of 2	P03.1
398128-MMD-00-XX-DR-H-3000 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 1 of 20	P02.1
398128-MMD-00-XX-DR-H-3001 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 2 of 20	P02.1
398128-MMD-00-XX-DR-H-3002 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 3 of 20	P02.1
398128-MMD-00-XX-DR-H-3003 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 4 of 20	P02.1
398128-MMD-00-XX-DR-H-3004 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 5 of 20	P02.1
398128-MMD-00-XX-DR-H-3005 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 6 of 20	P02.1
398128-MMD-00-XX-DR-H-3006 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 7 of 20	P02.1
398128-MMD-00-XX-DR-H-3007 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 8 of 20	P02.1
398128-MMD-00-XX-DR-H-3008 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 9 of 20	P02.1
398128-MMD-00-XX-DR-H-3009 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 10 of 20	P02.1
398128-MMD-00-XX-DR-H-3010 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 11 of 20	P02.1
398128-MMD-00-XX-DR-H-3011 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 12 of 20	P02.1
398128-MMD-00-XX-DR-H-3012 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 13 of 20	P02.1
398128-MMD-00-XX-DR-H-3013 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 14 of 20	P02.1
398128-MMD-00-XX-DR-H-3014 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 15 of 20	P02.1
398128-MMD-00-XX-DR-H-3015 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 16 of 20	P02.1
398128-MMD-00-XX-DR-H-3016 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 17 of 20	P02.1
398128-MMD-00-XX-DR-H-3017 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 18 of 20	P02.1
398128-MMD-00-XX-DR-H-3018 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 19 of 20	P02.1
398128-MMD-00-XX-DR-H-3019 (1)	March to Wisbech Transport Corridor Combined C2 Utilites Plan Sheet 20 of 20	P02.1
Drainage Track		
398128-MMD-00-XX-DR-D-1001 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Ch 138,08 - Ch 138.50 March Station Option 2B Sheet 1 of 12	P01.1
398128-MMD-00-XX-DR-D-1002 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Ch 138.50 - Ch 138.77 March Station Option 2B Sheet 2 of 12	P01.1
398128-MMD-00-XX-DR-D-1003 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Ch 138.600 - Ch 139.900 Sheet 3 of 12	P01.1
398128-MMD-00-XX-DR-D-1004 (1)	March to Wisbech Transport Track Drainage Plan and Profile Design Ch 139.900 - Ch 141.200 Sheet 4 of 12	P01.1
398128-MMD-00-XX-DR-D-1005 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Design Ch 141.200 - Ch 142.500 Sheet 5 of 12	P01.1
398128-MMD-00-XX-DR-D-1006 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Design Ch 141.500 - Ch 143.800 Sheet 6 of 12	P01.1
398128-MMD-00-XX-DR-D-1007 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Design Ch 143.800 - Ch 145.100 Sheet 7 of 12	P01.1
398128-MMD-00-XX-DR-D-1008 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Design Ch 145.100 - Ch 146.400 Sheet 8 of 12	P01.1
398128-MMD-00-XX-DR-D-1009 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Design Ch 146.400 - Ch 147.700 Sheet 9 of 12	P01.1
398128-MMD-00-XX-DR-D-1010 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Design Ch 147.700 - Ch 149.000 Sheet 10 of 12	P01.1
398128-MMD-00-XX-DR-D-1011 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Design Ch 149.000 - Ch 150.100 Sheet 11 of 12	P01.1
398128-MMD-00-XX-DR-D-1012 (1)	March to Wisbech Transport Corridor ELR:WIG Track Drainage Plan and Profile Design Ch 150.100 - Ch 150.410 Sheet 12 of 12	P01.1
Highways Drainage		
398128-MMD-00-XX-DR-D-0101	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 1 - Elm Road Roundabout Sheet 1 of 10	P03.1
398128-MMD-00-XX-DR-D-0102	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 1 - B1101 + Elm Road Sheet 2 of 10	P03.1
398128-MMD-00-XX-DR-D-0103	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 1 - B1101 Sheet 3 of 10	P03.1
398128-MMD-00-XX-DR-D-0104	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 1 - B1101 Sheet 4 of 10	P03.1
398128-MMD-00-XX-DR-D-0201	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 2 - Coldham Bridge Sheet 5 of 10	P03.1
398128-MMD-00-XX-DR-D-0301	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 3 - Holly Bank / Crooked Bank Sheet 6 of 10	P03.1
398128-MMD-00-XX-DR-D-0302	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 3 - Broad Drove Road Sheet 7 of 10	P03.1
398128-MMD-00-XX-DR-D-0303	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 3 - Broad Drove Road Sheet 8 of 10	P03.1
398128-MMD-00-XX-DR-D-0401	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 4 - A47 Wisbech Bypass Sheet 9 of 10	P03.1
398128-MMD-00-XX-DR-D-0501	March to Wisbech Transport Corridor Proposed Highway Drainage General Arrangement Scheme 5 - Weasenham Lane Sheet 10 of 10	P03.1
	150mm Square Flap Valve	
	ACO KerbDrain SP480 Installation Detail Drawing	
	ACO -4960 -KerbDrain SP480 500mm Channel -AC0 A3	
	Drainage information memo 14/01/20	
	Road Gully	
	Stainless steel 316 100mm Flat Orifice Plate	
Track		
398128-MMD-00-XX-DR-P-0001 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 138.08 - Ch 138.60 Sheet 1 of 14	P03.1
398128-MMD-00-XX-DR-P-0002 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 138.60 - Ch 138.50 Sheet 2 of 14	P03.1
398128-MMD-00-XX-DR-P-0003 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 138.50 - Ch 138.77 Sheet 3 of 14	P03.1
398128-MMD-00-XX-DR-P-0004 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 138.600 - Ch 139.900 Sheet 4 of 14	P03.1
398128-MMD-00-XX-DR-P-0005 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 139.900 - Ch 141.200 Sheet 5 of 14	P03.1
398128-MMD-00-XX-DR-P-0006 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 141.200 - Ch 142.500 Sheet 6 of 14	P03.1
398128-MMD-00-XX-DR-P-0007 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 142.500 - Ch 143.800 Sheet 7 of 14	P03.1
398128-MMD-00-XX-DR-P-0008 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 143.800 - Ch 145.100 Sheet 8 of 14	P03.1
398128-MMD-00-XX-DR-P-0009 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 145.100 - Ch 146.400 Sheet 9 of 14	P03.1
398128-MMD-00-XX-DR-P-0010 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 146.400 - Ch 147.700 Sheet 10 of 14	P03.1
398128-MMD-00-XX-DR-P-0011 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 147.700 - Ch 149.000 Sheet 11 of 14	P03.1
398128-MMD-00-XX-DR-P-0012 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 149.000 - Ch 150.100 Sheet 12 of 14	P03.1
398128-MMD-00-XX-DR-P-0013 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 150.100 - Ch 150.410 Sheet 13 of 14	P03.1
398128-MMD-00-XX-DR-P-0014 (1)	March to Wisbech Transport Corridor ELR:WIG Track Alignment Plan and Profile Design Ch 138.07 - Ch 138.05 Sheet 14 of 14	P01.1
Drainage Stations		
398128-MMD-00-XX-DR-D-0010 - comments (1)	March to Wisbech Transport Corridor Wisbech Station Car Park Proposed Drainage Strategy Sheet 1 of 1	P01.1
398128-MMD-00-XX-DR-D-0020 05-02-2020 markup	March to Wisbech Transport Corridor March Station Car Park Proposed Drainage Strategy Sheet 1 of 1	P01.1
Permeable Block Paving (1)	Section of 0020 markup Drwg above: March to Wisbech Transport Corridor Wisbech Station Car Park Proposed Drainage Strategy Sheet 1 of 1	
398128-MMD-00-XX-DR-D-0010 KB comments for costing	March to Wisbech Transport Corridor Wisbech Station Car Park Proposed Drainage Strategy Sheet 1 of 1	P01.1
E&P		
398128-MMD-00-XX-DR-E-0001 (1)	March to Wisbech Transport Corridor E&P Signalling Power Option Selection General Arrangement Sheet 1 of 1	P01.1
Telecom Drawings		
398128-MMD-00-XX-DR-T-0001	March to Wisbech Transport Corridor Wisbech Station Car Park Proposed SISS General Arrangement Sheet 1 of 1	P02
398128-MMD-00-XX-DR-T-0002	March to Wisbech Transport Corridor Wisbech Station Car Park Proposed SISS Block Diagram Sheet 1 of 1	P02
398128-MMD-00-XX-DR-T-0003	March to Wisbech Transport Corridor Wisbech Station Car Park Proposed SISS General Arrangement Sheet 1 of 1	P02
398128-MMD-00-XX-DR-T-0004	March to Wisbech Transport Corridor Wisbech Station Car Park Proposed SISS Block Diagram Sheet 1 of 1	P02
398128-MMD-00-XX-DR-T-0005	March to Wisbech Transport Corridor Wisbech Station Car Park Proposed SISS General Arrangement Car Park Sheet 1 of 1	P02
Geotech		
398128-MMD-00-XX-DR-G-0001 (1)	March to Wisbech Transport Corridor Typical Embankment Details Grade Separations Sheet 1 of 1	P01.1
398128-MMD-00-XX-DR-G-0002 (1)	March to Wisbech Transport Corridor Existing Railway Embankment Proposed Regrade Location and Typical Detail Sheet 1 of 1	P01.1
398128-MMD-00-XX-DR-G-0002 (1)	March to Wisbech Transport Corridor Existing Railway Embankment Proposed Regrade Location and Typical Detail Sheet 1 of 1	P02.1
398128-MMD-00-XX-DR-G-0002 (1)	March to Wisbech Transport Corridor Retaining wall General Arrangement Sheet 1 of 1	P01.1
	Geotechnical Design Quantities	
Car Parks		
398128-MMD-00-XX-DR-H-1000-A1-00 (1)	March to Wisbech Transport Corridor Wisbech Station Car Park Sheet 1 of 1	P02
398128-MMD-00-XX-DR-H-1001-A1-00 (1)	March to Wisbech Transport Corridor Wisbech Station Car Park Sheet 1 of 1	P02
Bridges		
398128-MMD-00-XX-DR-S-1001 (1)	March to Wisbech Transport Corridor Weasenham Bridge Proposed General Arrangement Sheet 1 of 3	P2
398128-MMD-00-XX-DR-S-1002 (1)	March to Wisbech Transport Corridor Weasenham Bridge Proposed General Arrangement Sheet 2 of 3	P2
398128-MMD-00-XX-DR-S-1003 (1)	March to Wisbech Transport Corridor Weasenham Bridge Proposed General Arrangement Sheet 3 of 3	P2
398128-MMD-00-XX-DR-S-2001 (1)	March to Wisbech Transport Corridor A47 Wisbech Bypass Bridge Proposed General Arrangement Sheet 1 of 2	P2
398128-MMD-00-XX-DR-S-2002 (1)	March to Wisbech Transport Corridor A47 Wisbech Bypass Bridge Proposed General Arrangement Sheet 2 of 2	P2
398128-MMD-00-XX-DR-S-2003 (1)	March to Wisbech Transport Corridor A47 Wisbech Bypass Bridge Proposed General Arrangement Sheet 2 of 3	P2
398128-MMD-00-XX-DR-S-3001 (1)	March to Wisbech Transport Corridor Broad Drove Bridge Proposed General Arrangement Sheet 1 of 3	P2
398128-MMD-00-XX-DR-S-3002 (1)	March to Wisbech Transport Corridor Broad Drove Bridge Proposed General Arrangement Sheet 2 of 3	P2
398128-MMD-00-XX-DR-S-3003 (1)	March to Wisbech Transport Corridor Broad Drove Bridge Proposed General Arrangement Sheet 3 of 3	P2
398128-MMD-00-XX-DR-S-4001 (1)	March to Wisbech Transport Corridor Holly Bank / Crooked Bank Bridge Proposed General Arrangement Sheet 1 of 3	P2
398128-MMD-00-XX-DR-S-4002 (1)	March to Wisbech Transport Corridor Holly Bank / Crooked Bank Bridge Proposed General Arrangement Sheet 2 of 3	P2

398128-MMD-00-XX-DR-S-4003 (1)	March to Wisbech Transport Corridor Holly Bank / Crooked Bank Bridge Proposed General Arrangement Sheet 3 of 3	P2
398128-MMD-00-XX-DR-S-7001 (1)	March to Wisbech Transport Corridor Coldham Bridge Proposed General Arrangement Sheet 1 of 3	P2
398128-MMD-00-XX-DR-S-7002 (1)	March to Wisbech Transport Corridor Coldham Bridge Proposed General Arrangement Sheet 2 of 3	P2
398128-MMD-00-XX-DR-S-7003 (1)	March to Wisbech Transport Corridor Coldham Bridge Proposed General Arrangement Sheet 3 of 3	P2
398128-MMD-00-XX-DR-S-8001 (1)	March to Wisbech Transport Corridor Elm Road Bridge Proposed General Arrangement Sheet 1 of 3	P2
398128-MMD-00-XX-DR-S-8002 (1)	March to Wisbech Transport Corridor Elm Road Bridge Proposed General Arrangement Sheet 2 of 3	P2
398128-MMD-00-XX-DR-S-8003 (1)	March to Wisbech Transport Corridor Elm Road Bridge Proposed General Arrangement Sheet 3 of 3	P2
398128-MMD-00-XX-DR-S-9001 (1)	March to Wisbech Transport Corridor Twenty Foot River Bridge Proposed General Arrangement Sheet 1 of 2	P2
398128-MMD-00-XX-DR-S-9002 (1)	March to Wisbech Transport Corridor Twenty Foot River Bridge Proposed General Arrangement Sheet 2 of 2	P2
MMD-123456-C-DR-00-XX-1000 (1)	March to Wisbech Transport Corridor March Station Footbridge Footbridge Visual Arrrangement	P2
MMD-123456-C-DR-00-XX-1001 (1)	March to Wisbech Transport Corridor March Station Footbridge Proposed General Arrangement Sheet 1 of 4	P2
MMD-123456-C-DR-00-XX-1002 (1)	March to Wisbech Transport Corridor March Station Footbridge Proposed General Arrangement Sheet 2 of 4	P2
MMD-123456-C-DR-00-XX-1003 (1)	March to Wisbech Transport Corridor March Station Footbridge Proposed General Arrangement Sheet 3 of 4	P2
MMD-123456-C-DR-00-XX-1004 (1)	March to Wisbech Transport Corridor March Station Footbridge Proposed General Arrangement Sheet 4 of 4	P2
MMD-123456-C-DR-00-XX-1005 (1)	March to Wisbech Transport Corridor March Station Footbridge Proposed Lift Steelwork	P2
Signalling		
398128-MMD-00-XX-SK-SG-0001	March to Wisbech Transport Corridor March Option 2A Signalling Sketch (GRIP 3) Sheet 1 of 1	P01
398128-MMD-00-XX-SK-SG-0002	March to Wisbech Transport Corridor March Option 2B Signalling Sketch (GRIP 3) Sheet 1 of 1	P01
398128-MMD-00-XX-SK-SG-0003	March to Wisbech Transport Corridor March Option 4C Signalling Sketch (GRIP 3) Sheet 1 of 1	P01.1
Ancillary Civils		
398128-MMD-00-XX-DR-C-0002	March to Wisbech Transport Corridor March Station Proposed Works Sheet 1 of 1	P05.1
398128-MMD-00-XX-DR-C-0100	March to Wisbech Transport Corridor Lineside Ancillary Civils General Arrangement 138.087km to 138.800km Sheet 1 of 16	P05.1

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WBS	Proposed Transport Corridor	Scheme 1 Elm Road	Scheme 2 Coldham Grade	Scheme 3 Holly Bank/Crooked Bank & Broad Drove	Scheme 4 A47 Grade Separation	Scheme 5 Weasenham Lane	March Station Car Park	Wisbech Station Car Park
1	**DIRECT CONSTRUCTION COSTS**	**£ 13,981,726**	**£ 4,586,450**	**£ 8,075,901**	**£ 5,808,424**	**£ 1,745,542**	**£ 1,544,475**	**£ 1,709,677**
1.01	Railway Control Systems							
1.02	Train Power Systems							
1.03	Electric Power and Plant							
1.04	Permanent Way							
1.05	Operational Telecommunications Systems							
1.06	Buildings and Property							
1.07	Civil Engineering	£ 13,849,781	£ 4,561,637	£ 8,007,713	£ 5,732,441	£ 1,729,358	£ 1,520,333	£ 1,671,095
1.08	Enabling Works	£ 131,944	£ 24,814	£ 68,187	£ 75,983	£ 16,184	£ 24,141	£ 38,581
2	**INDIRECT CONSTRUCTION COSTS**	**£ 6,816,093**	**£ 2,235,896**	**£ 3,937,003**	**£ 2,831,608**	**£ 850,953**	**£ 752,933**	**£ 833,469**
2.01a	CONTRACTORS PRELIMINARIES	£ 3,495,431	£ 1,146,613	£ 2,018,975	£ 1,452,106	£ 436,386	£ 386,119	£ 427,419
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 1,398,172.57	£ 458,645.04	£ 807,590.08	£ 580,842.40	£ 174,554.24	£ 154,447	£ 170,968
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 1,922,489	£ 630,638	£ 1,110,438	£ 798,660	£ 240,014	£ 212,367	£ 235,082
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 20,797,819**	**£ 6,822,347**	**£ 12,012,904**	**£ 8,640,032**	**£ 2,596,496**	**£ 2,297,408**	**£ 2,543,146**
3	**DESIGN COSTS**	**£ 2,911,695**	**£ 955,129**	**£ 1,681,807**	**£ 1,209,605**	**£ 363,509**	**£ 321,637**	**£ 356,040**
3.01	Stated Project Phase Design Fees - ask	£ 2,911,695	£ 955,129	£ 1,681,807	£ 1,209,605	£ 363,509	£ 321,637	£ 356,040
4	**PROJECT MANAGEMENT COSTS**	**£ 2,422,946**	**£ 794,803**	**£ 1,399,503**	**£ 1,006,564**	**£ 302,492**	**£ 267,648**	**£ 296,276**
4.01	Client Project Organisation	£ 2,422,946	£ 794,803	£ 1,399,503	£ 1,006,564	£ 302,492	£ 267,648	£ 296,276
5	**OTHER PROJECT COSTS**	**£ 519,945**	**£ 170,559**	**£ 300,323**	**£ 216,001**	**£ 64,912**	**£ 57,435**	**£ 63,579**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 519,945	£ 170,559	£ 300,323	£ 216,001	£ 64,912	£ 57,435	£ 63,579
5.02	Schedule 4 costs (on Possession Working only)	£ -	£ -	£ -	£ -	£ -		
5.03	Possession Management and Isolations (on Possession Working only) - 3%	£ -	£ -	£ -	£ -	£ -		
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19	£ -	£ -	£ -	£ -	£ -		
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes	£ -	£ -	£ -	£ -	£ -		
	PROJECT COST ESTIMATE	**£ 26,652,405**	**£ 8,742,837**	**£ 15,394,536**	**£ 11,072,201**	**£ 3,327,409**	**£ 2,944,128**	**£ 3,259,041**
8	**RISK & CONTINGENCY COSTS**							
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -		
	ANTICIPATED FINAL COST	**£ 26,652,405**	**£ 8,742,837**	**£ 15,394,536**	**£ 11,072,201**	**£ 3,327,409**	**£ 2,944,128**	**£ 3,259,041**

WBS	Proposed Transport Corridor	Weasenham Bridge	A47 Wisbech Bridge	Broad Drive Bridge	Holly - Crooked Bank Bridge	Coldham Bridge	Elm Road Bridge	Twenty Foot River Bridge	Embankment Regrade & Track Drainage
1	**DIRECT CONSTRUCTION COSTS**	**£ 1,563,947**	**£ 646,609**	**£ 649,599**	**£ 484,199**	**£ 650,731**	**£ 649,724**	**£ 812,365**	**£ 2,585,199**
1.01	Railway Control Systems								
1.02	Train Power Systems								
1.03	Electric Power and Plant								
1.04	Permanent Way								
1.05	Operational Telecommunications Systems								
1.06	Buildings and Property								
1.07	Civil Engineering	£ 1,563,947	£ 646,609	£ 649,599	£ 484,199	£ 650,731	£ 649,724	£ 812,365	£ 2,585,199
1.08	Enabling Works								
2	**INDIRECT CONSTRUCTION COSTS**	**£ 762,426**	**£ 315,223**	**£ 316,681**	**£ 236,049**	**£ 317,233**	**£ 316,742**	**£ 396,029**	**£ 1,260,286**
2.01a	CONTRACTORS PRELIMINARIES	£ 390,987	£ 161,652	£ 162,400	£ 121,050	£ 162,683	£ 162,431	£ 203,091	£ 646,300
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 156,395	£ 64,661	£ 64,960	£ 48,420	£ 65,073	£ 64,972	£ 81,237	£ 258,520
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 215,044	£ 88,910	£ 89,321	£ 66,579	£ 89,477	£ 89,339	£ 111,702	£ 355,466
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 2,326,373**	**£ 961,833**	**£ 966,281**	**£ 720,248**	**£ 967,964**	**£ 966,466**	**£ 1,208,395**	**£ 3,845,486**
3	**DESIGN COSTS**	**£ 325,692**	**£ 134,657**	**£ 135,279**	**£ 100,835**	**£ 135,515**	**£ 135,305**	**£ 169,175**	**£ 538,368**
3.01	Stated Project Phase Design Fees - ask	£ 325,692	£ 134,657	£ 135,279	£ 100,835	£ 135,515	£ 135,305	£ 169,175	£ 538,368
4	**PROJECT MANAGEMENT COSTS**	**£ 271,022**	**£ 112,054**	**£ 112,572**	**£ 83,909**	**£ 112,768**	**£ 112,593**	**£ 140,778**	**£ 447,999**
4.01	Client Project Organisation	£ 271,022	£ 112,054	£ 112,572	£ 83,909	£ 112,768	£ 112,593	£ 140,778	£ 447,999
5	**OTHER PROJECT COSTS**	**£ 58,159**	**£ 24,046**	**£ 24,157**	**£ 18,006**	**£ 24,199**	**£ 24,162**	**£ 30,210**	**£ 96,137**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 58,159	£ 24,046	£ 24,157	£ 18,006	£ 24,199	£ 24,162	£ 30,210	£ 96,137
5.02	Schedule 4 costs (on Possession Working only)								
5.03	Possession Management and Isolations (on Possession Working only) - 3%								
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19								
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes								
	PROJECT COST ESTIMATE	**£ 2,981,247**	**£ 1,232,589**	**£ 1,238,288**	**£ 922,998**	**£ 1,240,446**	**£ 1,238,527**	**£ 1,548,558**	**£ 4,927,990**
8	**RISK & CONTINGENCY COSTS**								
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
	ANTICIPATED FINAL COST	**£ 2,981,247**	**£ 1,232,589**	**£ 1,238,288**	**£ 922,998**	**£ 1,240,446**	**£ 1,238,527**	**£ 1,548,558**	**£ 4,927,990**

WBS	Proposed Transport Corridor	Underbridges	March Station Footbridge	March Station Ancillary Civils	Wisbech Station Ancillary Civils	Lineside Ancillary Civils	Heavy Rail Option 2A	C3 Utility Costs	Project Total
1	**DIRECT CONSTRUCTION COSTS**	**£ 1,605,000**	**£ 1,923,202**	**£ 710,265**	**£ 679,721**	**£ 3,472,015**	**£ 27,202,839**	**£ 10,788,401**	**£ 91,876,014**
1.01	Railway Control Systems						£ 3,163,815		£ 3,163,815
1.02	Train Power Systems								£ -
1.03	Electric Power and Plant						£ 2,270,437		£ 2,270,437
1.04	Permanent Way						£ 18,252,530		£ 18,252,530
1.05	Operational Telecommunications Systems						£ 537,440		£ 537,440
1.06	Buildings and Property		£ 633,450	£ 5,680	£ 108,000				£ 747,130
1.07	Civil Engineering	£ 1,605,000	£ 1,289,752	£ 592,272	£ 571,721	£ 3,124,037	£ 2,978,617	£ 10,788,401	£ 66,064,534
1.08	Enabling Works			£ 112,314		£ 347,978			£ 840,127
2	**INDIRECT CONSTRUCTION COSTS**	**£ 782,439**	**£ 937,563**	**£ 346,256**	**£ 331,365**	**£ 1,692,609**	**£ 13,261,386**	**£ 5,259,347**	**£ 44,789,591**
2.01a	CONTRACTORS PRELIMINARIES	£ 401,250	£ 480,801	£ 177,566	£ 169,930	£ 868,004	£ 6,800,710	£ 2,697,100	£ 22,969,003
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 160,500	£ 192,320	£ 71,027	£ 67,972	£ 347,202	£ 2,720,284	£ 1,078,840	£ 9,187,601
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 220,689	£ 264,442	£ 97,663	£ 93,463	£ 477,404	£ 3,740,392	£ 1,483,407	£ 12,632,986
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 2,387,439**	**£ 2,860,765**	**£ 1,056,521**	**£ 1,011,086**	**£ 5,164,624**	**£ 40,464,225**	**£ 16,047,748**	**£ 136,665,604**
3	**DESIGN COSTS**	**£ 334,241**	**£ 400,507**	**£ 147,913**	**£ 141,552**	**£ 723,047**	**£ 5,664,991**	**£ -**	**£ 16,886,500**
3.01	Stated Project Phase Design Fees - ask	£ 334,241	£ 400,507	£ 147,913	£ 141,552	£ 723,047	£ 5,664,991		£ 16,886,500
4	**PROJECT MANAGEMENT COSTS**	**£ 278,137**	**£ 348,754**	**£ 123,085**	**£ 117,792**	**£ 601,679**	**£ 4,727,908**	**£ 1,644,894**	**£ 15,726,175**
4.01	Client Project Organisation	£ 278,137	£ 348,754	£ 123,085	£ 117,792	£ 601,679	£ 4,727,908	£ 1,644,894	£ 15,726,175
5	**OTHER PROJECT COSTS**	**£ 59,686**	**£ 226,265**	**£ 26,413**	**£ 25,277**	**£ 129,116**	**£ 1,149,864**	**£ 401,194**	**£ 3,709,644**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 59,686	£ 71,519	£ 26,413	£ 25,277	£ 129,116	£ 1,011,606	£ 401,194	£ 3,416,640
5.02	Schedule 4 costs (on Possession Working only)		£ 121,586				£ 108,631		£ 230,217
5.03	Possession Management and Isolations (on Possession Working only) - 3%		£ 33,160				£ 29,627		£ 62,786
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19								£ -
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes								£ -
	PROJECT COST ESTIMATE	**£ 3,059,503**	**£ 3,836,290**	**£ 1,353,932**	**£ 1,295,707**	**£ 6,618,466**	**£ 52,006,988**	**£ 18,093,836**	**£ 172,987,922**
8	**RISK & CONTINGENCY COSTS**								
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -		£ -
	ANTICIPATED FINAL COST	**£ 3,059,503**	**£ 3,836,290**	**£ 1,353,932**	**£ 1,295,707**	**£ 6,618,466**	**£ 52,006,988**	**£ 18,093,836**	**£ 172,987,922**

REVISION 6 31/05/2020

WBS	Proposed Transport Corridor	Scheme 1 Elm Road	Scheme 2 Coldham Grade	Scheme 3 Holly Bank/Crooked Bank & Broad Drove	Scheme 4 A47 Grade Separation	Scheme 5 Weasenham Lane	March Station Car Park	Wisbech Station Car Park
1	**DIRECT CONSTRUCTION COSTS**	**£ 13,981,726**	**£ 4,586,450**	**£ 8,075,901**	**£ 5,808,424**	**£ 1,745,542**	**£ 1,544,475**	**£ 1,709,677**
1.01	Railway Control Systems							
1.02	Train Power Systems							
1.03	Electric Power and Plant							
1.04	Permanent Way							
1.05	Operational Telecommunications Systems							
1.06	Buildings and Property							
1.07	Civil Engineering	£ 13,849,781	£ 4,561,637	£ 8,007,713	£ 5,732,441	£ 1,729,358	£ 1,520,333	£ 1,671,095
1.08	Enabling Works	£ 131,944	£ 24,814	£ 68,187	£ 75,983	£ 16,184	£ 24,141	£ 38,581
2	**INDIRECT CONSTRUCTION COSTS**	**£ 6,816,093**	**£ 2,235,896**	**£ 3,937,003**	**£ 2,831,608**	**£ 850,953**	**£ 752,933**	**£ 833,469**
2.01a	CONTRACTORS PRELIMINARIES	£ 3,495,431	£ 1,146,613	£ 2,018,975	£ 1,452,106	£ 436,386	£ 386,119	£ 427,419
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 1,398,172.57	£ 458,645.04	£ 807,590.08	£ 580,842.40	£ 174,554.24	£ 154,447	£ 170,968
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 1,922,489	£ 630,638	£ 1,110,438	£ 798,660	£ 240,014	£ 212,367	£ 235,082
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 20,797,819**	**£ 6,822,347**	**£ 12,012,904**	**£ 8,640,032**	**£ 2,596,496**	**£ 2,297,408**	**£ 2,543,146**
3	**DESIGN COSTS**	**£ 2,911,695**	**£ 955,129**	**£ 1,681,807**	**£ 1,209,605**	**£ 363,509**	**£ 321,637**	**£ 356,040**
3.01	Stated Project Phase Design Fees - ask	£ 2,911,695	£ 955,129	£ 1,681,807	£ 1,209,605	£ 363,509	£ 321,637	£ 356,040
4	**PROJECT MANAGEMENT COSTS**	**£ 2,422,946**	**£ 794,803**	**£ 1,399,503**	**£ 1,006,564**	**£ 302,492**	**£ 267,648**	**£ 296,276**
4.01	Client Project Organisation	£ 2,422,946	£ 794,803	£ 1,399,503	£ 1,006,564	£ 302,492	£ 267,648	£ 296,276
5	**OTHER PROJECT COSTS**	**£ 519,945**	**£ 170,559**	**£ 300,323**	**£ 216,001**	**£ 64,912**	**£ 57,435**	**£ 63,579**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 519,945	£ 170,559	£ 300,323	£ 216,001	£ 64,912	£ 57,435	£ 63,579
5.02	Schedule 4 costs (on Possession Working only)	£ -	£ -	£ -	£ -	£ -		
5.03	Possession Management and Isolations (on Possession Working only) - 3%	£ -	£ -	£ -	£ -	£ -		
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19	£ -	£ -	£ -	£ -	£ -		
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes	£ -	£ -	£ -	£ -	£ -		
	PROJECT COST ESTIMATE	**£ 26,652,405**	**£ 8,742,837**	**£ 15,394,536**	**£ 11,072,201**	**£ 3,327,409**	**£ 2,944,128**	**£ 3,259,041**
8	**RISK & CONTINGENCY COSTS**							
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -		
	ANTICIPATED FINAL COST	**£ 26,652,405**	**£ 8,742,837**	**£ 15,394,536**	**£ 11,072,201**	**£ 3,327,409**	**£ 2,944,128**	**£ 3,259,041**

WBS	Proposed Transport Corridor	Weasenham Bridge	A47 Wisbech Bridge	Broad Drive Bridge	Holly - Crooked Bank Bridge	Coldham Bridge	Elm Road Bridge	Twenty Foot River Bridge	Embankment Regrade & Track Drainage
1	**DIRECT CONSTRUCTION COSTS**	**£ 1,563,947**	**£ 646,609**	**£ 649,599**	**£ 484,199**	**£ 650,731**	**£ 649,724**	**£ 812,365**	**£ 2,585,199**
1.01	Railway Control Systems								
1.02	Train Power Systems								
1.03	Electric Power and Plant								
1.04	Permanent Way								
1.05	Operational Telecommunications Systems								
1.06	Buildings and Property								
1.07	Civil Engineering	£ 1,563,947	£ 646,609	£ 649,599	£ 484,199	£ 650,731	£ 649,724	£ 812,365	£ 2,585,199
1.08	Enabling Works								
2	**INDIRECT CONSTRUCTION COSTS**	**£ 762,426**	**£ 315,223**	**£ 316,681**	**£ 236,049**	**£ 317,233**	**£ 316,742**	**£ 396,029**	**£ 1,260,286**
2.01a	CONTRACTORS PRELIMINARIES	£ 390,987	£ 161,652	£ 162,400	£ 121,050	£ 162,683	£ 162,431	£ 203,091	£ 646,300
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 156,395	£ 64,661	£ 64,960	£ 48,420	£ 65,073	£ 64,972	£ 81,237	£ 258,520
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 215,044	£ 88,910	£ 89,321	£ 66,579	£ 89,477	£ 89,339	£ 111,702	£ 355,466
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 2,326,373**	**£ 961,833**	**£ 966,281**	**£ 720,248**	**£ 967,964**	**£ 966,466**	**£ 1,208,395**	**£ 3,845,486**
3	**DESIGN COSTS**	**£ 325,692**	**£ 134,657**	**£ 135,279**	**£ 100,835**	**£ 135,515**	**£ 135,305**	**£ 169,175**	**£ 538,368**
3.01	Stated Project Phase Design Fees - ask	£ 325,692	£ 134,657	£ 135,279	£ 100,835	£ 135,515	£ 135,305	£ 169,175	£ 538,368
4	**PROJECT MANAGEMENT COSTS**	**£ 271,022**	**£ 112,054**	**£ 112,572**	**£ 83,909**	**£ 112,768**	**£ 112,593**	**£ 140,778**	**£ 447,999**
4.01	Client Project Organisation	£ 271,022	£ 112,054	£ 112,572	£ 83,909	£ 112,768	£ 112,593	£ 140,778	£ 447,999
5	**OTHER PROJECT COSTS**	**£ 58,159**	**£ 24,046**	**£ 24,157**	**£ 18,006**	**£ 24,199**	**£ 24,162**	**£ 30,210**	**£ 96,137**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 58,159	£ 24,046	£ 24,157	£ 18,006	£ 24,199	£ 24,162	£ 30,210	£ 96,137
5.02	Schedule 4 costs (on Possession Working only)								
5.03	Possession Management and Isolations (on Possession Working only) - 3%								
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19								
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes								
	PROJECT COST ESTIMATE	**£ 2,981,247**	**£ 1,232,589**	**£ 1,238,288**	**£ 922,998**	**£ 1,240,446**	**£ 1,238,527**	**£ 1,548,558**	**£ 4,927,990**
8	**RISK & CONTINGENCY COSTS**								
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
	ANTICIPATED FINAL COST	**£ 2,981,247**	**£ 1,232,589**	**£ 1,238,288**	**£ 922,998**	**£ 1,240,446**	**£ 1,238,527**	**£ 1,548,558**	**£ 4,927,990**

WBS	Proposed Transport Corridor	Underbridges	March Station Footbridge	March Station Ancillary Civils	Wisbech Station Ancillary Civils	Lineside Ancillary Civils	Heavy Rail Option 2B	C3 Utility Costs	Project Total
1	**DIRECT CONSTRUCTION COSTS**	**£ 1,605,000**	**£ 1,923,202**	**£ 710,265**	**£ 679,721**	**£ 3,472,015**	**£ 28,146,228**	**£ 10,788,401**	**£ 92,819,402**
1.01	Railway Control Systems						£ 3,370,754		£ 3,370,754
1.02	Train Power Systems								£ -
1.03	Electric Power and Plant						£ 2,287,925		£ 2,287,925
1.04	Permanent Way						£ 18,862,755		£ 18,862,755
1.05	Operational Telecommunications Systems						£ 568,433		£ 568,433
1.06	Buildings and Property		£ 633,450	£ 5,680	£ 108,000				£ 747,130
1.07	Civil Engineering	£ 1,605,000	£ 1,289,752	£ 592,272	£ 571,721	£ 3,124,037	£ 3,056,360	£ 10,788,401	£ 66,142,277
1.08	Enabling Works			£ 112,314		£ 347,978			£ 840,127
2	**INDIRECT CONSTRUCTION COSTS**	**£ 782,439**	**£ 937,563**	**£ 346,256**	**£ 331,365**	**£ 1,692,609**	**£ 13,721,287**	**£ 5,259,347**	**£ 45,249,492**
2.01a	CONTRACTORS PRELIMINARIES	£ 401,250	£ 480,801	£ 177,566	£ 169,930	£ 868,004	£ 7,036,557	£ 2,697,100	£ 23,204,850
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 160,500	£ 192,320	£ 71,027	£ 67,972	£ 347,202	£ 2,814,623	£ 1,078,840	£ 9,281,940
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 220,689	£ 264,442	£ 97,663	£ 93,463	£ 477,404	£ 3,870,108	£ 1,483,407	£ 12,762,702
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 2,387,439**	**£ 2,860,765**	**£ 1,056,521**	**£ 1,011,086**	**£ 5,164,624**	**£ 41,867,515**	**£ 16,047,748**	**£ 138,068,894**
3	**DESIGN COSTS**	**£ 334,241**	**£ 400,507**	**£ 147,913**	**£ 141,552**	**£ 723,047**	**£ 5,861,452**	**£ -**	**£ 17,082,960**
3.01	Stated Project Phase Design Fees - ask	£ 334,241	£ 400,507	£ 147,913	£ 141,552	£ 723,047	£ 5,861,452	£ -	£ 17,082,960
4	**PROJECT MANAGEMENT COSTS**	**£ 278,137**	**£ 348,754**	**£ 123,085**	**£ 117,792**	**£ 601,679**	**£ 4,891,885**	**£ 1,644,894**	**£ 15,890,152**
4.01	Client Project Organisation	£ 278,137	£ 348,754	£ 123,085	£ 117,792	£ 601,679	£ 4,891,885	£ 1,644,894	£ 15,890,152
5	**OTHER PROJECT COSTS**	**£ 59,686**	**£ 226,265**	**£ 26,413**	**£ 25,277**	**£ 129,116**	**£ 1,189,887**	**£ 401,194**	**£ 3,749,667**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 59,686	£ 71,519	£ 26,413	£ 25,277	£ 129,116	£ 1,046,688	£ 401,194	£ 3,451,722
5.02	Schedule 4 costs (on Possession Working only)		£ 121,586				£ 112,513		£ 234,099
5.03	Possession Management and Isolations (on Possession Working only) - 3%		£ 33,160				£ 30,685		£ 63,845
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19								£ -
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes								£ -
	PROJECT COST ESTIMATE	**£ 3,059,503**	**£ 3,836,290**	**£ 1,353,932**	**£ 1,295,707**	**£ 6,618,466**	**£ 53,810,739**	**£ 18,093,836**	**£ 174,791,673**
8	**RISK & CONTINGENCY COSTS**								
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
	ANTICIPATED FINAL COST	**£ 3,059,503**	**£ 3,836,290**	**£ 1,353,932**	**£ 1,295,707**	**£ 6,618,466**	**£ 53,810,739**	**£ 18,093,836**	**£ 174,791,673**

REVISION 6 31/05/2020

WBS	Proposed Transport Corridor	Scheme 1 Elm Road	Scheme 2 Coldham Grade	Scheme 3 Holly Bank/Crooked Bank & Broad Drove	Scheme 4 A47 Grade Separation	Scheme 5 Weasenham Lane	March Station Car Park	Wisbech Station Car Park
1	**DIRECT CONSTRUCTION COSTS**	**£ 13,981,726**	**£ 4,586,450**	**£ 8,075,901**	**£ 5,808,424**	**£ 1,745,542**	**£ 1,544,475**	**£ 1,709,677**
1.01	Railway Control Systems							
1.02	Train Power Systems							
1.03	Electric Power and Plant							
1.04	Permanent Way							
1.05	Operational Telecommunications Systems							
1.06	Buildings and Property							
1.07	Civil Engineering	£ 13,849,781	£ 4,561,637	£ 8,007,713	£ 5,732,441	£ 1,729,358	£ 1,520,333	£ 1,671,095
1.08	Enabling Works	£ 131,944	£ 24,814	£ 68,187	£ 75,983	£ 16,184	£ 24,141	£ 38,581
2	**INDIRECT CONSTRUCTION COSTS**	**£ 6,816,093**	**£ 2,235,896**	**£ 3,937,003**	**£ 2,831,608**	**£ 850,953**	**£ 752,933**	**£ 833,469**
2.01a	CONTRACTORS PRELIMINARIES	£ 3,495,431	£ 1,146,613	£ 2,018,975	£ 1,452,106	£ 436,386	£ 386,119	£ 427,419
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 1.398.172.57	£ 458.645.04	£ 807.590.08	£ 580.842.40	£ 174.554.24	£ 154.447	£ 170.968
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 1,922,489	£ 630,638	£ 1,110,438	£ 798,660	£ 240,014	£ 212,367	£ 235,082
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 20,797,819**	**£ 6,822,347**	**£ 12,012,904**	**£ 8,640,032**	**£ 2,596,496**	**£ 2,297,408**	**£ 2,543,146**
3	**DESIGN COSTS**	**£ 2,911,695**	**£ 955,129**	**£ 1,681,807**	**£ 1,209,605**	**£ 363,509**	**£ 321,637**	**£ 356,040**
3.01	Stated Project Phase Design Fees - ask	£ 2,911,695	£ 955,129	£ 1,681,807	£ 1,209,605	£ 363,509	£ 321,637	£ 356,040
4	**PROJECT MANAGEMENT COSTS**	**£ 2,422,946**	**£ 794,803**	**£ 1,399,503**	**£ 1,006,564**	**£ 302,492**	**£ 267,648**	**£ 296,276**
4.01	Client Project Organisation	£ 2,422,946	£ 794,803	£ 1,399,503	£ 1,006,564	£ 302,492	£ 267,648	£ 296,276
5	**OTHER PROJECT COSTS**	**£ 519,945**	**£ 170,559**	**£ 300,323**	**£ 216,001**	**£ 64,912**	**£ 57,435**	**£ 63,579**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 519,945	£ 170,559	£ 300,323	£ 216,001	£ 64,912	£ 57,435	£ 63,579
5.02	Schedule 4 costs (on Possession Working only) - 11%	£ -	£ -	£ -	£ -	£ -		
5.03	Possession Management and Isolations (on Possession Working only) - 3%							
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19	£ -	£ -	£ -	£ -	£ -		
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes	£ -	£ -	£ -	£ -	£ -		
	PROJECT COST ESTIMATE	**£ 26,652,405**	**£ 8,742,837**	**£ 15,394,536**	**£ 11,072,201**	**£ 3,327,409**	**£ 2,944,128**	**£ 3,259,041**
8	**RISK & CONTINGENCY COSTS**							
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -		
	ANTICIPATED FINAL COST	**£ 26,652,405**	**£ 8,742,837**	**£ 15,394,536**	**£ 11,072,201**	**£ 3,327,409**	**£ 2,944,128**	**£ 3,259,041**

WBS	Proposed Transport Corridor	Weasenham Bridge	A47 Wisbech Bridge	Broad Drive Bridge	Holly - Crooked Bank Bridge	Coldham Bridge	Elm Road Bridge	Twenty Foot River Bridge
1	**DIRECT CONSTRUCTION COSTS**	**£ 1,563,947**	**£ 646,609**	**£ 649,599**	**£ 484,199**	**£ 650,731**	**£ 649,724**	**£ 812,365**
1.01	Railway Control Systems							
1.02	Train Power Systems							
1.03	Electric Power and Plant							
1.04	Permanent Way							
1.05	Operational Telecommunications Systems							
1.06	Buildings and Property							
1.07	Civil Engineering	£ 1,563,947	£ 646,609	£ 649,599	£ 484,199	£ 650,731	£ 649,724	£ 812,365
1.08	Enabling Works							
2	**INDIRECT CONSTRUCTION COSTS**	**£ 762,426**	**£ 315,223**	**£ 316,681**	**£ 236,049**	**£ 317,233**	**£ 316,742**	**£ 396,029**
2.01a	CONTRACTORS PRELIMINARIES	£ 390,987	£ 161,652	£ 162,400	£ 121,050	£ 162,683	£ 162,431	£ 203,091
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 156.395	£ 64.661	£ 64.960	£ 48.420	£ 65.073	£ 64.972	£ 81.237
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 215,044	£ 88,910	£ 89,321	£ 66,579	£ 89,477	£ 89,339	£ 111,702
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 2,326,373**	**£ 961,833**	**£ 966,281**	**£ 720,248**	**£ 967,964**	**£ 966,466**	**£ 1,208,395**
3	**DESIGN COSTS**	**£ 325,692**	**£ 134,657**	**£ 135,279**	**£ 100,835**	**£ 135,515**	**£ 135,305**	**£ 169,175**
3.01	Stated Project Phase Design Fees - ask	£ 325,692	£ 134,657	£ 135,279	£ 100,835	£ 135,515	£ 135,305	£ 169,175
4	**PROJECT MANAGEMENT COSTS**	**£ 271,022**	**£ 112,054**	**£ 112,572**	**£ 83,909**	**£ 112,768**	**£ 112,593**	**£ 140,778**
4.01	Client Project Organisation	£ 271,022	£ 112,054	£ 112,572	£ 83,909	£ 112,768	£ 112,593	£ 140,778
5	**OTHER PROJECT COSTS**	**£ 58,159**	**£ 24,046**	**£ 24,157**	**£ 18,006**	**£ 24,199**	**£ 24,162**	**£ 30,210**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 58,159	£ 24,046	£ 24,157	£ 18,006	£ 24,199	£ 24,162	£ 30,210
5.02	Schedule 4 costs (on Possession Working only) - 11%							
5.03	Possession Management and Isolations (on Possession Working only) - 3%							
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19							
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes							
	PROJECT COST ESTIMATE	**£ 2,981,247**	**£ 1,232,589**	**£ 1,238,288**	**£ 922,998**	**£ 1,240,446**	**£ 1,238,527**	**£ 1,548,558**
8	**RISK & CONTINGENCY COSTS**							
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -
	ANTICIPATED FINAL COST	**£ 2,981,247**	**£ 1,232,589**	**£ 1,238,288**	**£ 922,998**	**£ 1,240,446**	**£ 1,238,527**	**£ 1,548,558**

WBS	Proposed Transport Corridor	Embankment Regrade & Track Drainage	Underbridges	March Station Footbridge	March Station Ancillary Civils	Wisbech Station Ancillary Civils	Lineside Ancillary Civils	Heavy Rail Option 4C	Lineside Ancillary Civils 4C	C3 Utility Costs	Project Total
1	**DIRECT CONSTRUCTION COSTS**	**£ 2,585,199**	**£ 1,605,000**	**£ 1,923,202**	**£ 710,265**	**£ 679,721**	**£ 3,472,015**	**£ 29,513,794**	**£ 460,737**	**£ 10,788,401**	**£ 94,647,705**
1.01	Railway Control Systems							£ 4,064,436			£ 4,064,436
1.02	Train Power Systems										£ -
1.03	Electric Power and Plant							£ 2,303,234			£ 2,303,234
1.04	Permanent Way							£ 19,490,606			£ 19,490,606
1.05	Operational Telecommunications Systems							£ 577,778			£ 577,778
1.06	Buildings and Property			£ 633,450	£ 5,680	£ 108,000					£ 747,130
1.07	Civil Engineering	£ 2,585,199	£ 1,605,000	£ 1,289,752	£ 592,272	£ 571,721	£ 3,124,037	£ 3,077,740	£ 460,737	£ 10,788,401	£ 66,624,394
1.08	Enabling Works				£ 112,314		£ 347,978		£ -		£ 840,127
2	**INDIRECT CONSTRUCTION COSTS**	**£ 1,260,286**	**£ 782,439**	**£ 937,563**	**£ 346,256**	**£ 331,365**	**£ 1,692,609**	**£ 14,387,976**	**£ 224,611**	**£ 5,259,347**	**£ 46,140,792**
2.01a	CONTRACTORS PRELIMINARIES	£ 646,300	£ 401,250	£ 480,801	£ 177,566	£ 169,930	£ 868,004	£ 7,378,448	£ 115,184	£ 2,697,100	£ 23,661,926
2.01b	CONTRACTORS METHOD RELATED TEMPORARY WORKS	£ 258.520	£ 160.500	£ 192.320	£ 71.027	£ 67.972	£ 347.202	£ 2.951.379	£ 46.074	£ 1.078.840	£ 9.464.771
2.02	CONTRACTORS OVERHEAD AND PROFIT	£ 355,466	£ 220,689	£ 264,442	£ 97,663	£ 93,463	£ 477,404	£ 4,058,148	£ 63,353	£ 1,483,407	£ 13,014,095
	BASE COST ESTIMATE (DIRECT COSTS + INDIRECT COSTS)	**£ 3,845,486**	**£ 2,387,439**	**£ 2,860,765**	**£ 1,056,521**	**£ 1,011,086**	**£ 5,164,624**	**£ 43,901,770**	**£ 685,348**	**£ 16,047,748**	**£ 140,788,497**
3	**DESIGN COSTS**	**£ 538,368**	**£ 334,241**	**£ 400,507**	**£ 147,913**	**£ 141,552**	**£ 723,047**	**£ 6,146,248**	**£ 95,949**	**£ -**	**£ 17,463,705**
3.01	Stated Project Phase Design Fees - ask	£ 538,368	£ 334,241	£ 400,507	£ 147,913	£ 141,552	£ 723,047	£ 6,146,248	£ 95,949	£ -	£ 17,463,705
4	**PROJECT MANAGEMENT COSTS**	**£ 447,999**	**£ 278,137**	**£ 348,754**	**£ 123,085**	**£ 117,792**	**£ 601,679**	**£ 5,129,644**	**£ 83,325**	**£ 1,644,894**	**£ 16,211,236**
4.01	Client Project Organisation	£ 447,999	£ 278,137	£ 348,754	£ 123,085	£ 117,792	£ 601,679	£ 5,129,644	£ 83,325	£ 1,644,894	£ 16,211,236
5	**OTHER PROJECT COSTS**	**£ 96,137**	**£ 59,686**	**£ 226,265**	**£ 26,413**	**£ 25,277**	**£ 129,116**	**£ 1,248,426**	**£ 51,956**	**£ 401,194**	**£ 3,860,162**
5.01	Environmental Mitigations (2.5% of Base Cost Estimate)	£ 96,137	£ 59,686	£ 71,519	£ 26,413	£ 25,277	£ 129,116	£ 1,097,544	£ 17,134	£ 401,194	£ 3,519,712
5.02	Schedule 4 costs (on Possession Working only) - 11%			£ 121,586				£ 118,550	£ 27,360		£ 267,496
5.03	Possession Management and Isolations (on Possession Working only) - 3%			£ 33,160				£ 32,332	£ 7,462		£ 72,954
6	**INFLATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
6.01	Base date 4Q19										£ -
7	**TAXATION**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**	**£ -**
7.01	Stated Taxes										£ -
	PROJECT COST ESTIMATE	**£ 4,927,990**	**£ 3,059,503**	**£ 3,836,290**	**£ 1,353,932**	**£ 1,295,707**	**£ 6,618,466**	**£ 56,426,088**	**£ 916,578**	**£ 18,093,836**	**£ 178,323,600**
8	**RISK & CONTINGENCY COSTS**										
8.02	Risk and Contingency - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
8.04	Optimism Bias - Excluded to be applied in the economic and finincial cases as appropriate	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
	ANTICIPATED FINAL COST	**£ 4,927,990**	**£ 3,059,503**	**£ 3,836,290**	**£ 1,353,932**	**£ 1,295,707**	**£ 6,618,466**	**£ 56,426,088**	**£ 916,578**	**£ 18,093,836**	**£ 178,323,600**

Mott MacDonald

Scheme 1: Elm Road grade separation, B1101 diversion and Twenty Foot River Bridge

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
	INITIAL CONSTRUCTION					
1.07	**CIVIL ENGINEERING**					**13,849,781**
1.07.09.02	**Barriers and Guardrails**					**116,781**
1.07.09.02.03	Type N1 barrier	784	m	£ 56.28	£ 44,123.52	
1.07.09.02.03	Type N2 barrier	1,291	m	£ 56.28	£ 72,657.48	
1.07.09	**General Drainage**					**919,532**
1.07.09.01	**Surface Water Drainage**					
1.07.09.01.01	450mm diameter filter drain with type S bed and surround, depth to invert not exceeding 2m	572	m	£ 121.51	£ 69,470.91	
1.07.09.01.01	450mm diameter culvert drain with type Z bed and surround, depth to invert not exceeding 2m	472	m	£ 116.32	£ 54,858.84	
1.07.09.01.01	150mm diameter carrier drain with type Z bed and surround, depth to invert not exceeding 2m	46	m	£ 64.11	£ 2,946.50	
1.07.09.01.06	Connections to public mains drainage	52	nr	£ 285.79	£ 14,861.08	
	Headwalls - Allowance	38	nr	£ 5,320.65	£ 202,184.78	
	60mm Orifice Plate - Allowance	13	nr	inc		
	Flap Valve		nr	£ 100.00	£ -	
	Flow control chamber	7	nr	£ 5,040.62	£ 35,284.32	
	Attenuation Pond's					
1.07.09.03.01	Attenuation pond - capacity of 7,674m3	1	item	£ 383,700.00	£ 383,700.00	
	Ditches					
1.07.09.03.01	Excavation and disposal of ditches	1,670	m	£ 55.00	£ 91,876.95	
1.07.09.03.01	Existing ditches to be diverted	1,103	m	£ 58.36	£ 64,348.32	
1.07.01	**Earthworks**					**9,371,800**
1.07.01.02	**Embankments**					
1.07.01.02.03	Embankment : Class 1 fill.	84,060	m³	£ 41.80	£ 3,513,705.07	
1.07.01.02.03	Embankment : Leca light weight fill.	39,252	m³	£ 97.58	£ 3,830,168.20	
	Band Drains					
	Mobilise band drain installation equipment	2	sum	£ 4,473.48	£ 8,946.96	
	De-mobilise band drain installation equipment	2	sum	£ 4,473.48	£ 8,946.96	
	Depth of drain not exceeding 10m	31,180	m	£ 1.40	£ 43,652.00	
	Vibro Stone Columns					
	Mobilise Vibro Stone Columns (VSC), installation equipment	2	sum	£ 4,473.48	£ 8,946.96	
	De-mobilise Vibro Stone Columns (VSC) installation equipment	2	sum	£ 4,473.48	£ 8,946.96	
	500mm dia Vibro Stone Column, Depth of column not exceeding 10m	49,020	m	£ 25.00	£ 1,225,500.00	
	Testing of Columns	49	nr	£ 200.00	£ 9,804.00	
1.07.01.02	**Cuttings**					
	Existing Highway					
1.07.01.01.05	Grading existing profile	5,916	m²	£ 5.15	£ 30,467.97	
	New Highway					
1.07.01.01.01	General Excavation	14,602	m³	£ 4.03	£ 58,846.26	

Mott MacDonald

Scheme 1: Elm Road grade separation, B1101 diversion and Twenty Foot River Bridge

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
1.07.01.01.04	Completion of sub-formation on acceptable material	33,977	m²	£ 1.13	£ 38,394.01	
	Geotextile separator (Terram 1000 or similar)	32,378	m²	£ 2.93	£ 94,867.54	
	Disposal of Material					
1.07.01.01.02	Disposal of acceptable material	16,865	m³	£ 29.09	£ 490,607.24	
1.07.11	**Roads, Pavements and Hardstandings**					**2,645,466**
	Existing Highway					
1.07.11.01.03	40mm Thin surface course system	5,916	m²	£ 11.46	£ 67,798.62	
	New Highway					
1.07.11.01.03	Imported granular sub-base; Type 1 aggregate; 520mm depth	33,977	m²	£ 22.87	£ 777,053.99	
1.07.11.01.03	AC32 HDM base 40/60 Rec 125mm thick	26,920	m²	£ 23.96	£ 645,003.20	
1.07.11.01.03	AC20 Dense binder course 40/60 Rec 65mm thick	26,136	m²	£ 11.05	£ 288,802.80	
1.07.11.01.03	40mm Thin surface course system	33,977	m²	£ 11.46	£ 389,376.42	
	Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks					
1.07.11.01.06	Precast concrete kerb; half battered (HB2 125 x 255 x 915mm) laid straight or curved	2,621	m	£ 22.31	£ 58,474.51	
1.07.11.01.06	Straight or curved to radius > 12m; Standard Beany Block Kerb with integral drainage channel	1,790	m²	£ 105.53	£ 188,937.75	
	New Footpath					
1.07.11.03.04	Footpath; comprising Type 1 granular material sub-base 225mm thick; AC20 DBM binder course 40/60 60mm thick; AC6 DBM surface course 25mm thick	3,004	m²	£ 51.74	£ 155,426.96	
	New Tarmac Islands					
1.07.11.03.04	New kerbed Tarmac islands; Comprising Granular sub-base 225mm; 50mm dense bin 100/150 AC20 and 20mm dense surface 100/150 AC6 (kerbs measured elsewhere)	1,661	m²	£ 44.90	£ 74,591.47	
1.07.11	**Lighting Systems**					**735,124**
1.07.11.06	**Street Lighting**					
1.07.11.06.01	8m mounting height tubular galvanised steel column complete with a post top mounted Philips Luma 3 (BGP627 DS50 - 40klm neutral white LED) mounted at 0° tilt	221	nr	£ 1,722.13	£ 379,847.63	
1.07.11.05.01	Street lighting cable	7,940	m	£ 11.43	£ 90,759.53	
1.07.11.05.02	1 way x 100mm diameter duct route in highway; not exceeding 1m deep to invert	4,411	m	£ 52.79	£ 232,876.22	
	Terminations at each column (low quantities)	221	nr	£ 143.45	£ 31,640.55	
1.07.08	**Traffic Signs and Road Marking**					**56,034**
	Traffic Signs					
1.07.08.01.01	Non-illuminated Signs and bollards - allowance	44	item	£ 500.00	£ 22,056.85	
	Road Markings					
1.07.08.02.04	Hydroblasting existing lining	33,977	m²	£ 0.50	£ 16,988.50	
1.07.08.02.04	Road Marking (Lining Crew)	33,977	m²	£ 0.50	£ 16,988.50	
	Grass, Concrete, Paving					**5,045**
	Seeding and Turfing					
	Seeding - Allowance	10,090	m²	£ 0.50	£ 5,045.00	
1.08	**ENABLING WORKS**					**131,944**
1.08.02	**Site Clearance and Preparation Works**					**131,944**
1.08.02.01	**General Clearance**					

Mott MacDonald

Scheme 1: Elm Road grade separation, B1101 diversion and Twenty Foot River Bridge

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
1.08.02.01.01	General site clearance	193,762	m²	£ 0.50	£ 96,881.07	
1.07.11.01.06	Take up and remove from site PCC Kerb	1,525	m	£ 8.87	£ 13,526.75	
	Take up and remove from site sign (small - 1 pole)	5	No	£ 43.91	£ 219.55	
	Take up and remove from site existing footpath	1,056	m²	£ 18.78	£ 19,831.68	
	Take up and remove from site gully grating	31	No	£ 22.75	£ 693.88	
	General clearance; Fill abandoned gully with concrete	31	No	£ 25.95	£ 791.48	
				Total	**£ 13,981,725.74**	

Mott MacDonald

Scheme 2: Coldham Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
	INITIAL CONSTRUCTION					
1.07	**CIVIL ENGINEERING**					**4,561,637**
1.07.09.02	**Barriers and Guardrails**					**46,938**
1.07.09.02.03	Type N1 barrier	718	m	£ 56.28	£ 40,409.04	
1.07.09.02.03	Type N2 barrier	116	m	£ 56.28	£ 6,528.48	
1.07.09	**General Drainage**					**820,901**
1.07.09.01	**Surface Water Drainage**					
1.07.09.01.01	150mm diameter carrier drain with type Z bed and surround, depth to invert not exceeding 2m	1,692	m	£ 64.11	£ 108,474.12	
	Miscellaneous drainage modifications	2	item	£ 285.79	£ 571.58	
	Headwalls - Allowance	13	nr	£ 5,320.65	£ 69,168.48	
	60mm Orifice Plate - Allowance	6	nr	inc		
	Flap Valve	5	nr	£ 100.00	£ 500.00	
	Flow control chamber	6	nr	£ 5,040.62	£ 30,243.71	
	Chambers and Gullies					
1.07.09.01.03	Precast concrete trapped gully with Class D400 grating and frame; 450mm x	15	nr	£ 506.65	£ 7,346.43	
1.07.09.01.03	Manhole; Depth : not exceeding 1.5 m; Type 2A (1.5m internal diameter)	15	nr	£ 3,178.77	£ 46,092.17	
	Attenuation Pond's					
1.07.09.03.01	Attenuation pond - capacity of 10,751m3	1	item	£ 537,550.00	£ 537,550.00	
	Ditches					
1.07.09.03.01	Excavation and disposal of ditches	381	m	£ 55.00	£ 20,955.00	
1.07.01	**Earthworks**					**2,821,703**
1.07.01.02	**Embankments**					
1.07.01.02.03	Embankment : Class 1 fill.	24,160	m³	£ 41.80	£ 1,009,882.98	
1.07.01.02.03	Embankment : Leca light weight fill.	12,696	m³	£ 97.58	£ 1,238,911.78	
	Band Drains					
	Mobilise band drain installation equipment	1	sum	£ 4,473.48	£ 4,473.48	
	De-mobilise band drain installation equipment	1	sum	£ 4,473.48	£ 4,473.48	
	Depth of drain not exceeding 10m	8,120	m	£ 1.40	£ 11,368.00	
	Vibro Stone Columns					
	Mobilise Vibro Stone Columns (VSC), installation equipment	1	sum	£ 4,473.48	£ 4,473.48	
	De-mobilise Vibro Stone Columns (VSC) installation equipment	1	sum	£ 4,473.48	£ 4,473.48	
	500mm dia Vibro Stone Column, Depth of column not exceeding 10m	15,390	m	£ 25.00	£ 384,750.00	
	Testing of Columns	15	nr	£ 200.00	£ 3,078.00	
1.07.01.02	**Cuttings**					
	Existing Highway					
1.07.01.01.05	Grading existing profile	655	m²	£ 5.15	£ 3,370.88	

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
	New Highway					
1.07.01.01.01	General Excavation	3,309	m³	£ 4.03	£ 13,333.63	
1.07.01.01.04	Completion of sub-formation on acceptable material	7,352	m²	£ 1.13	£ 8,308.25	
	Geotextile separator (Terram 1000 or similar)	7,352	m²	£ 2.93	£ 21,542.62	
	Disposal of Material					
1.07.01.01.02	Disposal of acceptable material	3,756	m³	£ 29.09	£ 109,263.42	
1.07.11	**Roads, Pavements and Hardstandings**					**618,904**
	Existing Highway					
1.07.11.01.03	40mm Thin surface course system	655	m²	£ 11.46	£ 7,501.03	
	New Highway					
1.07.11.01.03	Imported granular sub-base; Type 1 aggregate; 520mm depth	7,122	m²	£ 22.87	£ 162,880.14	
1.07.11.01.03	AC32 HDM base 40/60 Rec 125mm thick	5,644	m²	£ 23.96	£ 135,230.24	
1.07.11.01.03	AC20 Dense binder course 40/60 Rec 65mm thick	5,479	m²	£ 11.05	£ 60,542.95	
1.07.11.01.03	40mm Thin surface course system	5,479	m²	£ 11.46	£ 62,789.34	
	Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks					
1.07.11.01.06	Precast concrete kerb; half battered (HB2 125 x 255 x 915mm) laid straight or curved	725	m	£ 22.31	£ 16,174.75	
1.07.11.01.06	Straight or curved to radius > 12m; Standard Beany Block Kerb with integral drainage channel	718	m²	£ 105.53	£ 75,789.54	
	New Footpath					
1.07.11.03.04	Footpath; comprising Type 1 granular material sub-base 225mm thick; AC20 DBM binder course 40/60 60mm thick; AC6 DBM surface course 25mm thick	1,894	m²	£ 51.74	£ 97,995.56	
1.07.11	**Lighting Systems**					**240,496**
1.07.11.06	**Street Lighting**					
1.07.11.06.01	8m mounting height tubular galvanised steel column complete with a post top mounted Philips Luma 3 (BGP627 DS50 - 40klm neutral white LED) mounted at 0° tilt	72	nr	£ 1,722.13	£ 124,267.18	
1.07.11.05.01	Street lighting cable	2,598	m	£ 11.43	£ 29,691.99	
1.07.11.05.02	1 way x 100mm diameter duct route in highway; not exceeding 1m deep to invert	1,443	m	£ 52.79	£ 76,185.47	
	Terminations at each column (low quantities)	72	nr	£ 143.45	£ 10,351.21	
1.07.08	**Traffic Signs and Road Marking**					**12,695**
	Traffic Signs					
1.07.08.01.01	Non-illuminated Signs and bollards - allowance	14	nr	£ 500.00	£ 7,215.90	
	Road Markings					
1.07.08.02.04	Hydroblasting existing lining	5,479	m²	£ 0.50	£ 2,739.50	
1.07.08.02.04	Road Marking (Lining Crew)	5,479	m²	£ 0.50	£ 2,739.50	
1.08	**ENABLING WORKS**					**24,814**
1.08.02	**Site Clearance and Preparation Works**					**24,814**
1.08.02.01	**General Clearance**					
1.08.02.01.01	General site clearance	40,714	m²	£ 0.50	£ 20,356.75	

Mott MacDonald

Scheme 2: Coldham Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
1.07.11.01.06	Take up and remove from site PCC Kerb	478	m	£ 8.87	£ 4,237.38	
	Take up and remove from site sign (small - 1 pole)	5	No	£ 43.91	£ 219.55	
				Total	**£ 4,586,450.45**	

Mott MacDonald

Scheme 3: Holly Bank/Crooked Bank Accommodation Bridge
Broad Drove Road and Broad Drove Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
	INITIAL CONSTRUCTION					
1.07	**CIVIL ENGINEERING**					**8,007,713**
1.07.09.02	**Barriers and Guardrails**					**67,536**
1.07.09.02.03	Type N1 barrier	500	m	£ 56.28	£ 28,140.00	
1.07.09.02.03	Type N2 barrier	700	m	£ 56.28	£ 39,396.00	
1.07.09	**General Drainage**					**301,492**
1.07.09.01	**Surface Water Drainage**					
1.07.09.01.01	750mm diameter culvert drain with type Z bed and surround, depth to invert not exceeding 2m	150	m	£ 116.32	£ 17,458.47	
1.07.09.01.06	Miscellaneous drainage connections	2	nr	£ 285.79	£ 571.58	
	Headwalls - Allowance	14	nr	£ 5,320.65	£ 74,489.13	
	60mm Orifice Plate - Allowance	14	nr	inc		
	Flap Valve	1	nr	£ 100.00	£ 100.00	
	Flow control chamber		nr		£ -	
	Attenuation Pond's					
1.07.09.03.01	Attenuation pond - capacity of 3,424.5m3	1	item	£ 171,225.00	£ 171,225.00	
	Ditches					
1.07.09.03.01	Excavation and disposal of ditches	685	m	£ 55.00	£ 37,647.78	
1.07.01	**Earthworks**					**5,900,173**
1.07.01.02	**Embankments**					
1.07.01.02.03	Embankment : Class 1 fill.	48,098	m3	£ 41.80	£ 2,010,504.34	
1.07.01.02.03	Embankment : Leca light weight fill.	26,369	m3	£ 97.58	£ 2,573,117.27	
	Band Drains					
	Mobilise band drain installation equipment	2	sum	£ 4,473.48	£ 8,946.96	
	De-mobilise band drain installation equipment	2	sum	£ 4,473.48	£ 8,946.96	
	Depth of drain not exceeding 10m	16,330	m	£ 1.40	£ 22,862.00	
	Vibro Stone Columns					
	Mobilise Vibro Stone Columns (VSC), installation equipment	2	sum	£ 4,473.48	£ 8,946.96	
	De-mobilise Vibro Stone Columns (VSC) installation equipment	2	sum	£ 4,473.48	£ 8,946.96	
	500mm dia Vibro Stone Column, Depth of column not exceeding 10m	32,370	m	£ 25.00	£ 809,250.00	
	Testing of Columns	32	nr	£ 200.00	£ 6,474.00	
1.07.01.02	**Cuttings**					
	Existing Highway					
1.07.01.01.05	Grading existing profile	2,389	m^3	£ 5.15	£ 12,304.28	
	New Highway					
1.07.01.01.01	General Excavation	10,458	m^3	£ 4.03	£ 42,145.74	
1.07.01.01.04	Completion of sub-formation on acceptable material	13,944	m^2	£ 1.13	£ 15,756.72	

Mott MacDonald

Scheme 3: Holly Bank/Crooked Bank Accommodation Bridge
Broad Drove Road and Broad Drove Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £		Total £		Subtotal £
	Geotextile separator (Terram 1000 or similar)	13,944	m²	£	2.93	£	40,855.92	
	Disposal of Material							
1.07.01.01.02	Disposal of acceptable material	11382	m³	£	29.09	£	331,114.69	
1.07.11	**Roads, Pavements and Hardstandings**							1,367,205
	Existing Highway							
1.07.11.01.03	40mm Thin surface course system	2,389	m²	£	11.46	£	27,380.00	
	New Highway							
1.07.11.01.03	Imported granular sub-base; Type 1 aggregate; 520mm depth	19,471	m²	£	22.87	£	445,301.77	
1.07.11.01.03	AC32 HDM base 40/60 Rec 125mm thick	15,427	m²	£	23.96	£	369,630.92	
1.07.11.01.03	AC20 Dense binder course 40/60 Rec 65mm thick	14,977	m²	£	11.05	£	165,495.85	
1.07.11.01.03	40mm Thin surface course system	14,977	m²	£	11.46	£	171,636.42	
	Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks							
1.07.11.01.06	Precast concrete kerb; half battered (HB2 125 x 255 x 915mm) laid straight or curved	2,076	m	£	22.31	£	46,315.56	
	New Footpath							
1.07.11.03.04	Footpath; comprising Type 1 granular material sub-base 225mm thick; AC20 DBM binder course 40/60 60mm thick; AC6 DBM surface course 25mm thick	2,700	m²	£	51.74	£	139,698.00	
	New Tarmac Islands							
1.07.11.03.04	New kerbed Tarmac islands; Comprising Granular sub-base 225mm; 50mm dense bin 100/150 AC20 and 20mm dense surface 100/150 AC6 (kerbs measured elsewhere)	39	m²	£	44.90	£	1,746.16	
1.07.11	**Lighting Systems**							345,951
1.07.11.06	**Street Lighting**							
1.07.11.06.01	8m mounting height tubular galvanised steel column complete with a post top mounted Philips Luma 3 (BGP627 DS50 - 40klm neutral white LED) mounted at 0° tilt	104	nr	£	1,722.13	£	178,757.09	
1.07.11.05.01	Street lighting cable	3,737	m	£	11.43	£	42,711.62	
1.07.11.05.02	1 way x 100mm diameter duct route in highway; not exceeding 1m deep to invert	2,076	m	£	52.79	£	109,592.04	
	Terminations at each column (low quantities)	104	nr	£	143.45	£	14,890.11	
1.07.08	**Traffic Signs and Road Marking**							25,357
	Traffic Signs							
1.07.08.01.01	Non-illuminated Signs and bollards - allowance	21	nr	£	500.00	£	10,380.00	
	Road Markings							
1.07.08.02.04	Hydroblasting existing lining	14,977	m2	£	0.50	£	7,488.50	
1.07.08.02.04	Road Marking (Lining Crew)	14,977	m2	£	0.50	£	7,488.50	
1.08	**ENABLING WORKS**							68,187
1.08.02	**Site Clearance and Preparation Works**							68,187
1.08.02.01	**General Clearance**							
1.08.02.01.01	General site clearance	95,926	m²	£	0.50	£	47,962.93	
1.07.11.01.06	Take up and remove from site PCC Kerb	1,144	m	£	8.87	£	10,145.59	
	Take up and remove from site sign (small - 1 pole)	5	No	£	43.91	£	219.55	

Mott MacDonald

Scheme 3: Holly Bank/Crooked Bank Accommodation Bridge
Broad Drove Road and Broad Drove Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

Item	Qty	Unit	Unit rate £	Total £	Subtotal £
Take up and remove from site existing footpath	395	m²	£ 18.78	£ 7,417.54	
Take up and remove from site gully grating	23	No	£ 22.75	£ 520.43	
General clearance; Fill abandoned gully with concrete	23	No	£ 22.75	£ 520.43	
Demolition of buildings	56	m²	£ 25.00	£ 1,401.00	
			Total	**£ 8,075,900.77**	

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Scheme 4: A47 Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
	INITIAL CONSTRUCTION					
1.07	**CIVIL ENGINEERING**					**5,732,441**
1.07.09.02	**Barriers and Guardrails**					**42,604**
1.07.09.02.03	Type N1 barrier	0	m	£ 56.28	£ -	
1.07.09.02.03	Type N2 barrier	757	m	£ 56.28	£ 42,603.96	
1.07.09	**General Drainage**					**151,247**
1.07.09.01	**Surface Water Drainage**					
1.07.09.01.01	750mm diameter culvert drain with type Z bed and surround, depth to invert not exceeding 2m	26	m	£ 116.32	£ 3,010.36	
1.07.09.01.06	Connections to public mains drainage	5	nr	£ 285.79	£ 1,428.95	
	Headwalls - Allowance	5	nr	£ 5,320.65	£ 26,603.26	
	60mm Orifice Plate - Allowance	3	nr	inc		
	Flap Valve	3	nr	£ 100.00	£ 300.00	
	Flow control chamber	1	nr	£ 5,040.62	£ 5,040.62	
	<u>Attenuation Pond's</u>					
1.07.09.03.01	Attenuation pond - capacity of 1,522m3	1	item	£ 76,100.00	£ 76,100.00	
	<u>Ditches</u>					
1.07.09.03.01	Excavation and disposal of ditches	705	m	£ 55.00	£ 38,763.73	
1.07.01	**Earthworks**					**4,446,427**
1.07.01.02	**Embankments**					
1.07.01.02.03	Embankment : Class 1 fill.	33,178	m3	£ 41.80	£ 1,386,858.79	
1.07.01.02.03	Embankment : Leca light weight fill.	19,986	m3	£ 97.58	£ 1,950,190.94	
	<u>Band Drains</u>					
	Mobilise band drain installation equipment	1	sum	£ 4,473.48	£ 4,473.48	
	De-mobilise band drain installation equipment	1	sum	£ 4,473.48	£ 4,473.48	
	Depth of drain not exceeding 10m	9,820	m	£ 1.40	£ 13,748.00	
	<u>Vibro Stone Columns</u>					
	Mobilise Vibro Stone Columns (VSC), installation equipment	1	sum	£ 4,473.48	£ 4,473.48	
	De-mobilise Vibro Stone Columns (VSC) installation equipment	1	sum	£ 4,473.48	£ 4,473.48	
	500mm dia Vibro Stone Column, Depth of column not exceeding 10m	24,640	m	£ 25.00	£ 616,000.00	
	Testing of Columns	25	nr	£ 200.00	£ 4,928.00	
1.07.01.02	**Cuttings**					
	<u>Existing Highway</u>					
1.07.01.01.05	Grading existing profile	2,881	m³	£ 5.15	£ 14,835.81	
	<u>New Highway</u>					
1.07.01.01.01	General Excavation	11,183	m³	£ 4.03	£ 45,067.49	

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Scheme 4: A47 Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
1.07.01.01.04	Completion of sub-formation on acceptable material	10,512	m²	£ 1.13	£ 11,878.56	
	Geotextile separator (Terram 1000 or similar)	10,512	m²	£ 2.93	£ 30,800.16	
	Disposal of Material					
1.07.01.01.02	Disposal of acceptable material	12,177	m³	£ 29.09	£ 354,225.12	
1.07.11	**Roads, Pavements and Hardstandings**					**994,214**
	Existing Highway					
1.07.11.01.03	40mm Thin surface course system	2,881	m²	£ 11.46	£ 33,013.28	
	New Highway					
1.07.11.01.03	Imported granular sub-base; Type 1 aggregate; 520mm depth	10,512	m²	£ 22.87	£ 240,409.44	
1.07.11.01.03	AC32 HDM base 40/60 Rec 125mm thick	8,329	m²	£ 23.96	£ 199,562.84	
1.07.11.01.03	AC20 Dense binder course 40/60 Rec 65mm thick	8,086	m²	£ 11.05	£ 89,350.30	
1.07.11.01.03	40mm Thin surface course system	8,086	m²	£ 11.46	£ 92,665.56	
	Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks					
1.07.11.01.06	Precast concrete kerb; half battered (HB2 125 x 255 x 915mm) laid straight or curved	513	m	£ 22.31	£ 11,450.83	
	New Footpath					
1.07.11.03.04	Footpath; comprising Type 1 granular material sub-base 225mm thick; AC20 DBM binder course 40/60 60mm thick; AC6 DBM surface course 25mm thick	6,335	m²	£ 51.74	£ 327,761.52	
1.07.11	**Lighting Systems**					**85,531**
1.07.11.06	**Street Lighting**					
1.07.11.06.01	8m mounting height tubular galvanised steel column complete with a post top mounted Philips Luma 3 (BGP627 DS50 - 40klm neutral white LED) mounted at 0° tilt	26	nr	£ 1,722.13	£ 44,195.02	
1.07.11.05.01	Street lighting cable	924	m	£ 11.43	£ 10,559.81	
1.07.11.05.02	1 way x 100mm diameter duct route in highway; not exceeding 1m deep to invert	513	m	£ 52.79	£ 27,095.00	
	Terminations at each column (low quantities)	26	nr	£ 143.45	£ 3,681.36	
1.07.08	**Traffic Signs and Road Marking**					**10,652**
	Traffic Signs					
1.07.08.01.01	Non-illuminated Signs and bollards - allowance	5	nr	£ 500.00	£ 2,566.30	
	Road Markings					
1.07.08.02.04	Hydroblasting existing lining	8,086	m2	£ 0.50	£ 4,043.00	
1.07.08.02.04	Road Marking (Lining Crew)	8,086	m2	£ 0.50	£ 4,043.00	
	Grass Concrete Paving					**1,766**
	Seeding and Turfing					
	Seeding - Allowance	3,532	m²	£ 0.50	£ 1,765.86	
1.08	**ENABLING WORKS**					**75,983**
1.08.02	**Site Clearance and Preparation Works**					**75,983**
1.08.02.01	**General Clearance**					
1.08.02.01.01	General site clearance	47,611	m²	£ 0.50	£ 23,805.51	
1.07.11.01.06	Take up and remove from site PCC Kerb	3,098	m	£ 8.87	£ 27,475.53	

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Scheme 4: A47 Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

Item	Qty	Unit	Unit rate £	Total £	Subtotal £
Take up and remove from site sign (small - 1 pole)	5	No	£ 43.91	£ 219.55	
Take up and remove from site existing footpath	1,143	m²	£ 18.78	£ 21,465.54	
Take up and remove from site gully grating	62	No	£ 22.75	£ 1,409.40	
General clearance; Fill abandoned gully with concrete	62	No	£ 25.95	£ 1,607.64	
			Total	**£ 5,808,423.95**	

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Scheme 5 Weasenham Lane Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
	INITIAL CONSTRUCTION					
1.07	**CIVIL ENGINEERING**					**1,729,358**
1.07.09.02	**Barriers and Guardrails**					**36,582**
1.07.09.02.03	Type N4 barrier	650	m	£ 56.28	£ 36,582.00	
1.07.09	**General Drainage**					**180,850**
1.07.09.01	**Surface Water Drainage**					
	Miscellaneous drainage modifications	1	item	£ 285.79	£ 285.79	
	Headwalls - Allowance	4	nr	£ 5,320.65	£ 21,282.61	
	60mm Orifice Plate	2	nr	inc		
	Flap Valve	2	nr	£ 100.00	£ 200.00	
	Flow control chamber	2	nr	£ 5,040.62	£ 10,081.24	
	Geocellular Storage -allowance	360	m²	£ 400.00	£ 144,000.00	
	Attenuation Pond's					
1.07.09.03.01	Attenuation pond - capacity of 100m3	1	item	£ 5,000.00	£ 5,000.00	
1.07.01	**Earthworks**					**716,569**
1.07.01.02	**Embankments**					
1.07.01.02.03	Embankment - Reinforced earth retaining structure	14,802	m3	£ 41.80	£ 618,723.60	
1.07.01.02	**Cuttings**					
	New Highway					
1.07.01.01.01	General Excavation	2,321	m³	£ 4.03	£ 9,354.03	
1.07.01.01.04	Completion of sub-formation on acceptable material	5,158	m²	£ 1.13	£ 5,828.54	
	Geotextile separator (Terram 1000 or similar)	5,158	m²	£ 2.93	£ 15,112.94	
	Disposal of Material					
1.07.01.01.02	Disposal of acceptable material	2,322	m³	£ 29.09	£ 67,549.89	
1.07.11	**Roads, Pavements and Hardstandings**					**489,299**
	New Highway					
1.07.11.01.03	Imported granular sub-base; Type 1 aggregate; 520mm depth	5,158	m²	£ 22.87	£ 117,963.46	
1.07.11.01.03	AC32 HDM base 40/60 Rec 125mm thick	4,086	m²	£ 23.96	£ 97,900.56	
1.07.11.01.03	AC20 Dense binder course 40/60 Rec 65mm thick	3,967	m²	£ 11.05	£ 43,835.35	
1.07.11.01.03	40mm Thin surface course system	3,967	m²	£ 11.46	£ 45,461.82	
	Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks					
1.07.11.01.06	Precast concrete kerb; half battered (HB2 125 x 255 x 915mm) laid straight or curved	1,760	m	£ 22.31	£ 39,265.60	
	New Footpath					
1.07.11.03.04	Footpath; comprising Type 1 granular material sub-base 225mm thick; AC20 DBM binder course 40/60 60mm thick; AC6 DBM surface course 25mm thick	2,800	m²	£ 51.74	£ 144,872.00	
1.07.11	**Lighting Systems**					**293,292**
1.07.11.06	**Street Lighting**					

Mott MacDonald

Scheme 5 Weasenham Lane Grade Separation

Transport Corridor Proposed Civils Work

March to Wisbech

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
1.07.11.06.01	8m mounting height tubular galvanised steel column complete with a post top mounted Philips Luma 3 (BGP627 DS50 - 40klm neutral white LED) mounted at 0° tilt	88	nr	£ 1,722.13	£ 151,547.44	
1.07.11.05.01	Street lighting cable	3,168	m	£ 11.43	£ 36,210.24	
1.07.11.05.02	1 way x 100mm diameter duct route in highway; not exceeding 1m deep to invert	1,760	m	£ 52.79	£ 92,910.40	
	Terminations at each column (low quantities)	88	nr	£ 143.45	£ 12,623.60	
1.07.08	**Traffic Signs and Road Marking**					**12,767**
	Traffic Signs					
1.07.08.01.01	Non-illuminated Signs and bollards - allowance	18	nr	£ 500.00	£ 8,800.00	
	Road Markings					
1.07.08.02.04	Hydroblasting existing lining	3,967	m2	£ 0.50	£ 1,983.50	
1.07.08.02.04	Road Marking (Lining Crew)	3,967	m2	£ 0.50	£ 1,983.50	
1.08	**ENABLING WORKS**					**16,184**
1.08.02	**Site Clearance and Preparation Works**					**16,184**
1.08.02.01	**General Clearance**					
1.08.02.01.01	General site clearance	8,007	m²	£ 0.50	£ 4,003.25	
1.07.11.01.06	Take up and remove from site PCC Kerb	296	m	£ 8.87	£ 2,627.03	
	Take up and remove from site sign (small - 1 pole)	5	No	£ 43.91	£ 219.55	
	Take up and remove from site existing footpath	482	m²	£ 18.78	£ 9,045.95	
	Take up and remove from site gully grating	6	No	£ 22.75	£ 134.76	
	General clearance; Fill abandoned gully with concrete	6	No	£ 25.95	£ 153.71	
				Total	**£ 1,745,542.35**	

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Transport Corridor Carparks

March Station

	Item	Qty	Unit	Unit rate £		Total £		Subtotal £
	INITIAL CONSTRUCTION							
1.07	**CIVIL ENGINEERING**							**£ 1,520,333.43**
1.07.09	**General Drainage**							**24,713**
1.07.09.01	**Surface Water Drainage**							
	Standard Route							
1.07.09.01.01	150mm diameter carrier drain with type Z bed and surround, depth to invert not exceeding 2m	7	m	£	64.11	£	478.90	
1.07.09.01.06	Connections to existing drainage/outfalls; 225/450mm dia; depth to invert exceeding 2m but not exceeding 4m	2	nr	£	285.79	£	571.58	
	Miscellaneous drainage modifications	1	item	£	1,000.00	£	1,000.00	
	Flow control chamber - assumes 2.5m depth	1	nr	£	5,040.62	£	5,040.62	
	Hydrobrake	1	nr	£	11,201.37	£	11,201.37	
	150mm Pre-cast concrete headwall	1	nr	£	5,320.65	£	5,320.65	
	150mm Flapvalve	1	nr	£	100.00	£	100.00	
	Outlet unit - allowance	1	nr	£	1,000.00	£	1,000.00	
1.07.01	**Earthworks**							**233,151**
1.07.01.02	**Cuttings**							
1.07.09.03.01	Excavation of acceptable material normal material, excluding hard or artificially hard material, excluding Class 5A;	6,752	m³	£	4.03	£	27,209.14	
	Disposal of Material							
1.07.01.01.02	Disposal of acceptable material excluding Class 5A	6,752	m³	£	29.09	£	196,405.44	
	Completion of Formation and Sub-formation							
1.07.01.01.04	Completion of sub-formation on acceptable material	8,439	m²	£	1.13	£	9,536.07	
1.07.11	**Roads, Pavements and Hardstandings**							**931,787**
	New Carpark Surfacing							
	Granular reservoir; as sub-base beneath permeable block paving; 570mm depth	6,674	m²	£	10.16	£	67,806.11	
	DBM50 to BS7533 base 40/60 Rec 100mm thick	6,674	m²	£	23.96	£	159,904.97	
	50mm 6.3 - 2mm grit	6,674	m²	£	11.05	£	73,745.82	
	80mm permeable block paving - what spec or product? Has Jim got any quotes?	6,674	m²	£	75.00	£	500,537.25	
	Entrance / Exit Road							
	Cold milling/planning; 40mm thick	1,766	m²	£	2.06	£	3,638.91	
	40mm Thin surface course system	1,766	m²	£	11.46	£	20,243.63	
	Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks							
1.07.11.01.06	Precast concrete kerb; half battered (HB2 125 x 255 x 915mm) laid straight or curved	1,851	m	£	22.31	£	41,299.16	
1.07.11.01.06	Straight or curved to radius > 12m; Standard Beany Block Kerb with integral drainage channel	119	m²	£	105.53	£	12,508.47	
	New Footpath							
1.07.11.03.04	Footpath type 1; comprising Type 1 granular material sub-base 100mm thick; AC20 DBM binder course 40/60 50mm thick; AC6 DBM surface course 20mm thick	787	m²	£	37.67	£	29,664.37	
	New Tarmac Islands							

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Transport Corridor Carparks

March Station

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
1.07.11.03.04	New kerbed Tarmac islands; Comprising Granular sub-base 225mm; 50mm dense bin 100/150 AC20 and 20mm dense surface 100/150 AC6 (kerbs measured elsewhere)	500	m²	£ 44.90	£ 22,438.78	
1.07.08	**Traffic Signs and Road Marking**					**18,289**
	Traffic Signs					
1.07.08.01.01	Signs and bollards - allowance	20	nr	£ 500.00	£ 9,848.40	
	Road Markings					
1.07.08.02.04	Hydroblasting existing lining	8,440	m2	£ 0.50	£ 4,220.15	
1.07.08.02.04	Road Marking (Lining Crew)	8,440	m2	£ 0.50	£ 4,220.15	
1.07.11	**Lighting Systems**					**312,394**
1.07.11.06	**Street Lighting**					
1.07.11.06.01	8m mounting height tubular galvanised steel column complete with a post top mounted Philips Luma 3 (BGP627 DS50 - 40klm neutral white LED) mounted at 0° tilt	50	nr	£ 1,600.62	£ 80,031.00	
	Luminaires	70	nr	£ 345.75	£ 24,202.50	
1.07.11.05.01	Primary Power Supply; Cables and Containment; 4-core 4mm2 XLPE/SWA/LSF	3,000	m	£ 45.00	£ 135,000.00	
1.07.11.05.02	1 way x 100mm diameter duct route in highway; not exceeding 1m deep to invert	1,250	m	£ 52.79	£ 65,987.50	
	Terminations at each column (low quantities)	50	nr	£ 143.45	£ 7,172.50	
1.08	**ENABLING WORKS**					**24,141**
1.08.02	**Site Clearance and Preparation Works**					**24,141**
	General Site Clearance					
1.08.02.01.01	General clearance; debris and rubbish lying on the ground, manpower only	11,573	m²	£ 0.50	£ 5,786.56	
1.08.03.01.01	Clearance of woodland	1,921	m²	£ 8.62	£ 16,555.49	
	Take up and remove from site sign (small - 1 pole)	5	No	£ 43.91	£ 219.55	
	Take up and remove from site existing Footpath	84	m²	£ 18.78	£ 1,579.77	
				Total	**£ 1,544,474.80**	

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Transport Corridor Carparks

Wisbech Station

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
	INITIAL CONSTRUCTION					
1.07	**CIVIL ENGINEERING**					**1,671,095**
1.07.09	**General Drainage**					
1.07.09.01	**Surface Water Drainage**					**94,187**
	Alternative Route					
1.07.09.01.01	150mm diameter carrier drain with type Z bed and surround, depth to invert not exceeding 2m	6	m	£ 64.11	£ 355.81	
1.07.11.01.06	Straight or curved to radius > 12m; Standard Beany Block Kerb with integral drainage channel	267	m²	£ 105.53	£ 28,132.19	
1.07.09.01.06	Connections to existing drainage/outfalls; 225/450mm dia; depth to invert exceeding 2m but not exceeding 4m	2	nr	£ 285.79	£ 571.58	
	Flow contro chamber	1	nr	£ 5,040.62	£ 5,040.62	
	Hydrobrake - allowance	1	nr	£ 11,201.37	£ 11,201.37	
	150mm Pre-cast concrete headwall - allowance	1	nr	£ 5,320.65	£ 5,320.65	
	150mm Flapvale	1	nr	£ 100.00	£ 100.00	
	Access units - allowance	2	nr	£ 1,000.00	£ 2,000.00	
	Outlet unit - allowance	4	nr	£ 1,000.00	£ 4,000.00	
	Geocell crate - allowance	4	nr	£ 500.00	£ 2,000.00	
	Standard Route					
1.07.09.01.01	150mm diameter carrier drain with type Z bed and surround, depth to invert not exceeding 2m	6	m	£ 64.11	£ 371.84	
1.07.09.01.06	Connections to existing drainage/outfalls; 225/450mm dia; depth to invert exceeding 2m but not exceeding 4m	6	nr	£ 285.79	£ 1,714.74	
	Linear drainage channel	48	m	£ 62.95	£ 2,995.25	
	Flow control chamber	1	nr	£ 5,040.62	£ 5,040.62	
	Hydrobrake - allowance	1	nr	£ 11,201.37	£ 11,201.37	
	150mm Pre-cast concrete headwall - allowance	1	nr	£ 5,040.62	£ 5,040.62	
	150mm Flapvale	1	nr	£ 100.00	£ 100.00	
	Access units - allowance	3	nr	£ 1,000.00	£ 3,000.00	
	Outlet unit - allowance	3	nr	£ 1,000.00	£ 3,000.00	
	Geocell crate - allowance	6	nr	£ 500.00	£ 3,000.00	
1.07.01	**Earthworks**					**256,495**
1.07.01.02	**Cuttings**					
	Hard Surfaced Area					
1.07.01.01.05	Grading existing profile	7,703	m³	£ 5.15	£ 39,672.26	
	Grass Area					
1.07.09.03.01	Excavation of acceptable material Class 5A Topsoil 150mm; excavate and set aside for re-use,	880	m³	£ 4.03	£ 3,546.60	
1.07.09.03.01	Excavation of acceptable material; excluding Class 5A; normal material, excluding hard or artificially hard material,	3,814	m³	£ 4.03	£ 15,368.61	
1.07.01.01.04	Completion of sub-formation on acceptable material	5,867	m²	£ 1.13	£ 6,629.71	
	IDB Watercourse					

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Transport Corridor Carparks

Wisbech Station

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
1.07.09.03.01	Excavation of acceptable material Class 5A Topsoil 150mm; excavate and set aside for re-use,	124	m³	£ 4.03	£ 499.56	
1.07.09.03.01	Excavation of acceptable material; excluding Class 5A; normal material, excluding hard or artificially hard material,	1,529	m³	£ 4.03	£ 6,161.23	
	Disposal of Material					
1.07.01.01.02	Disposal of acceptable material excluding Class 5A	6,346	m³	£ 29.09	£ 184,616.78	
1.07.11	**Roads, Pavements and Hardstandings**					**865,733**
	New Carpark Surfacing					
	Granular reservoir; as sub-base beneath permeable block paving; 570mm depth	5,867	m²	£ 10.16	£ 59,608.72	
	DBM50 to BS7533 base 40/60 Rec 100mm thick	5,867	m²	£ 23.96	£ 140,573.32	
	50mm 6.3 - 2mm grit	5,867	m²	£ 11.05	£ 64,830.35	
	80mm permeable block paving	5,867	m²	£ 75.00	£ 440,025.00	
	Kerbs, Channels, Edgings, Combined Drainage and Kerb Blocks					
1.07.11.01.06	Precast concrete kerb; half battered (HB2 125 x 255 x 915mm) laid straight or curved	1,980	m	£ 22.31	£ 44,180.05	
1.07.11.01.06	Straight or curved to radius > 12m; Standard Beany Block Kerb with integral drainage channel	194	m²	£ 105.53	£ 20,440.11	
	New Footpath					
1.07.11.03.04	Footpath type 1; comprising Type 1 granular material sub-base 100mm thick; AC20 DBM binder course 40/60 50mm thick; AC6 DBM surface course 20mm thick	1,367	m²	£ 37.67	£ 51,494.14	
	New Tarmac Islands					
1.07.11.03.04	New kerbed Tarmac islands; Comprising Granular sub-base 225mm; 50mm dense bin 100/150 AC20 and 20mm dense surface 100/150 AC6 (kerbs measured elsewhere)	265	m²	£ 44.90	£ 11,894.01	
	Station Concourse					
1.07.11.03.04	Station Concourse; comprising Type 1 granular material sub-base 100mm thick; AC20 DBM binder course 40/60 50mm thick; AC6 DBM surface course 20mm thick	852	m²	£ 37.67	£ 32,086.55	
	Paving					
1.07.11.03.04	400x400x50mm PCC tactile paving laid on 25mm to 35mm semidry mortar on 150mm thick type 1 subbase	10	m²	£ 62.48	£ 601.06	
1.07.08	**Traffic Signs and Road Marking**					**16,737**
	Traffic Signs					
1.07.08.01.01	Signs and bollards - allowance	22	nr	£ 500.00	£ 10,869.85	
	Road Markings					
1.07.08.02.04	Hydroblasting existing lining	5,867	m2	£ 0.50	£ 2,933.50	
1.07.08.02.04	Road Marking (Lining Crew)	5,867	m2	£ 0.50	£ 2,933.50	
1.07.11	**Lighting Systems**					**398,893**
1.07.11.06	**Street Lighting**					
1.07.11.06.01	8m mounting height tubular galvanised steel column complete with a post top mounted Philips Luma 3 (BGP627 DS50 - 40klm neutral white LED) mounted at 0° tilt	55	nr	£ 1,600.62	£ 88,034.10	
	Luminaires	70	nr	£ 345.75	£ 24,202.50	
1.07.11.05.01	Primary Power Supply; Cables and Containment; 4-core 4mm2 XLPE/SWA/LSF	3,000	m	£ 45.00	£ 135,000.00	
1.07.11.05.02	1 way x 100mm diameter duct route in highway; not exceeding 1m deep to invert	1,375	m	£ 52.79	£ 72,586.25	

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Transport Corridor Carparks

Wisbech Station

	Item	Qty	Unit	Unit rate £	Total £	Subtotal £
	Terminations at each column (low quantities)	55	nr	£ 143.45	£ 7,889.75	
	DNO Cubicle	1	nr	£ 10,000.00	£ 10,000.00	
	Bike Racks	61	m²	£ 1,000.00	£ 61,180.00	
	Telecoms					**39,051**
	CCTV columns	4	nr	£ 1,601.08	£ 6,404.32	
	CCTV Cameras	12	nr	£ 2,720.58	£ 32,646.96	
1.08	**ENABLING WORKS**					**38,581**
1.08.02	**Site Clearance and Preparation Works**					**38,581**
	General Site Clearance					
1.08.02.01.01	General clearance; debris and rubbish lying on the ground, manpower only	15,635	m²	£ 0.50	£ 7,817.50	
1.08.03.01.01	Demolition of small buildings - Assumed height 5m	77	m³	£ 25.00	£ 1,913.75	
1.08.03.01.01	Demolition of storage containers	1,145	m³	£ 25.00	£ 28,630.50	
	Take up and remove from site sign (small - 1 pole)	5	No	£ 43.91	£ 219.55	
				Total	**£ 1,709,676.73**	

B. Project Assumptions Register

Reference	Mode	Discipline	Assumption	Source	Consequences (associated risks)	Date Raised
20	National Rail	Bridges Civil Structures	For purposes of GRIP 3 bridge assessment - Condition of existing bridges and culverts is accurately reflected in reports in NR Existing Structure Dashboard. Where insufficient information is available to determine the condition of existing bridges, these will be assumed to be in good condition	GRIP 3 bridge assessment	Incorrect assumption may result in increased design and construction costs.	14/06/2019
21	National Rail	Bridges Civil Structures	For purposes of GRIP 3 culvert assessment - Where insufficient information desktop is available to determine a Network Rail Culvert Risk Assessment Score (CRAS), it will be assumed that exisitng culverts are structurally inadequate and will be overslabbed or replaced.	GRIP 3 culvert assessment	Increase in design and construction costs if overslabbing is not feasible.	14/06/2019
33	National Rail	General Civils	It is assumed no further improvements to March station facilities will be provided, other than those required to bring the dis-used platforms back into operation	GRIP 3 report	Inadequate facilities within existing station.	17/07/2019
34	National Rail	Highways	In line with Table 1 of the standard: NR-l3-trk-2049-mod07, a minimum clearance of 4780mm will be assumed from the proposed top of rail level to the soffit of the overbridge structures.	GRIP 3 report	Allows for electrification in the future	26/07/2019
35	National Rail	General Civils	Passive provision shall be provided for electrification of the branch line where new infrastructure is proposed. No existing infrastructure shall be modified to provide passive provision.	GRIP 3 report	Additional works may be required to existing structures, should electrification be required in the future.	06/08/2019
36	National Rail	Track	The existing track level for vertical alignment purposes is 200mm above the LIDAR surface level	GRIP 3 report	Changes to track vertical alignment as a result of more detailed survey information leading to increased earthworks costs	19/08/2019
37	National Rail	Geotechnics	Where sections of embankment could not be inspected due to dense vegetation, condition of existing embankments to be based on information included in the NR Earthworks Inspection Reports and observations in the GRIP 2 Report.	Geotechnical and Geoenvironmental Desk Study	Conflicting observations between NR reports and GRIP 2 report and hence regrade locations may change following further site inspections.	23/08/2019
38	National Rail	Geotechnics	Ground conditions and groundwater profile assumed based on limited historical boreholes located at the centre of the scheme and within Wisbech.	Geotechnical and Geoenvironmental Desk Study	Ground conditions to be confirmed following GI at the next phase and may require additional location specific ground models.	23/08/2019
39	National Rail	Geotechnics	Existing bridges conditions assumed to be as per 2020 visual inspection survey.	Geotechnical and Geoenvironmental Desk Study	Bridge foundation strengthening solutions will need to be reviewed following detailed site inspections.	23/08/2019
40	National Rail	General Civils	The existing platform condition and recess is unknown from currently available information. It is assumed from limited site photos that the wall is in a fair condition and has near to zero recess. This would allow for the existing wall to be utilised with the installation of an oversail unit for the proposed coper adjustments.	GRIP 3 report	If the wall is in a poor condition or already contains a large recess it may be required to rebuild the front wall. *Update: During site surveys it was noted that the wall for Platform 3 and 4 is in a poor condition. It is proposed to demolish and rebuild these walls where the platform is being reinstated. For Platform 3 an oversail detail is still proposed to provide a compliant recess.*	28/08/2019
41	National Rail	General Civils	The existing canopy over Platform 3 and the station building on Platform 4 are proposed to be incorporated into the accessible station areas. There are no records of these elements however during site surveys no major defects were noted.	GRIP 3 report	If the elements are found to be in a poor condition during detailed site surveys, they may require remedial works or partial demolition/reconstruction.	28/08/2019
42	National Rail	General Civils	With the information available the existing platform levels are unknown. It is assumed with the proposed coper locations, providing new surfacing to the existing platform areas will allow for compliant crossfalls (between 1:40 and 1:80 away from the coper edge).	GRIP 3 report	If this is not achievable this could cause a risk of prams/wheelchairs falling onto the track, or if too shallow could allow ponding of water. This could be addressed but would require further works to the existing station.	28/08/2019
43	National Rail	General Civils	The existing foundations for the platforms are unknown. It is assumed the foundations are to the standard detail NR/CIV/SD/3012.	GRIP 3 report	If these dimensions are different the could be impacted by the proposed construction works, affecting their stability. This may lead to re-design once the foundations are verified.	28/08/2019
44	National Rail	Track	Track Speed Calculations - Where calculations have been undertaken on existing track the following assumptions on turnout type have been made: -Turnout 45A on the Up Main Line is CV 9.25. -Whitemoor Jn existing turnout (50) is BV - contra flexure	GRIP 3 report	Differing turnout types could impact proposed operational speed at March station (currently 20mph)	05/09/2019
45	National Rail	Track	The proposed drawing format has been based on recent (2019) GRIP 3 drawings approved by Network Rail on the Skelmersdale Rail Link project. Refer to "Key Document Links" tab for example drawings	GRIP 3 report	Rework of drawings if format is not accepted by client and/or Network Rail	05/09/2019
46	National Rail	Track	Operational platform lengths are based on two car class 170 length from GRIP 2 report (47.22m). -Part 5 of Rail Industry Standard 7016 defines the overrun risk zone as 20m behind the face of the buffer stop. -Part 8, Table 2 defines inaccurate stopping (terminal platforms) as 5m and buffer stop stand back as 2m -E.1.7 of NR 2049 defines the minimum platform length as max length of train + inaccurate stopping + buffer stop allowance For Wisbech the operational platform length needs to be 47.22m (two car class 170 length from GRIP 2 report) + 5m + 2m = 55m (rounded up). Adding 20m for the overrun risk zone and then 47.22m passive provision for a 4 car train in the future, means the length of straight at the end of the track needs to be at least 122m. For March the operational platform length needs to be 47.22m (two car class 170 length from GRIP 2 report) + 5m = 53m (rounded up). Adding 47.22m passive provision for a 4 car train in the future gives 100m.	GRIP 3 report	Change in rolling stock could impact track and platform design	05/09/2019
47	National Rail	Track	It is assumed that exceptional track radius of <200m (NR/L2/TRK/2102, table 6) and flexed turnout with exceptional track radius at March station will be approved by the NR RAM [Track] with the provision of lubrication and check rails (where feasible)	GRIP 3 report	Major changes to track design (Opportunities to flatten the radii are limited due to the location of the station platforms, Norwood Road Overbridge and adjacent pond)	05/09/2019
48	National Rail	Track	At existing chain river bridge, proposed sluing of the track is approximately 300 mm from the existing horizontal alignment. The minimum existing clearance from track to the hog back girder is approximately 900 mm, the minimum clearance required is 730 mm. Therefore a train can potentially clash with the bridge girders. Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage with detailed topographical survey.	GRIP 3 report	There may be a requirement to replace the bridge (or parts of)	30/09/2019
49	National Rail	Highways	It is assumed that the scheme 1 highways design should be developed directly from the GRIP 2 design provided by NR.	GRIP 3 report	Highway alignments from GRIP 2 may not be the most appropriate solution.	20/09/2019
50	National Rail	Highways	It is assumed that a new access to the western end of Redmoor Lane will be required and that this can be provided via the acquisition of agricultural land.	GRIP 3 report	Increased scheme cost	20/09/2019
51	National Rail	Highways	It is assumed that Newbridge Lane level crossing is to be closed to all traffic, as no design was provided at GRIP 2 for grade separation or alternative access.	GRIP 3 report	Scheme objections, increased design cost later if this needs to be re-considered.	20/09/2019

Reference	Mode	Discipline	Assumption	Source	Consequences (associated risks)	Date Raised
52	National Rail	Highways	It is assumed that in order to construct the Weasenham Lane grade separation, the Lamb Weston property on the north side of the road will require demolition.	GRIP 3 report	Increased scheme cost, scheme objections	20/09/2019
53	National Rail	Highways	It is assumed that in order to construct the Weasenham Lane grade separation, Hitchinsons business will require acquisition, as access to land parcel is severed.	GRIP 3 report	Increased scheme cost, scheme objections	20/09/2019
54	National Rail	Highways	It is assumed that it is acceptable to close the egress to the Lamb Western property on the south side of Weasenham Lane without affecting site access and circulation.	GRIP 3 report	Increased scheme cost, scheme objections.	20/09/2019
55	National Rail	Highways	It is assumed that it is acceptable to close the existing access road to Crown Packaging and re-provide access through the existing staff car park without affecting site access and circulation.	GRIP 3 report	Increased scheme cost, scheme objections	20/09/2019
56	National Rail	Highways	It is assumed that in order to construct the Weasenham Lane grade separation, the Yearsley Group business will require acquisition, as access to land parcel is severed.	GRIP 3 report	Increased scheme cost, scheme objections	20/09/2019
57	National Rail	Highways	It is assumed that it is acceptable to close the access to the Del Monte property on the south side of Weasenham Lane and convert the egress to two-way traffic without affecting site access and circulation.	GRIP 3 report	Increased scheme cost, scheme objections	20/09/2019
58	National Rail	Highways	It is assumed that highway lighting will be reinstated/installed in the following areas, in line with the existing situation: Scheme 1 - Within 30/40mph areas. Scheme 2 - None Scheme 3 - New link road, about 100m from the A47 roundabout. A47 Wisbech Bypass - None, assumes lighting on approach to roundabouts is not affected. Weasenham Lane - all along Assumes that existing lighting is adequate.	GRIP 3 report	Increased costs for lighting surveys/assessment/design.	21/10/2019
59	National Rail	General Civils	Current provision for parking at the station is below expected demand. Additional through services to Cambridge are expected to increase parking demand up to 3-fold for passengers starting their journey at March Station. Demand for an increase of parking between 200-300 spaces is expected based on demand modelling. 6% of these spaces will be allocated for disabled users. It is not proposed to provide any additional bus stops/taxi ranks for this station as it is assumed the existing arrangements are sufficient. It is acknowledged there is an opportunity to reduce the works required for the car park as part of this project. Integration / modification of the proposed parking area with the Fenland Stations proposals are to be agreed at the next design phase. This has been identified in Opportunity OE02 in Table 12.13	GRIP 3 report	Increased scheme cost, scheme objections	21/10/2019
60	National Rail	General Civils	A new car park is proposed at Wisbech station. It is assumed that this car park will require between 60 and 200 spaces to meet the proposed demand. 6% of these spaces will be allocated for disabled users. It is assumed a taxi rank, bus stop and cycle parking will all be required at the station.	GRIP 3 report	Increased scheme cost, scheme objections	21/10/2019
61	National Rail	Bridges	The assessments of the 4 existing underbridges is based on limited record information was provided in January 2020 and visual inspections carried out in March 2020. Assessments carried out in a conservative manner.	GRIP 3 report	Incorrect assumptions regarding assessed rating could result in overly optimistic or conservative assessment. This may result in abortive work, requirement for re-work, programme delay, additional cost.	06/11/2019
62	National Rail	Electrical & Plant	It is assumed that all signalling supplies within the March West & East junctions' area would be derived from March Substation 'G' Low Voltage Supply Cubicle. After visual assessment of the cubicle on the March 2020 surveys there was found to be spare capacity for the additional proposed supplies.	GRIP 3 report	Incorrect assumption on existing capacity and the ability to utilise this existing supply point may result in increased cost to E&P design.	11/11/2019
63	National Rail	Electrical & Plant	The route is categorised as critical and thus warrants a UPS with a mobile generator connection at each signalling supply point. This will be discussed with the RAM at GRIP4 and conclusion will be drawn on how critical each supply is.	GRIP 3 report	Potential reduction in capital expenditure, realised through the decreased complexity of the required signalling power infrastructure.	11/11/2019
64	National Rail	Electrical & Plant	The FSP to be located at Wisbech station for the supply of local signalling assets is to be supplied locally due to its isolated location.	GRIP 3 report	Remote load supplied from proposed signalling supply point at Coldham loop; resulting in an additional 5km of trackside feeder cable.	11/11/2019
65	National Rail	Electrical & Plant	It is assumed that both March East Junction PHCC No.2 and Whitemoor Junction PHCC has sufficient spare capacity for the addition of the proposed points heating installations. This is based on the existing number of points in the area surrounding the two PHCCs.	GRIP 3 report	Design and installation of additional PHCCs at each location; resulting in increased design, construction and maintenance costs.	11/11/2019
66	National Rail	Electrical & Plant	At GRIP 3 having had only a desktop survey of the proposed Coldham Loop area it is assumed that electrical supply will be acquired from Station Road level crossing.	GRIP 3 report	Unsuitability of proposed E&P options; alternative signalling power approach shall be required, including the assessment of feasible DNO locations.	11/11/2019
67	National Rail	Electrical & Plant	March Station lifts are assumed to have the capacity for 16 people. The lift load requirements is assumed to be 40kVA.	GRIP 3 report	Potential increase to E&P design and construction costs.	12/11/2019
68	National Rail	Electrical & Plant	It has been assumed that March Station fire alarm system category is to be an L5 system.	GRIP 3 report	Potential increase to E&P design and construction costs.	12/11/2019
69	National Rail	Electrical & Plant	Record information regarding the lighting at March station is assumed to be correct. This has formed the basis of the proposed lighting design.	GRIP 3 report	Incorrect assumption may result in increased E&P design costs.	12/11/2019
70	National Rail	Electrical & Plant	The assumption has been made that there is to be approximately 50No. 6m high lighting columns for the proposed car park with an approximate spacing of 15m.	GRIP 3 report	Increase in construction cost due to greater number of required lighting columns.	12/11/2019
71	National Rail	Electrical & Plant	It is assumed that the proposed DNO connection at Wisbech station for the LV station supply shall be feasible and not cost prohibitive.	GRIP 3 report	Re-design/development of proposed signalling power options, additional design costs.	12/11/2019
72	National Rail	Electrical & Plant	The assumption has been made that there is to be approximately 55No. 6m high lighting columns for the proposed car park with an approximate spacing of 12-13m.	GRIP 3 report	Incorrect assumption may result in increased E&P design costs.	12/11/2019
73	National Rail	Drainage	Proposed P-Way alignment follows existing ground profile.	Rail Department	Incorrect assumption may result in increased design costs, design time and additional attenuation thus project costs.	05/08/2019
74	National Rail	Drainage	Receiving no further existing drainage information.	Middle Level Commission	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
75	National Rail	Drainage	Assumed outfall invert levels based on LIDAR information.	Middle Level Commission	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
76	National Rail	Drainage	Assumed no infiltration based on IDB area generally having high groundwater levels.	Middle Level Commission	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
77	National Rail	Drainage	Assumed discharge rates due to lack of engagement from IDB / MLC / CCC. Presented drawings to Graham Moore at IDB on 10th December and discussed strategy over the phone. No issues were raised on the phone call regarding the strategy. This included, keeping proposed ditches separate to IDB ditches. Minimum 60mm orifices for attenuation swales and 2/ls hydrobrake for larger areas of attenuation (basins, permeable paving). Panel to provide formal response by 15th January however this has not occured.	Middle Level Commission/LLFA	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019

Reference	Mode	Discipline	Assumption	Source	Consequences (associated risks)	Date Raised
78	National Rail	Drainage	Acceptable drainage systems have been assumed due to lack of engagement from CCC. CCC online guidance used.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
79	National Rail	Drainage	No increases in track impermeable area as of 13/11/19.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
80	National Rail	Drainage	No changes in Station layouts at this stage.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
81	National Rail	Drainage	Wisbech Station carpark - existing pavement is to be replaced.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
82	National Rail	Drainage	Wisbech Station carpark - assumed proposed levels strategy based on LIDAR. Drainge to provide indicative spot levels as requested by Highways	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
83	National Rail	Drainage	Assumed size of off-track culverts due to lack of existing information. For costing 450ø and 750ø have been used.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
84	National Rail	Drainage	No existing capacity assessments of IDB culverts or ditches undertaken at this stage due to budget restraints and lack of information. Assumed minimum 60mm orifice plate for attenuation swales and 2l/s Hydrobrakes for larger attenuation features (basins and permeable paving)	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
85	National Rail	Drainage	Betterment to be provided on redevelopment of existing in line with CCC SuDS guidance. When unable to meet desired greenfield runoff rates, CIRIA SuDS manual C735 guidance to be followed.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages. Negative effects RE planning application.	14/11/2019
86	National Rail	Drainage	Assumption of existing drained area and systems due to lack of information.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
87	National Rail	Geotechnics	Proposed highway embankment slopes to change to 1 in 3 after IDC or at next stage of design.	Slope Stability Modelling	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	27/11/2019
88	National Rail	Drainage	MLC and CCC design standards used for non-track drainage. Where this is not possible, DMRB standards to be used. NR standards used for track drainage.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
89	National Rail	Signalling	Only a passenger service from March to Wisbech is planned. No provision for Freight trains.	GRIP 3 report (Assessmet of Rail Operations)	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	26/11/2019
90	National Rail	Signalling	The rail infrastructure is to be capable of operating 2 trains per hour between Wisbech and March (and onwards to Cambridge)	GRIP 3 report (Assessmet of Rail Operations)	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	26/11/2019
91	National Rail	Signalling	Permissable Line Speed on the East Curve at March can be raised from 10mph to 20mph for all trains. (see item 112, Track)	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	26/11/2019
92	National Rail	Signalling	Minimum Signalling Braking Distance (between Whitemoor Junction and Wisbech) : GKRT0075 Appendix C Table 3 “MSBD data for enhanced braked passenger trains with 9%g or higher deceleration rate”. Any rolling stock (other than modern DMUs) using the line (between Whitemoor Junction and Wisbech) will operate under special instructions (with Speed Restrictions as appropriate for braking capability).	GRIP 3 report	If a different braking rate was to be used, positions of signals and associated equipment locations would need to be altered (Signalling, E&P, Civils redesign costs).	26/11/2019
93	National Rail	Signalling	Use of AWS Cancelling Indicators for 'wrong direction' trains passing over permanent AWS magnets on the Wisbech line. The maximum of two ‘wrong direction’ trains per hour, could be permitted by RIS-0775-CCS Iss 2, section 3.1.6.5.1, subject to risk assessment.	GRIP 3 report	If the AWS magnets need to be suppressed, extra equipment, LOC cases and possibly power supplies would be required. (Signalling, E&P, Civils redesign costs).	26/11/2019
94	National Rail	Track	Drainage ditches have been proposed in the earthworks. In the cross section these have been located 600mm from the edge of the cycle path (or the edge of the track formation) to ensure suitable clearance	GRIP 3 report	Change required to earthworks which could impact costings	26/11/2019
95	National Rail	Geotechnics	Highway embankment slopes to be at a grade of 1 in 3.	Slope Stability Modelling	Ground conditions to be confirmed following GI at next phase and may result in the need for slacker embankment slopes to limit potential for deep slips.	27/11/2019
96	National Rail	Electrical & Plant	Segregated REB which will house a PSP and Signalling assets within the same building shall reduce costs in comparison to a singular bespoke PSP REB.	GRIP 3 report	Segregated REBs required, resulting in increased Civils costs at design and construction phases. Additional assets requiring maintenance.	27/11/2019
97	National Rail	Electrical & Plant	Existing Loc 85/71 and Loc 85/77 shall be resupplied at 110V from March East Relay Room.	GRIP 3 report	Potential increase to E&P design and construction costs.	27/11/2019
98	National Rail	Electrical & Plant	Assumed that the existing signalling power cables have sufficient slack in them in order for them to be 'lifted and shifted' into the proposed cable trough route before Whitemoor Junction.	GRIP 3 report	Potential increase to E&P design and construction costs.	27/11/2019
99	National Rail	Electrical & Plant	At March Station the lighting required across the proposed footbridge will be supplied from the spare ways available at Platform 1's LV cubicle 'DB/1'. The cable for this lighting shall be routed across the proposed footbridge.	GRIP 3 report	Potential increase to E&P design and construction costs.	27/11/2019
100	National Rail	Electrical & Plant	Platform 2 at March station has a LV cubicle 'DB/A' which has a number of spare ways; assumed that this cubicle shall supply the proposed lighting across the reinstated platform 3 whilst also supplying the proposed telecom assets across Platforms 2 & 3.	GRIP 3 report	Potential increase to E&P design and construction costs.	27/11/2019
101	National Rail	Electrical & Plant	Existing junction lighting installed at Whitemoor Junction shall need to be moved due to the proposed track layout. This junction lighting shall be 'lifted and shifted' to the relevant clearance zone to illuminate the walkway. Assumed that this lighting is still required and that the lighting itself is adequate.	GRIP 3 report	Increased design and construction costs relating to a redesign of the existing walkway lighting.	27/11/2019
102	National Rail	Drainage	Existing defences against fluvial flooding are adequate up to 1/200 return period. No interventions required to increase resiliance of the proposed infrastructure against fluvial/tidal flooding.	GRIP 3 report	To provide increased resiliance levels may require additional infrastructure interventions. Risk to capital cost of the scheme.	28/11/2019
103	National Rail	Drainage	New station and car park at Wisbech may generate increased flood risk to adjacent properties. Assumed that any increase in flood risk is acceptable to xxx (clarify who would need to accept this).	GRIP 3 report	Increase in flood risk to adjacent properties may be a source of objection at planning/approval stage.	28/11/2019

Reference	Mode	Discipline	Assumption	Source	Consequences (associated risks)	Date Raised
104	National Rail	Drainage	The existing ditch either side will remain and act as land drainage. No allowance for any flows from outside the network rail boundary (to be reviewed at the next stage following surveys) ASSUMPTION UPDATED: Validated by survey data Existing ditches and/or bunds assumed to be present were not at multiple sections of the track alignment. No formal existing infrastructure to prevent surface water run-off from adjacent third-party land into the railway drainage system.	GRIP 3 report	To provide increased resiliance levels may require additional infrastructure interventions. Risk to capital cost of the scheme.	03/12/2019
105	National Rail	Drainage	The rational method with 50mm/hr will be used to calculate existing runoff from the existing railway corridor, except for the grassed areas where the greenfield (IDB) rate of 1.4l/s per ha will be used. For new track where there is no existing track the noted 1.4l/s per ha will be used.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	03/12/2019
106	National Rail	Drainage	For the proposed condition a runoff coefficient of 0.8 will be applied to the ballasted track area and a coefficient of 1 will be applied to the maintenance access, cycle lane and ditch profile. For the remaining grassed areas to the NR boundary, a runoff coefficient of 0.4 will be applied.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	03/12/2019
107	National Rail	Drainage	Drainage outfalls from the railway area will be to the existing culverts, rivers or local drains based on the calculated discharge limit at the respective outfall locations. ASSUMPTION UPDATED: Validated by survey data Some assumed culvert outfalls are not outfalls to a IDB drain and used to change existing ditch from side of the track to the other side.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	03/12/2019
108	National Rail	Drainage	Attenuation of discharge from the railway area will be designed up to 100yr event plus 40% climate change. This will apply to the whole railway area regardless of whether the existing area falls away or into the railway corridor.	GRIP 3 report	Insufficient attenutaion volume will result in flooding to third party lands where the surface runoff cannot be contained within the railway boundary	03/12/2019
109	National Rail	Drainage	No additional path will be provided alongside the ditch. However, the existing ground profile and boundary extent should allow access to the ditch.	GRIP 3 report	Ditch sizes will be reduced if excess vegetation and debris are not periodicly removed. Any reduction to the ditch capacity will result in flooding to third party lands where the surface runoff cannot be contained within the railway boundary	03/12/2019
110	National Rail	Drainage	The proposed new overbridges will be the Council's assets and associated drainage will not be discharged into the railway area drainage.	GRIP 2 report	Drainage system redesigned to allow additional capacity to accommodate additional surface water discharge flows	03/12/2019
111	National Rail	Drainage	The overbridge abutments (as shown in the latest IDC drawings) provide sufficient space to accommodate a piped through section for the ditch profiles.	GRIP 3 report	Alternative drainage required to provide continuity of the drainage network. Increased design costs, design time and abortive work in this or any future design stages.	03/12/2019
112	National Rail	Track	Current speed for March station to Whitemoor Yard is 10mph. To meet the project operational requirements, the speed needs to be increased, to improve running times. Initial speed calculations have indicated that the track geometry is capable of 20mph and this has been briefed to Operations. It is noted that due to the tight track curvature there may be increased noise, vibration and wear as a result of raising the speed.	GRIP 3 report	Increase in speed is not accepted by Network rail and therefore impacts the timetable of the scheme. Initial analysis suggests that with a speed limit of 10mph imposed at western end of Platform 3 (138,355m) until turnout PM2 (138,713m), where the Platform 3 line meets the single line, equates to a time penalty of 40 seconds (compared to 20mph). This would be rounded up to 60 seconds when compiling a timetable.	20/12/2019
113	National Rail	Drainage	Due to limited information, it will be assumed that all existing culverts, rivers or local IDB drains have enough depth to accommodate railway drainage outfall connections. If bypassed existing culverts are found at shallower depths and pose a constraint to the ditch construction a new outfall shall be installed at that existing culvert.	GRIP 3 report	Additional chambers required for culvert connections. Drainage catchment areas and attenuation storage volumes to be reassessed.	20/12/2019
114	National Rail	Geotechnics	Pile loading was provided for Weasenham Lane and the most heavily loaded pile was used for all throughout the scheme.	Information provided by Bridges.	Pile lengths based on conservative values and may be reduced at the next stage.	06/01/2019
115	National Rail	Highways	Highway embankment slopes to be at a grade of 1 in 3.	GRIP 3 report	Ground conditions to be confirmed following GI at next phase and may result in the need for slacker embankment slopes to limit potential for deep slips.	26/07/2019
116	National Rail	Highways	Pavement design assumes a CBR of <2%	GRIP 3 report	Ground conditions to be confirmed following GI at next phase and may result in the need for ground improvement works (particularly for the A47) to bring it up to 2.5%.	05/11/2019
117	National Rail	Cost estimation	Opening date assumed to be late 2027/early 2028	GRIP 3 report		13/01/2020
118	National Rail	Track	Single through platform to be re-opened at March station and single platform to be provided at Wisbech station. Passing loop required between the stations, around Coldham area, to allow for proposed operational demand	GRIP 3 report	n/a - input from operational report	13/01/2020
119	National Rail	Cost estimation	Cost of addressing existing non-compliances with March East signal box/signal control are excluded (assumed to be carried out by a wider NR re-control project). It is stated in NRs route plans that March signalling will be moved to a central control centre by the end of CP7 2029.	GRIP 3 report		13/01/2020
120	National Rail	Cost estimation	Existing level crossings between March and Cambridge would be impacted by Wisbech to Cambridge services. March East Level Crossing would also be impacted by proposed March Station car park. It is assumed that the EACE or other Netwrok Rail projects will resolve any level crossing issues, therefore all costs associated with upgrade of these crossings will be excluded from the business case for the Wisbech rail project.	GRIP 3 report	May not be possible to deliver 1tph from Wisbech to Cambridge ahead of EACE scheme due to level crossing risk.	13/01/2020
121	National Rail	Cost estimation	Service patterns due to the Ely Area Capacity Enhancement (EACE) impacting on infrastructure approach at March Station - two service patterns for the EACE scheme are currently being progressed either 11tph (13tph including 2tph Wisbech to Cambridge) or 14tph (including 2tph Wisbech to Cambridge). 14tph option assumed to be progressed.	GRIP 3 report		15/01/2020
122	National Rail	Cost estimation	Rolling stock assumption is for two car class 170s. Greater Anglia are replacing their class 170s with longer class 755s. Current assumption is to proceed with the class 170s, with passive provision for longer trains in the future. Motts are checking the demand modelling to check capacity on 170s.	GRIP 3 report	If class 755s were to be used this would impact on infrastructure requirements.	15/01/2020
123	National Rail	Drainage	Track. For drainage related to the track - a minimum discharge rate of 5 l/s has been considered for small catchments.	GRIP 3 report	A lower discharge requirements would result in increased ditch sizes and attenuation volumes	16/01/2020
124	National Rail	Track	March East level crossing will be closed as part of the EACE or other Network Rail project.	GRIP 3 report	Ability to relocate the turnout to the east of March Platforms as far east as possible to maximise a signalling overlap and then add a crossover. This offers operational benefits, increasing ability to reliably run March to Wisbech service with 2tph	24/01/2020
125	National Rail	Signalling	Badgeney Road LC and Horsemoor LC propsed for closure under EACE project (source: info from CCC project manager)	GRIP 3 report	If these crossing remain opening the detailed design phase will need to consider alterations to crossing controls.	24/01/2020
126	National Rail	Signalling	March East Jn Signal Box and March South Signal Box will be closed, under a resignalling project with re-control to a Central location (e.g Cambridge PSB) by the end of CP7 2029. Source Network Rail Anglia Route Strategic Plan, March 2019.	GRIP 3 report	If the existing Signal Boxes remain, it risks the ability to the integrate proposed new signalling with existing electro-mechanical signalling at March and re-opened the Wisbech line	24/01/2020

Reference	Mode	Discipline	Assumption	Source	Consequences (associated risks)	Date Raised
127	National Rail	Drainage	Drainage swales to have a minimum 1m offset from toe of highway embankment as agreed during IDC with Geo team.	GRIP 3 report	Incorrect assumptions may result in additional land take, increased design costs, design time and abortive work in this or any future design stages.	09/12/2019
128	National Rail	Drainage	During IDC CCC expressed concerns over robustness of ACO combined kerb units.Consider using alternative provider for calculations at the next stage.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
129	National Rail	Drainage	Assumptions for Costing: Highway drainage strategy to be gullies/kerb outlets where footways are present and over the edge when footways are not present.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
130	National Rail	Drainage	Highways Water quality to be managed via filter strip, swale and pond. Using C753 Table 26.2 pollution hazard level Medium. Table 26.3 Filter strip, swale and pond meets this requirement. Lined swales at junctions 15m either direction. Elm Road Roundabout water quaitty to be managed via lining approx 50% basin area.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
131	National Rail	Drainage	Wisbech/March car parks Water Quality to be managed via permeable sub-base. Using C753 Table 26.2 pollution hazard level Medium. Table 26.3 Permeable Pavement meets this requirement.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
132	National Rail	Drainage	Highways Assumptions for Costing: Gullies located on ramped/embankment section of road to the bridge. 150ø outlet pipe to a separate carrier pipe running along verge. Kerb outlet located everywhere else. 150ø into ditches Gully/Kerb outlet every 50m when no footpath Gully/Kerb outlet every 30m with footpath	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
133	National Rail	Drainage	March Station assumes new off-site discharge at a rate of 2l/s.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
134	National Rail	Drainage	Weasenham Lane For costing assume 8no. outlets. 220m carrier pipework. 820m of combined kerb drain.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
135	National Rail	Drainage	Assume permeable block paving at March and Wisbech station car park.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
136	National Rail	Drainage	Assumptions for Costing: Outfalls at stations and highways to include flap valve into IDB watercourses with orifice plate/flow control chamber as noted on drawings.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
137	National Rail	Drainage	Assume permeable block paving at March and Wisbech station car park.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
138	National Rail	Drainage	March Station carpark - existing pavement north of the station building is to be replaced (full construction).	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
139	National Rail	Drainage	March Station carpark - assumed proposed levels strategy based on LIDAR. Drainage GA to show assumed indicative levels.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
140	National Rail	Drainage	Assume Network Rail responsible for operation and maintennace of proposed March and Wisbech external areas. Risk Network Rail won't accept drainage systems.	GRIP 3 report	Incorrect assumptions may result in increased design costs, design time and abortive work in this or any future design stages.	14/11/2019
141	National Rail	Signalling	One Train Working at Wisbech end of line	GRIP 3 report	No signals required at Wisbech.	24/01/2020
142	National Rail	Drainage	Design requires third party land including access - assume this shall be acquired as part of the project.	GRIP 3 report	Re-design	
143	National Rail	Drainage	Existing drainage ditch within the railway boundary to be retained at locations clashing with proposed ditch. Ditch profile sufficient to convey partial design flows from track surface run-off. Subject to detailed topographical survey.	GRIP 3 report Rev 2	Re-design	24/03/2020
144	National Rail	General Civils	The land required for the preferred carpark location for Wisbech station is able to be purchased as part of the project	GRIP 3 report	Alternative, less preferable carpark locations are required	04/05/2020

C. Designer’s Hazard Elimination and Management Record

Designers' hazard elimination and management record

Project Title	**Project Number**	**Project Manager**
March to Wisbech - GRIP 3 - Heavy Rail Design	398128	Robert Leather
	Division	
	BNI, ITD, RTS	
Scope of Design GRIP 3 design for heavy rail alignment between March and Wisbech		**Form No/ Revision**
		B

(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
D01	C - Civils	Existing platform condition and construction - March Station	The existing platform condition and recess is unknown from currently available information. It is assumed from limited site photos that the wall is in a fair condition and has near to zero recess. This would allow for the existing wall to be utilised with the installation of an oversail unit for the proposed coper adjustments. If the wall is in a poor condition or already contains a large recess it may be required to rebuild the front wall.	Construction	A site inspection of the front wall is required to assess the condition of the wall and determine the level of existing recess. *Update: During site surveys platforms 3 and 4 were seen to be in a poor condition. It is now proposed to rebuild the platform front walls in the locations where the platform is being opened to the public.*	Yes	D 398128-MMD-00-XX-DR-C-0002 P02	Closed
D02	C - Civils	Existing canopy condition - March Station	The existing canopy condition on the proposed Platform 3 is unknown. It is assumed to be in a fair condition however if in a poor condition may pose a risk of partial collapse endagering passengers on the platform.	Use (as workplace)	An inspection and assessment of the canopy within touching distance will be required at the next design stage to inform any remedial works.	Yes	D 398128-MMD-00-XX-DR-C-0002 P02	Closed
D03	C - Civils	Existing station building condition - March Station	The existing station building on Platform 4 is to be opened to allow access from the proposed car park to the north of the statoin. The condition of this building is currently unknown. It is assumed to be in a fair condition however if in a poor condition may pose a risk of partial collapse endagering passengers on the platform.	Construction	An inspection and assessment of the building within touching distance will be required at the next design stage to inform any remedial works. *Update: During site surveys no major defects were identified however additional survey from within the building would be required.*	Yes	D 398128-MMD-00-XX-DR-C-0002 P02	Closed
D04	C - Civils	Platform crossfalls - March Station	With the information available the existing platform levels are unknown. It is assumed with the proposed coper locations, providing new surfacing to the existing platform areas will allow for compliant crossfalls (between 1:40 and 1:80 away from the coper edge). If this is not achievable this could cause a risk of prams/wheelchairs falling onto the track, or if too shallow could allow ponding of water.	Use (as workplace)	A topographical survey of the platforms is required at the next design stage. This will inform the design of the platform crossfalls. It is not within the scope of the project to address existing non-compliances on Platforms 1 and 2 however, where any surfaces are resurfaced the crossfalls shal not be worsened. If compiant crossfalls cannot be achieved it shall be ensured, as a minimum, that no part of the platform falls towards the track.	Yes	D 398128-MMD-00-XX-DR-C-0002 P02	Closed

Designers' hazard elimination and management record

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March to Wisbech - GRIP 3 - Heavy Rail Design	398128	Robert Leather
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Scope of Design GRIP 3 design for heavy rail alignment between March and Wisbech		**Form No/ Revision**
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(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
D05	C - Civils	Existing platform foundations assumed - TBC at next design stage	The existing foundations for the platforms are unknown. It is assumed the foundations are to the standard detail NR/CIV/SD/3012. If these dimensions are different the could be impacted by the proposed construction works, affecting their stability.	Use (as workplace)	Extent and depth of existing foundations to be verified prior to detailed design and construction. Existing foundations to be temporary supported / underpinned during excavation and construction of new foundations.	Yes	D 398128-MMD-00-XX-DR-C-0002 P02	Closed
D06	P - Track	Track - Clearance to Chain River underbridge girders	At existing chain river bridge, proposed sluing of the track is approximately 300 mm from the existing horizontal alignment. The minimum existing clearance from track to the hog back girder is approximately 900 mm, the minimum clearance required is 730 mm. Therefore a train can potentially clash with the bridge girders	Use (as workplace)	Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage with detailed topographical survey. There may be a requirement to replace the bridge (or parts of)	Yes	D 398128-MMD-00-XX-DR-P-0005 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0004 P03.1, 398128-MMD-00-XX-DR-P-0006/7/8/9/10/11/12/13	Closed
D07	P - Track	Track - Clearance at Norwood Road overbridge	The existing (single) track is in close proximity to the eastern pier at Norwood Road Overbridge. A new track alignment is proposed under the bridge for both options 2A and 2B (which incorporates two tracks). This could lead to a clash between a train and the bridge parapet	Use (as workplace)	Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage with detailed topographical survey. There may be a requirement to realign the track. Consider use of check rails to limit the possibility of train derailments around the bridge structure.	Yes	D 398128-MMD-00-XX-DR-0-0001 P03.1 398128-MMD-00-XX-DR-P-0002 P03.1 398128-MMD-00-XX-DR-P-0003 P03.1 398128-MMD-00-XX-DR-P-0014 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0004/5/6/7/8/9/10/11/12/13	Closed

MOTT MACDONALD	**Designers' hazard elimination and management record**

Project Title	**Project Number**	**Project Manager**
March to Wisbech - GRIP 3 - Heavy Rail Design	398128	Robert Leather
	Division	
	BNI, ITD, RTS	
Scope of Design GRIP 3 design for heavy rail alignment between March and Wisbech		**Form No/ Revision**
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(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
D08	P - Track	Track - Track radius <300m	Tight track radius could lead to derailment of train	Use (as workplace)	As per NR/L2/TRK/2102 consideration should be given to applying check rail where there are high volumes of traffic and the track radius is between 201 and 300m.	Yes	D 398128-MMD-00-XX-DR-P-0001 P03.1 398128-MMD-00-XX-DR-P-0002 P03.1 398128-MMD-00-XX-DR-P-0003 P03.1 398128-MMD-00-XX-DR-P-0014 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0004/5/6/7/8/9/10/11/12/13	Closed
D09	P - Track	Track - clearance to Platform 3 at March Station due to tight geometry	Tight curvature (approx. R200m) for existing platform geometry on platform 3 could lead to clearance issues with train and potential collision. Railway Group Standard GI/RT7016 requires new platforms to be located on curvature greater than 1000m	Use (as workplace)	Geometry to be assessed when more detailed survey is available	Yes	D 398128-MMD-00-XX-DR-P-0001 P03.1 398128-MMD-00-XX-DR-P-0002 P03.1 398128-MMD-00-XX-DR-P-0014 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0012/13	Closed
D10		NOT USED						
D11	D - Drainage	Wisbech Station and Trackside equipment	Fluvial/tidal hydraulic modelling has not been undertaken at this stage of design and thus a design flood level has not been agreed. Wisbech station and associated hardstanding areas and track-side equipment have not been designed to take into account potentially necessary flood resistance and/or resilience measures e.g. raising levels. Raising levels at Wisbech station may have a knock-on effect on the proposed vertical alignment of the railway.	Use (as workplace)	To be reviewed at the next design stage.	Yes	P	Active

Step

MOTT MACDONALD	# Designers' hazard elimination and management record						
Project Title			**Project Number**		**Project Manager**		
March to Wisbech - GRIP 3 - Heavy Rail Design			398128		Robert Leather		
			Division				
			BNI, ITD, RTS				
Scope of Design		GRIP 3 design for heavy rail alignment between March and Wisbech			**Form No/ Revision**		
					B		

(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
D12	C - Civils	Unknown extent of existing lease boundary	The existing Network Boundary is not currently available for the majority of the route. An assumed boundary has been defined based on OS features however if this is incorrect this could lead to additional land take/re-design.	Use (as workplace)	The latest boundary plans are to be reviewed against the proposed design at the following design stage to rationalise the proposed boundary.	Yes	D 398128-MMD-00-XX-DR-C-0100 through to ….0115 P02 all renditions 398128-MMD-00-XX-DR-H-1001 P02	Closed
D13	C - Civils	Unknown location of existing assets	There are a number of existing assets along the route, particularly around March Station, that may be affected by the proposed works. The exact location of these assets is unknown and so the effect cannot be accurately quantified.	Construction	The existing assets have been identified using OS mapping and routeview images as accurately as possible. A topographical survey of these assets will be required at the following design stage to validate the location and affect of the proposed works. *Update: During site surveys the general position of assets was verified however topographical survey is still required to confirm the exact location.*	Yes	D 398128-MMD-00-XX-DR-C-0100 P02	Closed
D14	C - Civils	Access to critical infrastructure for maintenance purposes	The majority of access points along the route are currently level crossings, which are all to be closed. The location of the existing access points are not in close proximity to critical infrastructure requiring maintenance e.g. track points, overbridges, signals etc.	Maintenance	A review of possible access points has been undertaken based on the feasibility of the location and the proximity to maintainable assets. These locations are subject to change following a Network Rail review.	No		Closed
D15	C - Civils	Existing fence condition	The condition of the existing fence along the route is currently unknown from the information available. It is assumed that, for the majority of the route, the fence is in a poor condition and in need of replacement.	Construction	A site walkover and review of the existing fence condition is required at the following design stage to validate the assumed condtion. *Update: During site visit it was confirmed that nearly all of the NR fence is in a poor condition or not present.*	Yes	D 398128-MMD-00-XX-DR-C-0100 through to ….0115 P02 all renditions	Closed
D16	P - Track	Track - Clearance to Redmoor Drain underbridge girders	At existing Redmoor Drain bridge, proposed sluing of the track is approximately 300 mm from the existing horizontal alignment. The minimum existing clearance from track to the hog back girder is approximately 900 mm, the minimum clearance required is 730 mm. Therefore a train can potentially clash with the bridge girders	Use (as workplace)	Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage with detailed topographical survey. There may be a requirement to replace the bridge (or parts of)	Yes	D 398128-MMD-00-XX-DR-P-0011 P03.1	Closed
D17	E - Electrical	Cables routed within existing UTXs	Existing UTXs capacity has not been assessed.		Contractor shall verify the suitability of the existing UTXs prior to the installation of Signalling Power Cables.	Yes	D 398128-MMD-00-XX-DR-E-0001 P01	Closed

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(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
D18	E - Electrical	Existing Supply Points	Unknown spare capacity of supply points.		At the next GRIP stage site surveys will be required to determine the existing spare capacity of the existing supplies at March East and March west junctions.	Yes	D 398128-MMD-00-XX-DR-E-0001 P01	Closed
D19	P - Track	Track layout, Option 4B, proximity to March station pedestrian bridge	A new track alignment is proposed for Option 4B which puts the track close to the pedestrian footbridge. This could lead to a clash between a train and the bridge parapet	Use (as workplace)	Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage with detailed topographical survey. There may be a requirement to amend the alignment 24/01/2020: Design option has been eliminated by engineering and therefore risk can be closed.	No		Closed
D20	P - Track	Track layout, Option 4B, double-slip arrangement	A double slip arrangement is proposed. Double slips are mechanically complex, particularly with the point operating system; and they are prone to points failure and twist faults, potentially leading to a derailment	Use (as workplace)	Redesign track layout with crossover to the east of March East level crossing, noting this is not desirable operationally 24/01/2020: Design option has been eliminated by engineering and therefore risk can be closed.	Yes	D	Closed
D21	G - Geotechnics	Embankment Stability Assessment	Unknown state of existing track embankments.	Construction	Condition of embankments to be assessed during site surveys / when detailed topographical survey available. Update: Following visual surveys proposed regrade locations have been updated. There are sections of embankment which could not be inspected due to access restrictions or dense vegetation so this risk cannot be closed out.	Yes	D	Active
D22	G - Geotechnics	Geotechnical design	Unknown ground conditions due to limited Ground Investigation information available.	Construction	Ground model and characteristic parameters for design will be based on referenced values relating to information available and published information. Designs to be updated following GI in next phase.	Yes	P	Active
D23	G - Geotechnics	Geotechnical design	Unknown ground water profile conditions due to limited Ground Investigation information available.	Construction	Groundwater profile will be assumed based worst credible case for design and should be confirmed on site.	Yes	P	Closed
D24	G - Geotechnics	Embankment construction	Potential deep slips within 1:3 slopes.	Construction	Potential deep slips within 1:3 slopes. Further GI required to confirm ground conditions. Geogrid, Stone /columns beyond embankment or a berm within embankment should be considered at detail design stage.	Yes	D 398128-MMD-00-XX-DR-G-0001 P01.1	Active
D25	SG - Signalling	Signalling control location and interface with mainline signalling.	Uncertainty over timescale for re-control of March East Signal Box,	Construction	Assumption is that March East Signal Box remains at time of re-opening the Wisbech Branch. Re-control brings with it many unknowns such as technology to be used, and possible changes to the signal positions in the March area. The proposed scheme layout is compatible with either scenario.	Yes	D 398128-MMD-00-XX-SK-SG-0001/2/3.	Closed
D26	SG - Signalling	Alterations to Existing Signalling Equipment	Condition, space constraints, and existing non-compliances may prevent planned alterations.	Construction	Site Visits to assess Capacity. Conduct Condition assessment of existing signalling assets before detailed design stage. (Revised Assumption is Exsiting Signal box will be abolished)	No		Closed

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D27	SG - Signalling	Alterations in existing Signal Box, Relay Room, REBs and Location Cases.	Requirement to make alterations in existing equipment housings with degraded wiring could cause a wrong side failure.	Construction	Conduct Condition assessment of existing signalling assets before detailed design stage. Use new equipment housing where possible. Careful migration planning to be in place. (Revised Assumption is Exsiting Signal box will be abolished)	No		Closed
D28	SG - Signalling	Alterations in existing Signal Box, Relay Room, REBs and Location Cases.	Installation of equipment housings may expose installers to hazards from an operational railway due to work not being able to be carried out off site.	Construction	If at all possible design to consist of new equipment housing to be constructed and wired off site.	No		Closed
D29	C - Civils	Platform Drainage Outfall, March Station	It is proposed to outfall the Platform 3 drainage into the existing platform drainage. There is currently no information available on the existing platform drainage. There is a risk that there is no existing platform drainage or that it does not have sufficient spare capacity for the Proposed platform. This would therefore generate the need for further construction works.	Construction	The proposed platform surface would fall towards the centre of the platform, as it is unclear if this previously fell towards the track, an ACO channel is proposed along the length of Platform 3. This channel is proposed to fall into the existing drainage. A drainage survey is required at the following design stage to verify the suitability of the proposals.	Yes	D 398128-MMD-00-XX-DR-C-0002 P02	Closed
D30	C - Civils	Cable management at restricted clearance underbridges	At both Redmoor Lane underbridge and Chain bridge it is unclear from available information if there is sufficient space for cable trough to be positioned over the structure.	Construction	An alternate approach involving a pipe bridge could be employed at either bridge. This would likely present an increased cost to the project. *Update: Some underbridges were noted as containing limited clearance and so may require the provision of a pipe bridge (or similar solution) however this is again to be confirmed following topographical survey of the locations.*	Yes	D 398128-MMD-00-XX-DR-C-0103 P02 398128-MMD-00-XX-DR-C-0110 P02 398128-MMD-00-XX-DR-C-0112 P02	Closed
D31	T - Telecoms	*** Through design development the existing footbridge is remining in situ there is no requirement to modify this cable ***. Recovery of existing fibre cable from the existing footbridge. New fibre cable will be provided utilising the new AfA footbridge to connect platform 1 and platform 3 SISS equipment.	*** Through design development the existing footbridge is remining in situ there is no requirement to modify this cable ***. Recovery of existing fibre cable prior to the new cable been installed and fully commissioned resulting in the loss of SISS operation on platform 2.	Construction	*** Through design development the existing footbridge is remining in situ there is no requirement to modify this cable ***. A new telecoms cable route is to be provided under the AfA design which will provide for existing equipment on platform 2 and new proposed equipment on platform 3 as well as passive provision for new proposed telecoms assets in the future. All cable trays and ducting shall be sized for the numbers of cables and allowed 25% for spare capacity. The new cable must be fully installed and tested and entered into service.	No	F	Closed

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D32	T - Telecoms	Alterations to existing trough route on the proximity of the reinstated track.	Interaction/damage to the existing trough route and operational cables resulting in equipment/asset failure.	Construction	Full tag & trace survey to be conducted at the next GRIP stage to identify all existing cables within the exiting trough route. Once tag & trace has identified all cables suitable maintenance and spares will be available prior to any disconnection notice and/or at risk notices been applied for. appropriate maintenance personal must be engaged prior to the works commencing.	Yes	D/P 398128-MMD-00-XX-DR-T-0001 P02	Active
D33	T - Telecoms	Connecting new SISS assets into the existing SISS control equipment	Existing control equipment has no spare capacity for new SISS equipment to be connected.	Construction	Full as-built and maintenance records to be provided at the next GRIP stage and engagement with maintainer to established spare capacity available.	Yes	P	Active
D34	SG - Signalling	AWS equipment on East Curve for signals ME36/ME305	Shared AWS 42.5m metres between signals. Was 49m. Reduced distance between signals and higher speed limits reaction time for drivers. RIS-0775-CCS Iss 2, section 3.1.3.1.1 permits this but refers to platform lines. This may be a non-compliance.	Construction	Clarify with Network Rail if this will be permitted (raise TQ). Alternatively provide separate suppressed AWS magnets. Noted in Signalling Design log. Can be resolved at next GRIP stage.	No		Closed
D35	E - Electrical	Proposed locations for DNO supplies	Risk that the DNO locations are not feasible resulting in no supply for the proposed signalling power system required along the March to Wisbech route.	Construction	DNO locations are based on historic LX DNO locations. Assessment at the next GRIP stage required to determine the feasibility of the proposed DNO locations.	Yes	D 398128-MMD-00-XX-DR-E-0001 P01	Closed
D36	E - Electrical	'lift and shift' existing 230V signalling power cables to proposed cable trough routes in March Area	Interaction/damage to the existing trough route and operational cables resulting in equipment/asset failure.	Construction	Full tag & trace survey to be conducted at the next GRIP stage to identify all existing cables within the exiting trough route. Once tag & trace has identified all cables suitable maintenance and spares will be available prior to any disconnection notice and/or at risk notices been applied for. appropriate maintenance personal must be engaged prior to the works commencing.	Yes	D 398128-MMD-00-XX-DR-E-0001 P01	Closed
D37	C - Civils	Use of existing troughing at gound level adjacent to Platform 4	Restricts ability to reopen Platform 4 in future developments	Construction	The proposal involves the use of existing cable troughs in the cess adjacent to Platform 4. To reopen Platform 4 in the future these troughs would require relocation along with all the existing cables within. This is an existing constraint at the station and to relocate these troughs to allow passive provision for future works would prove disproportionate to the budget of the project.	No	D	Active

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D38	C - Civils	Access to points machines for passing loops	In the event of a points failure, restricted access to the location of the points would increase the time for emergency maintenance access and works. Additional travel distance from the access point would also increase the risk to staff in regards to slips, trips and falls.	Use (as workplace)	A safe cess walkway, in accordance with NR/CIV/SD/670, is proposed with access points positioned as close as possible to these elements.	No		Closed
D39	G - Geotechnics	Remodelling of existing earthworks	Clash with proposed infrastructure and additional landtake	Construction	Current design is based on limited accuracy OS mapping and an assumed Network Rail Boundary. Design to be reviewed at next stage with detailed topographical survey and land boundary	Yes	D 398128-MMD-00-XX-DR-TP-0004 P03 398128-MMD-00-XX-DR-TP-0006 P03 398128-MMD-00-XX-TP-0007 P03 398128-MMD-00-XX-TR-G-0002 P01.1	Closed
D40	G - Geotechnics	Weasenham Lane Grade Separation	Infilled land (fish ponds) in the vicinity with unknown ground conditions leading to settlement of bridge structure	Construction	Further Ground Investigation at next stage of design	Yes	P	Closed
D41	U - Cross Discipline	Walking route to Wisbech carpark from town centre	No current accessible route	Use (as workplace)	Town planning study to identify safe walking routes	Yes	D	Active
D42	C - Civils	Existing troughing capacity and condition	It is proposed to utilise some of the existing trough routes around the March station area. There is a risk that these troughs could be at capacity or in a state of disrepair.	Construction	Additional new trough may be required to replace/supplement the existing troughing. *Update: During site surveys some of the trough route was identified and noted to be in poor condition. It is now recommended to provide new trough route in these locations.*	Yes	D 398128-MMD-00-XX-DR-C-0100 P02	Closed
D43	C - Civils	Clearance at Norwood Road overbridge	Based on available information, it is assumed there is space for a combined trough/walkway beneath Norwood Road overbridge, with the proposed track works. There is a risk that the clearance here is in fact insufficient.	Construction	Available clearance to be confirmed following completion of topographical survey. *Update: During site surveys it was noted that an existing walkway and trough route is present beneath Norwood Road overbridge and so it is assumed sufficient space is available for the proposed works. Damaged gabion baskets were also noted towards the north eastern corner of the bridge. Further investigation to determine the function of these gabion baskets and why they are failing should be undertaken at the next design stage to ensure the safety of the walkway from the adjacent embankment.*	Yes	D 398128-MMD-00-XX-DR-C-0100 P02	Closed
D44	H - Highways	Highway construction on peat.	Highway subsidence		Carry out GI at next stage of the design to determine if any highways are to be constructed on areas of peat.	Yes	P	Closed

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D45	G - Geotechnics	Embankent construction	Potential for local peat deposits within stone column alignment which may reduce ground improvement betterment.	Construction	Undertake GI at next stage to determine ground conditions at construction locations.	Yes	D 398128-MMD-00-XX-DR-G-0001 P01.1	Closed
D46	C - Civils	Cycleway - within NR land boundary	The proposed cylce route diversion is within the assumed NR boundary to avoid the need for additional land purchase. Although seperated from the rail corridor by a fence there is a risk that maintenance of the cycleway would fall to NR.	Maintenance	It is possible to locate the cycle route adjacent to the east of the rail corridor however this would involve additional land purchase of agricultural land and potentially an additional drainage ditch. This assumed approach is to be agreed with NR at the following design stage.	Yes	D 398128-MMD-00-XX-DR-C-0109 P02 398128-MMD-00-XX-DR-C-0110 P02 398128-MMD-00-XX-DR-C-0111 P02	Closed
D47	D - Drainage	Piped sections of installed railway ditches	Insufficient depth of maintenance access/footpath over piped section of installed ditches	Construction	A minimum 450mm cover depth proposed to pipe soffit. Concrete protection to pipe beneath access points to be considered.	Yes	D 398128-MMD-00-XX-DR-D-1001 through to ….1012 P01.1	Closed
D48	D - Drainage	Proximity of NR boundary	Proposed ditch located in close proximity to railway boundary and adjoining residential properties. There could be insufficient space to allow access for ditch maintenance	Use (as workplace)	Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage with detailed topographical survey.	No	-	Closed
D49	D - Drainage	Track drainage outfall to existing culvert	Due to limited information, exisitng culverts, rivers or local IDB drains are potentially at a shallower depth and pose a constraint to the ditch construction and outfall connection	Use (as workplace)	Maximum ditch depth for Track Drainage limited to 1m. Potential to install additional outfalls where constraints are found subject to further survey of all existing culverts, rivers connections and local IDB drains.	Yes	D,P,F 398128-MMD-00-XX-DR-D-1001 through to ….1012 P01.1	Closed
D50	C - Civils	Drainage ditch clash with Civils Infrastructure	There are localised clashes between the drainage ditches and civils infrastructure such as LOC cabinets as a result of the ditch being modelled as an offset from the rail.	Construction	Ditch is to be locally diverted or position of infrastructure revised at following design stage.	Yes	D 398128-MMD-00-XX-DR-C-0100 P02 398128-MMD-00-XX-DR-C-0103 P02 398128-MMD-00-XX-DR-C-0107 P02 398128-MMD-00-XX-DR-C-0109 P02 398128-MMD-00-XX-DR-C-0111 P02 398128-MMD-00-XX-DR-C-0113 P02	Closed

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D51	D - Drainage	Depth of attenuation tank and UTX	Due to limited information, existing catchpit potentially at a shallower depth than the proposed March Station track drainage network and outfall connection	Construction	Design depths kept as shallow as possible. Minimum cover set to 0.9m above soffit beneath proposed cess walkway. Minimum chamber sizes proposed throughout. Due to the flat topograpgh of the site a small number of drainage runs become substantially deep which is unavoidable considering the location of the outfall subject to futher survey of all drainage features. The attenuation storage volume could be provided using by a small pond if outfall connection levels are unfeasible. The pond should be in an area substantially flat to reduce the extent of earth cutting required and to ease maintenance.	Yes	D,P,F 398128-MMD-00-XX-DR-D-1001 P01.1	Closed
D52	SG - Signalling	Sighting of new Signals.	Restricted view of signal if standard left-hand mounting is used.	Use (as workplace)	Comments noted in Initial Signal Sighting Report and design logs. Signal Sighting Committee may recommend that Signals ME36 (East Curve), ME302 (Platform 3, Up) and ME304 (Up Wisbech Single) be located on the right hand side of the track.	Yes	D 398128-MMD-00-XX-SK-SG-0003.	Closed
E01	C - Civils	Unknown infrastructure listed as "other heritage" on NR records	There is an area within the proposed car park to the north of March station that is listed as "other heritage". No further information is known regarding this area. There is a risk that works could not be completed in this area, or the scope of works would be restricted, due to heritage listings.	Construction	Classification of area to be verified prior to detailed design stage.	Yes	D 398128-MMD-00-XX-DR-C-0002 P02 398128-MMD-00-XX-DR-H-1001 P02	Closed
E02	C - Civils	Exiting noise wall	As the proposed line travels beyond the extents of the existing noise wall, there is potential for more noise to be heard from the adjacent properties.		There is no evidence to suggest the adjacent properties are particularly sensitive to noise pollution. In this area the trains will be running on straight track and will have only 2tph, without the potential to get as busy as the sidings area, for which the current sound barriers are provided.	Yes	D/F 398128-MMD-00-XX-DR-C-0100 P02	Closed
E03	D - Drainage	Modifications to existing watercourses	Disruption of established habitats in existing watercourses	Construction	Number of connections and modifications to existing watercourses has been minimised. Proposed ditches have been designed seperately and existing ditches retained where possible. Further conversation with IDB required to establish if proposed roads can drain directly into existing ditches to match existing scenario, thus minimising ecological impact of diversions and connections.	Yes	D	Closed
E04	D - Drainage	Site Clearance	Clearing of dense vegetation and possible impact to habitat	Construction	Drainage design to minimise clearance of dense vegetation.	Yes	D	Closed

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H01	P - Track	Track - Passengers accessing trains at March Station	Tight curvature (approx. R200m) for existing platform geometry on platform 3 would lead to large stepping distances and potential for passengers to fall between gap between platform and train. Railway Group Standard GI/RT7016 requires new platforms to be located on curvature greater than 1000m	Use (as workplace)	The western end of the existing platform is straight and therefore this section can be utilised to avoid trains stopping on tight curvature	No		Closed
H02	C - Civils	Buried services in existing platforms at March station	There are currently no records of known services within the proposed Platform 3. When breaking out areas of the platform this presents the risk of striking live cables.	Construction	Buried service records have been request from Network Rail. Prior to the next design stage, a tag and trace survey is to be completed to inform the design. Before any intrusive work, appropriate methods are to be used for physically locating any services believed to be in conflict with the proposed construction works, sub-terrain scan to be conducted and hand digging of trial holes in the vicinity of known/ assumed buried services. All electrical services to be isolated prior to the commencement of the works.	Yes	D, P 398128-MMD-00-XX-DR-C-0002 P02	Closed
H03	C - Civils	Manual handling - installation of cables in platforms	Pulling and man handling heavy cables resulting in potential musco-skeletal injuries	Construction	Access chambers to be located at a maximum of 30m intervals and at all changes in direction. Cables to be located at low level where practicable to reduce working at height or within confined spaces. Reduce cable lengths through the installation of junction boxes. Where this is not practicable due to site constraints, contractor to employ suitable measures to reduce the risk of manual handling and injury during installation. For example, ensure that cable drums are in a safe orientation and on stable ground and provide a sufficient number of installers to facilitate safe pulling of cables.	No		Closed
H04	C - Civils	Concrete break out	Where works on site involve breaking out of existing concrete workers would be exposed to Silica dust. This could lead to serious respiratory illness and possibly death.	Construction	The design, as far as is practicable, avoids the need to modify concrete on site. It will be the responsiblity of the contractor to provide appropriate PPE and utilise methods such as wet drilling when break out of conrete is required on site.	Yes	D, P 398128-MMD-00-XX-DR-C-0002 P02	Closed
H05	C - Civils	Damage to existing services in cable trough when relocated	Relocation of existing services in cable trough could lead to damage of unknown cables resulting in damage to existing infrastructure, disruption to services and possible injury.	Construction	All existing cables to be verified and tested prior to construction. All electrical services to be isolated prior to the commencement of the works.	Yes	D, P 398128-MMD-00-XX-DR-C-0002 P02 398128-MMD-00-XX-DR-C-0100 P02	Closed
H06	C - Civils	Manual handling - platform construction	Potential musco-skeletal injuries from manual handling	Construction	The design solution reduces the weight and size of components where practicable however it will be the contractors responsibility to ensure suitable training and resource is provided for the task.	Yes	D, P 398128-MMD-00-XX-DR-C-0002 P02	Closed

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H07	C - Civils	Exposure to hazarous materials	Exposure to hazardous / contaminated materials (i.e. asbestos or lead paint) resulting in illness and possible death	Construction	The hazard register indicates possible asbestos locations at March station. No asbestos records are available indicating the location of any hazardous materials. The asbestos records are to be requested from Network Rail and reviewed prior to any intrusive works/surveys.	Yes	D,P,F 398128-MMD-00-XX-DR-C-0002 P02	Closed
H08	C - Civils	Falling from height during lighting maintenance	Falling from height resulting in injuries and possible death	Maintenance	All new platform lighting columns to be raise and lower type with suitable consideration for dropping direction and jacking points.	No		Closed
H09	C - Civils	Additional equipment fixed to new or existing lighting columns	Failure of column may result in injury or death to members of the public, workers or station staff	Use (as workplace)	All new lighting columns to be medium duty (min). Existing lighting columns to be assessed for suitability when attaching additional equipment, such as signage, CCTV and PA.	No		Closed
H10	C - Civils	Unauthorised access to the railway corridor by members of public - March Station	Injury sustained by trespassers due to unauthorised access to the railway corridor.	Use (as workplace)	New 1.8m high platform fence to be installed along all new platform areas. End of platform fence also proposed with lockable gate and deterent paving.	No		Closed
H11	C - Civils	Train derailment impact - stations	There is a risk, should a train derail, particularly at March station that the train could end up on the operational platform area, causing injury and possible death to members of the public.	Use (as workplace)	All new platforms, including Platform 3 at March, are to be installed with end of platform stairs rather than platform ramps. This minimises the chances of trains encroaching on the operational platform area.	No		Closed
H12	C - Civils	Non-compliant recess / roll space	Non compliant recess increases the risk of injury or death to passengers, works and members of the public who inadvertedly become trapped between the platform and the train.	Use (as workplace)	The proposed works to Platform 3 at March station will introduce a compliant recess over the operational platform. The remainder of the platform and the other platforms will not be altered as part of these works. Wisbech station will be constructed as per the NR standard detail.	No		Closed
H13	C - Civils	Construction / installation of new platform extensions	Injuries resulting from wet trades and working adjacent to live railways.	Construction	Wet trades on site have been minimised as far as reasonably pracitcable with the use of precast components.	No		Closed
H14	P - Track	Track - Exceptional track radius (NR/L2/TRK/2102, table 6) - March station	Tight radius curves (<200m, exceptional in NR/L2/TRK/2102, table 6) around March station will lead to rail wear, noise and ultimately the risk of derailment	Use (as workplace)	Check rail, gauge widening, lubrication and approval from RAM (track)	Yes	D 398128-MMD-00-XX-DR-P-0001 P03.1 398128-MMD-00-XX-DR-P-0002 P03.1 398128-MMD-XX-DR-P-0003 P03.1 398128-MMD-00-XX-DR-P-0014 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0004/5/6/7/8/9/10/11/12/13	Closed

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March to Wisbech - GRIP 3 - Heavy Rail Design	398128	Robert Leather
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	BNI, ITD, RTS	
Scope of Design GRIP 3 design for heavy rail alignment between March and Wisbech		**Form No/ Revision**
		B

(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
H15	P - Track	Track - Proximity of existing crossover - East of March station	A new turnout is located in close proximity to an existing crossover, due to an adjacent level crossing. There could be insufficient clearance between the turnout and crossover potentially leading to a collision between trains. Reconfiguration of existing crossover (new long bearers required as a minimum).	Use (as workplace)	Current design is based on limited accuracy OS mapping. Design to be reviewed at next stage with detailed topographical survey. There may be a requirement to relocate the existing crossover.	Yes	D 398128-MMD-00-XX-SK-SG-0001 P02 (Op2A) 398128-MMD-00-XX-SK-SG-0002 P02 (Op2B) 398128-MMD-00-XX-DR-P-0001 P03.1 398128-MMD-00-XX-DR-P-0002 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0005/6/7/8/9/10/11/12/13/14	Closed
H16	P - Track	Track - Flexed turnout with exceptional track radius (NR/L2/TRK/2102, table 6) - March Station	Tight radius curves (<200m, exceptional in NR/L2/TRK/2102, table 6) around March station will lead to rail wear, noise and ultimately the risk of derailment	Use (as workplace)	Lubrication, gauge widening and approval from RAM (track)	Yes	D 398128-MMD-00-XX-DR-P-0001 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0002/4/5/6/7/8/9/10/11/12/14	Closed
H17	P - Track	Track - Relocation of lineside infrastructure at Whitemoor Junction (Option 2B)	Option 2B requires an additonal track to the east of the existing alignment to avoid operational conflicts with Whitemoor sidings. The proposed track leads to clashes with existing infrastructure including access walkways, lighting, noise walls, embankments, signalling and comms equipment	Construction	Impacted infrastructure to be redesigned to facilitate new track alignment	Yes	D 398128-MMD-00-XX-DR-P-0003 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0004 P03.1	Closed

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H18	H - Highways	Scheme 1 - New road over rail bridge at Elm Road level crossing	MP gas main in rail corridor.	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0101 P01 398128-MMD-00-XX-DR-D-0102 P01 398128-MMD-00-XX-DR-H-0101 P03 398128-MMD-00-XX-DR-H-0104 P03 398128-MMD-00-XX-DR-H-0110 P03	Closed
H19	H - Highways	Scheme 1 - New junction between Elm Road and Longhill Road	Buried services present, including MP gas main, overhead power lines	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0101 P01 398128-MMD-00-XX-DR-D-0102 P01 398128-MMD-00-XX-DR-H-0101 P03 398128-MMD-00-XX-DR-H-0110 P03	Closed
H20	H - Highways	Scheme 1 - Modified connection between existing Elm Road and new alignment	Buried services present, including MP gas main, LV electric	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0101 P01 398128-MMD-00-XX-DR-D-0102 P01 398128-MMD-00-XX-DR-H-0102 P03 398128-MMD-00-XX-DR-H-0103 P03 398128-MMD-00-XX-DR-H-0105 P03	Closed
H21	H - Highways	Scheme 1 - Existing alignment of B1101 north of the bridge over Twenty Foot River	Closing the section of the road between the existing T-junction and level crossing changes the priority of the junction meaning the current road layout may not be suitable.	Use (as workplace)	Road junction modified as existing B1101 alignment closed.	No		Closed

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H22	H - Highways	Scheme 1 - New road bridge over Twenty Foot River	HV power lines present as well as other buried services	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-H-0107 P03 398128-MMD-00-XX-DR-H-0109 P03 398128-MMD-00-XX-DR-H-0111 P03	Closed
H23	H - Highways	Scheme 1 - New B1101 alignment north of Twenty Foot River	HV power lines present	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0103 P01 398128-MMD-00-XX-DR-D-0104 P01 398128-MMD-00-XX-DR-H-0108 P03 398128-MMD-00-XX-DR-H-0109 P03	Closed
H24	H - Highways	Scheme 2 - New road over rail bridge at Coldham level crossing	SSD lower than required in DMRB due to space constraints. This is especially hazerdous due to close proximity of a 90° bend on the B1101.	Use (as workplace)	Consider further speed reduction on the B1101 from 40mph to 30mph through Coldham and speed reduction to 30mph on Station Road. Consider alternative alignment.	Yes	D,P 398128-MMD-00-XX-DR-D-0201 P01 398128-MMD-00-XX-DR-D-0301 P01 398128-MMD-00-XX-DR-H-0202 P03	Closed
H25	H - Highways	Scheme 2 - New road over rail bridge at Coldham level crossing - Between connection to Station Road and overbridge.	Overhead and buried services present, including HV cables.	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0201 P01 398128-MMD-00-XX-DR-D-0301 P01 398128-MMD-00-XX-DR-H-0201 P03 398128-MMD-00-XX-DR-H-0202 P03 398128-MMD-00-XX-DR-H-0203 P03	Closed
								Active

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H26	H - Highways	Scheme 2 - New road over rail bridge at Coldham level crossin - Between overbridge and connection to B1101	Buried services present, including MP Gas main and HV cables.	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0201 P01 398128-MMD-00-XX-DR-D-0301 P01 398128-MMD-00-XX-DR-H-0202 P03	Closed
H27	H - Highways	Scheme 2 - Cycle route 63 diversion from Long Drove onto the B1101, if rail corridor not wide enough.	Higher levels of motor traffic on the B1101. Lane widths on the B1101 are too narrow (<3.2m) to allow safe overtaking of cyclists within the lane and there are a number of blind bends which would make pulling out into the opposite lane hazardous.	Use (as workplace)	Consider the need for Waldersea bridge which would avoid the need for a diversion, if cycleway cannot be located in the rail corridor. Cycleway can be accomodated within the corridor, so closed.	No	-	Closed
H28	H - Highways	Scheme 3 - New Holly Bank/Crooked Bank bridge and Broad Drove bridge	SSDs lower than required in DMRB at Junction. No space for horizontal transition curve.	Use (as workplace)	Speeds are low and this is to replace minor access tracks.	No	-	Closed
H29	H - Highways	Scheme 3 - New Holly Bank/Crooked Bank bridge and Broad Drove bridge	Buried services present, including HP gas main adjacent to rail corridor.	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-H-0301 P03 398128-MMD-00-XX-DR-H-0302 P03	Closed
H30	H - Highways	Scheme 3 - New Broad Drove road bridge over rail corridor	Overhead services present, including HV cables	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0302 P01 398128-MMD-00-XX-DR-D-0303 P01 398128-MMD-00-XX-DR-H-0321 P03 398128-MMD-00-XX-DR-H-0322 P03 398128-MMD-00-XX-DR-H-0323 P03 398128-MMD-00-XX-DR-H-0324 P03	Closed

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H31	H - Highways	Scheme 3 - New Broad Drove road bridge over rail corridor	Buried services present, including HP gas main.	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0303 P01 398128-MMD-00-XX-DR-H-0322 P03 398128-MMD-00-XX-DR-H-0401 P03 398128-MMD-00-XX-DR-H-0402 P03	Closed
H32	H - Highways	Scheme 4 - New A47 bridge	Overhead power lines, which will require diversion/removal to accommodate earthworks and bridge.	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P	Closed
H33	H - Highways	Scheme 5 - New Weasenham Lane bridge	Bridge construction in close proximity to existing buildings	Construction	Consider a rail over road bridge as an alternative.	Yes	D,P 398128-MMD-00-XX-DR-D-0501 P01 398128-MMD-00-XX-DR-H-0501 P03	Closed
H34	H - Highways	Scheme 5 - New Weasenham Lane bridge	Very high density of buried services present, including HV electric cables	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0501 P01 398128-MMD-00-XX-DR-H-0501 P03	Closed
H35	H - Highways	Scheme 5 - New Weasenham Lane bridge	Piling in constrained location	Construction	Mark as hazard on drawings, include C2 information.	Yes	D,P 398128-MMD-00-XX-DR-D-0501 P01 398128-MMD-00-XX-DR-H-0501 P03	Closed
H36		NOT USED						

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H37	C - Civils	Buried services	When breaking ground there is a risk of strking live utilities when excavating along the route.	Construction	Buried service records have been reviewed and are highlighted on the drawings. These records have also be reviewed against the design to remove any potential clashes. Before any intrusive work, appropriate methods are to be used for physically locating any services, which may not be shown on the record information.	Yes	D, P 398128-MMD-00-XX-DR-C-0100 to …0115 P02 all renditions 398128-MMD-00-XX-DR-C-0001 P02 398128-MMD-00-XX-DR-H-1000 P02 398128-MMD-00-XX-DR-H-1001 P02	Closed
H38	C - Civils	Manual handling cables	Potential musco-skeletal injuries from manual handling	Construction	Cables to be located at low level in cable trough where practicable to reduce working at height or within confined spaces. Reduce cable lengths through the installation of junction boxes. Where this is not practicable due to site constraints, contractor to employ suitable measures to reduce the risk of manual handling and injury during installation. For example, ensure that cable drums are in a safe orientation and on stable ground and provide a sufficient number of installers to facilitate safe pulling of cables.	No		Closed
H39	C - Civils	Safe maintenance walking route	No defined position of safety currently exists within the rail corridor	Maintenance	A safe cess walkway, in accordance with NR/CIV/SD/670, is proposed a minimum of 2m from the nearest rail. This will for Site Warden Working along the route.	No		Closed
H40	C - Civils	Restricted clearance at underbridges	Restricted clearance is achievable at underbridges along the route. This presents the risk of workers being struck by trains.	Maintenance	No cess walkway is provided along these structures. Restricted clearance signs are to be erected at either end of the structure to warn track workers of the hazard.	Yes	D, F 398128-MMD-00-XX-DR-C-0103 P02 398128-MMD-00-XX-DR-C-0110 P02 398128-MMD-00-XX-DR-C-0112 P02	Closed

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H41	P - Track	Increased use of crossings	Proposed track layout introduces additional paths/rail traffic across the existing main line level crossings leading to longer wait times across the crossing and the potential for misuse	Use (as workplace)	Level crossing risk assessment at next stage of design with potential for upgrade/closure of the level crossing. Risk assessment may be undertaken by other project.	Yes	D 398128-MMD-00-XX-DR-C-0100 P02 398128-MMD-00-XX-SK-SG-0001 P02 (Op2A) 398128-MMD-00-XX-SK-SG-0002 P02 (Op2B) 398128-MMD-00-XX-DR-P-0001 P03.1 398128-MMD-00-XX-DR-P-0002 P03.1 also mentioned on 398128-MMD-00-XX-DR-P-0014 P03.1	Closed
H42	G - Geotechnics	Collapse of excavations	Collapse of side of excavation resulting in crushing/ suffocating due to possible variability in embankment fill, poor materials or water ingress.	Construction	Contractor to ensure appropriate temporary works in place to prevent collapse of the excavation.	Yes	D 398128-MMD-00-XX-DR-G-0002 P01.1	Closed
H43	G - Geotechnics	Production of waste materials from construction/demolition.	Contamination of the environment. Disposal of construction materials.	Construction	There is a residual risk of contamination of the environment from excavation of made ground. Contractor's waste management plan required to minimize environmental impact.	Yes	D 398128-MMD-00-XX-DR-G-0002 P01.1	Closed
H44	G - Geotechnics	Aggressive ground conditions for concrete structures	Unknown ground conditions due to limited Ground Investigation information available. The Marsh peat of the Fend district is known to contain pyrite.	Construction	Ground model and characteristic parameters for design will be based on referenced values relating to information available and published information. Designs to be updated following GI in next phase.	Yes	D 398128-MMD-00-XX-DR-S-1001/2/3 398128-MMD-00-XX-DR-S-2001/2/3 398128-MMD-00-XX-DR-S-3001/2/3 398128-MMD-00-XX-DR-S-4001/2/3 398128-MMD-00-XX-DR-S-7001/2/3 398128-MMD-00-XX-DR-S-8001/2/3 398128-MMD-00-XX-DR-S-9001/2	Closed

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H45	P - Track	Shunting at Whitemoor Yard sidings adjacent to passenger line to Wisbech	Higher line speed (20mph) and more frequent trains in area where ground staff are operating hand-points (Headshunt line at Whitemoor Junction).	Use (as workplace)	RFI for operations at Whitemoor Yard. Operational plan for Whitemoor Yard to be updated Continue to use segregated walkways for access to hand operated points machines	Yes	D 398128-MMD-00-XX-DR-P-0003 P03.1 398128-MMD-00-XX-DR-P-0004 P03.1	Closed
H46	SG - Signalling	Shunting at Whitemoor Yard sidings adjacent to passenger line to Wisbech	Unauthorised train movement out of Yard collides with Passenger train.	Use (as workplace)	Provision of Signaller's alarms as reminder to restore 51A/B crossover after each movement to/from Whitemoor Yard, to prevent dangerous situation occurring.	No	-	Closed
H47	SG - Signalling	Trains approaching signals at danger	Train overruns signal and collides with another train.	Use (as workplace)	All signals affected by scheme will need to be reviewed with Signal Overrun Risk Assessment Tool (SORAT) to identify required mitigations.	Yes	D. P 398128-MMD-00-XX-SK-SG-0001/2/3.	Closed
H48	SG - Signalling	Signaller Workload	Signaller Workload becomes excessive due to controlling the trains on the Wisbech branch/Coldham Loop.	Use (as workplace)	A Human Factors study should be carried out for Signaller workload for whichever location controls the Wisbech line. If it is March East SB, at present it is not clear if the adjacent Level crossing will be converted to automatic operation (MCB-OD). (Revised assumption is both SB and LC will be closed.)	No		Closed
H49	SG - Signalling	Use of AWS cancelling indicators for 'wrong direction' movements on the Wisbech single line.	Unnecessary AWS warnings could be a distraction to the train driver, or could lead other AWS warning being ignored.	Use (as workplace)	Use of AWS Cancelling Indicators can be permitted by RIS-0775-CCS Iss 2, section 3.1.6.5.1, subject to risk assessment. If the AWS magnets need to be suppressed, extra equipment, LOC cases and possibly power supplies would be required.	Yes	D 398128-MMD-00-XX-SK-SG-0001/2/3.	Closed
H50	SG - Signalling	Speed decrease from 60mph to 20mph approaching Whitemoor Junction	Driver does not react to speed indicators, leading to overspeed and possible derailment.	Use (as workplace)	Position of Advance Warning indicator at 139.650, 933m from start of 20mph PSR is significantly longer than the braking distance of modern DMU trains. The proposed position was discussed with a Signal Sighting Chairman, but alternative solutions for the AWI should be discussed during the 'Driveability Assessment' during the next stage of the project.	Yes	D 398128-MMD-00-XX-SK-SG-0001/2/3.	Closed
H51	D - Drainage	Ditches used to drain track formation	Fall into drainage ditch from track walking route or cycle path	Use (as workplace)	The drainage ditch has been located on the opposite side of the track for the track walkway. The cycle path has a segregation of 600mm from the drainage ditch.	Yes	D	Closed
H52	G - Geotechnics	Embankment Regrade	Movement of track during embankment regrading.	Construction	Contractor to monitor track during works.	Yes	D 398128-MMD-00-XX-DR-G-0002 P01.1	Closed
H53	T - Telecoms	Sighting of new equipment	New equipment impact signal sighting.	Construction	Cross liaising on with the signal sighting team and utilising cap videos prior to the final positioning of equipment.	Yes	P	Active
H54	SG - Signalling	Maintenance and inspection work on Bi-Directional lines	Risk to track workers from train movements. Patrolman's lockouts could be provided.	Use (as workplace)	Discuss with Network Rail (or raise TQ) to find out if lockouts are required.	Yes	D 398128-MMD-00-XX-SK-SG-0001/2/3.	Closed

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H55	D - Drainage	Construction of Highway drainage	Work within deep trench excavations	Construction	Mitigated the use of pipework by proposing a shallow drainage system in the form of ditches. Proposed ditches are kept shallow due to outfall level constraints and are min. 1.0m offset from toe of any embankments. Attenuation kept shallow due to outfall level constraints thus offering inherent protection from this hazard.	No	-	Closed
H56	D - Drainage	Inspection/maintenance of installed drainage	Confined spaces.	Maintenance	Number of chambers has been mitigated through the use of a shallow drainage system, in the form of ditches.	No	-	Closed
H57	D - Drainage	Inspection/maintenance of installed ditches	Contact with contaminated water, trips, vehicle overturning.	Construction	Highway drainage ditches are kept shallow and are offset 1.0m from toes of embankments. Track ditches are located on the opposite side of the cess walkway to minimise tripping hazard. A 600mm wide offset from end of track formation to the ditch channel is provided to provide a level space for operatives should access to the ditch be required.	Yes	F	Closed
H58	D - Drainage	Works to existing ditches	Contaminated water	Construction	Limited the length of existing ditches diverted/abandoned where possible.	Yes	D	Closed
H59	D - Drainage	Inspection and maintenance of installed drainage - chambers	Safe Access	Maintenance	Sizing of and layout of manholes to BS752. This has reduced the number of access chambers which require inspecting and ensures safe man-entry where required.	No	-	Closed
H60	D - Drainage	Inspection/maintenance of installed ditches	Drowning	Maintenance	Proposed outfalls shall be at a level that mitigates surcharging of the ditch, maintaining a low water level or dry ditch outside of ranifall events. Maximum ditch depth for highways = 0.5m and <1m for Track Drainage.	No	-	Closed
H61	D - Drainage	Works to existing ditches	Flooding risk	Construction	The number of connections into existing ditches has been minimised and design ditch depths have been kept as shallow as practical.	Yes	P	Closed
H62	D - Drainage	Construction of Railway drainage	Work within deep trench excavations	Construction	Mitigated the use of pipework by proposing a shallow drainage system in the form of ditches. Proposed ditches. 1m offset from toe of embankment.	No	-	Closed
H63	H - Highways	March car park access	Greater volume of traffic entering/exiting access to proposed March Station car park with a greater chance of accidents and blocking back onto the level crossing.	Use (as workplace)	A 2 way road has been proposed into the car park to reduce congestion. A visibility calculation has been completed for vehicles exiting the car park and shows visibility issues to the level crossing and due to the bus stop to the north of the crossing. It is recommended the location of the bus stop is reviewed with the Local Authority and this additional risk is incorporated into the level crossing risk assessment, undertaken by others.	Yes	D 398128-MD-00-XX-DR-H-1001 P02	Active
H64	C - Civils	Removal of exisiting walkway	Additonal footfall over level crossing produced by removal of walkway to island platform.		It is not possible to retain the existing walkway from the north to the island platform, with the new track alignment between Platforms 3 and 4. An alternate approach is provided, with the new footbridge which removes the need to use the level crossing. This footbridge also provides step free access to all platforms from either side of the railway, further reducing the requirement of passengers to use the level crossing. At the following design stage, signage will be designed to guide passengers to the most appropriate entrance via the safest route.	No		Closed
H65	S - Structures	Overbridge clearance	Conflict between train and overbridge	Use (as workplace)	Clearance adopted to running rail as per NR standards	No	D	Active

Designers' hazard elimination and management record

Project Title	Project Number	Project Manager
March to Wisbech - GRIP 3 - Heavy Rail Design	398128	Robert Leather
	Division	
	BNI, ITD, RTS	

Scope of Design		Form No/ Revision
	GRIP 3 design for heavy rail alignment between March and Wisbech	B

(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
H66	S - Structures	Chain river birdge - Decomissioning pre-stressed components	Demolition leads to injury due to pre-stressed re-bar	Demolition	Demoltion plan to be added to future drawings.Structure is steel and is not prestressed.	No		Closed
H67	C - Civils	Cycleway - east of alignment	Inadequate lighting and clearance means a cyclist falls into the associated drainage ditch	Use (as workplace)	Cycle path is located 600mm from drainage ditch. Lighting to be considered at next stage	Yes	D 398128-MMD-00-XX-DR-C-0109 P02 398128-MMD-00-XX-DR-C-0110 P02 398128-MMD-00-XX-DR-C-0111 P02	Closed
H68	G - Geotechnics	Drainage strategy includes water flowing down face of embankments	Softening base of embankment and deterioration of face leading to deep slips	Use (as workplace)	Suitable drainage measures in place to ensure surfacewater not eroding the slip face or poding at the toe of the embankment.	Yes	D	Active
H69	D - Drainage	Bridge piles clash with drainage channel	Flood risk	Use (as workplace)	Piped drainage proposed with attenuation up-stream.	No	-	Closed
H70	C - Civils	Walkway switching sides/terminating	Where there is limited clearance over underbridges the walking route is locally terminated. There are also instances where the walkway switches to the opposite cess. There is a risk that users of the walkway may cross the track at the end of the walkway, assuming there is a cess walkway/position of safety on the opposite side.	Use (as workplace)	At the following design stage signage will be provided to note cess walkway on other side of track with details of nearest access point in areas of limited clearance.	No		Closed
H81	P - Track	Wisbech Station - infrastructure located in buffer stop overrun risk zone	Train overruns buffer stop and strikes infrastructure	Use (as workplace)	Relocate infrastructure/walking routes and buffer stop risk assessment at the next stage of design	Yes	D 398128-MMD-00-XX-DR-P-0013 P03.1	Active
H82	H - Highways	Tight road geometry	Due to the tight road alignment to the north of the proposed Wisbech car park there is an increased risk of road traffic collisions and vehicles colliding with the existing infrastructure.	Use (as workplace)	Following a full topographical survey, the road alignment is to be optimised at the following design stage. This section of the road is to be used as a one way bus access to the station, limiting the chances of any incidents.	Yes	D/F 398128-MMD-00-XX-DR-H-1000 P02	Closed
H83	U - Cross Discipline	Walking route from Wisbech Station through exisiting Nestle carpark	Conflict between pedestrians and cars leading to collision	Use (as workplace)	Agreement with Nestle for designated/segregated walking route	Yes	D	Active
H84	G - Geotechnics	Platform ramp/stairs settlement	Structure may result in significant settlements for the pedestrian ramp which cannot be calculated at this stage due to insufficient ground investigation information at this location.	Use (as workplace)	Solutions may be required to minimise differential settlement between piled platform and pedestrian ramp. Options to be reviewed following further Ground Investigation at the next design stage	Yes	D/F 398128-MMD-00-XX-DR-C-0001 P02	Closed

MOTT MACDONALD	Designers' hazard elimination and management record	
Project Title	**Project Number**	**Project Manager**
March to Wisbech - GRIP 3 - Heavy Rail Design	398128	Robert Leather
	Division	
	BNI, ITD, RTS	
Scope of Design GRIP 3 design for heavy rail alignment between March and Wisbech		**Form No/ Revision**
		B

(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
H85	G - Geotechnics	Station building - Wisbech	Bearing capacity of the soil beneath the proposed station location has been assumed to be 50kPa based on interpreted ground information relating to boreholes >50m from the location and therefore foundation solution may increase after further GI is conducted.	Use (as workplace)	Solutions may be required to minimise settlement following further Ground investigation, to be reviewed at the next design stage	Yes	D/F 398128-MMD-00-XX-DR-C-0001 P02	Closed
H86	P - Track	Track construction	Buried or overhead services (gas main, HV or telecoms)	Construction	Mark as hazard on drawings, include C2 information.	Yes	D 398128-MMD-00-XX-DR-P-0001 P03.1 398128-MMD-00-XX-DR-P-0002 P03.1 398128-MMD-00-XX-DR-P-0003 P03.1 398128-MMD-00-XX-DR-P-0004 P03.1 398128-MMD-00-XX-DR-P-0005 P03.1 398128-MMD-00-XX-DR-P-0006 P03.1 398128-MMD-00-XX-DR-P-0007 P03.1 398128-MMD-00-XX-DR-P-0010 P03.1 398128-MMD-00-XX-DR-P-0011 P03.1 398128-MMD-00-XX-DR-P-0012 P03.1 398128-MMD-00-XX-DR-P-0014 P03.1 also mentioned though with no specific location on 398128-MMD-00-XX-DR-P-0008/9/13	Active
H87	H - Highways	A47 Grade Separation	720 radius for 70kph in the not recommended zone for FOSD. K 20 1 step and reduced SSD, so 1 step departure	Use (as workplace)	Review road alignment at next stage of the design. Consider having the bridge to the north of the existing alignment instead, rather than to the south, as shown on NR alignment.	Yes	D,P 398128-MMD-00-XX-DR-H-0401 P03	Closed

Step

MOTT MACDONALD

Designers' hazard elimination and management record

Project Title	Project Number	Project Manager
March to Wisbech - GRIP 3 - Heavy Rail Design	398128	Robert Leather
	Division	
	BNI, ITD, RTS	
Scope of Design GRIP 3 design for heavy rail alignment between March and Wisbech		**Form No/ Revision**
		B

(1) Haz Ref	Discipline	(2) Activity/Process/ Material/Element - what is being undertaken?	(3) Hazard[1]	(4) Stage of Work	(5) Designer Risk Control Measures[2]: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not having been taken.	(6) Is there a 'significant' residual risk to be passed on?[3] (Y/N)	(7) If answer to (6) is Yes, information flow: D/P/F[4]	(8) Status Within MM (Active / Closed)
H88	C - Civils	Relocating assets towards existing pond	There is an existing pond near to march station (c.138.500km). Due to the track realignment the trough route, signal and LOCs in this area are being moved towards this area. The exact space available is unknown from existing information. Risk of maintenance workers falling into pond.	Maintenance	It is proposed to provide a guard rail at the the LOCs and signal to prevent maintenance workers falling into the pond. The spacing is to be reviewed at the following design stage once a full topographical survey is available.	Yes	D,P,F 398128-MMD-00-XX-DR-C-0100 P02 398128-MMD-00-XX-DR-C-0101 P02	Closed
H89	H - Highways	Modification of junction between Elm Road and Twenty Foot Road	Tight curve, so risk of	Use (as workplace)	At the next stage of design , measures such as signage, road markinggs etc. should be investigated to slow traffic at this location.	Yes	D,P,F 398128-MMD-00-XX-DR-H-0112 P03	Active
H90	D - Drainage	Deep excavation for installation of underground tank.	Installation of underground attenuation tank	Construction	Attenuation tank sized based on the storage volume required. Depth of attenuation subject to survey of existing outfall catchpit. Depth of catchpit to be verified prior to detailed design and construction. Option to provide attenuation storage volume using small pond if outfall connection levels are not achievable.	Yes	D,P,F 398128-MMD-00-XX-DR-D-1001 through to ….1012 P01.1	Closed
H91	SG - Signalling	Installation and Maintenance of Signal Gantries	Working at Height	Maintenance	Signals mounted above the Down Main running line. Limited clearance between Down Main and Down Goods No1 prevents use of straight signal post.	Yes	D 398128-MMD-00-XX-SK-SG-0003.	Closed
H92	SG - Signalling	Repositioned Stop Signal MS35	Existing signal has Multi-SPAD history	Use (as workplace)	To be considered in SORAT process. Mitigations may be required if not addressed by new signal.	Yes	D 398128-MMD-00-XX-SK-SG-0003.	Closed
H93	SG - Signalling	Repositioned Stop Signal ME45	Existing signal has Multi-SPAD history	Use (as workplace)	To be considered in SORAT process. Mitigations may be required if not addressed by new signal.	Yes	D 398128-MMD-00-XX-SK-SG-0003.	Closed
H94	C - Civils	Clearance to proposed UTX chamber	A reduced clearance is available to the proposed UTX at ch. 137.725km for construction and maintenance purposes. To the sidings lines.	Construction	A minimum of 2m is provided to the adjacent goods line however this is not possible to the sidings lines. It is recommended that the design is reviewed at the following design stage following receipt of a detailed topographical survey.	Yes	D, P, F	Closed
D53	D - Drainage	Earth bund installation	Fluvial hydraulic modelling has not been undertaken at this stage of design and thus the capacity of existing ditches receiving third party lands and track run-off has not been assessed. Potential earthbunds required at locations without an existing ditch cannot be designed to consider necessary flood resistance e.g. rising levels.	Construction	Earth bund will be installed to prevent surface water run-off from adjacent third-party land into the railway drainage system. An assessment will be required in the next design stage to determine the earth bund heights.	Yes	P	Closed

Step

MOTT MACDONALD	**HAZID Attendance Record**

Project:	March to Wisbech Transport Corridor (GRIP 3 Heavy Rail Design)	Chaired by:	Gavin Jennings (Engineering Manager)
Location:	Skype Meeting	Date	26/11/19

Reference Documents

- 398128-MMD-00-XX-HS-U-0001_M2W_GRIP 3_Designers Hazard Elimination and Mgmt Record

Name/Discipline:	**Attended Briefing Signature:**	**Date:**
Gavin Jennings / Track	[redacted]	
Lawrence Kent / Signalling		
Douglas Crawford / Signalling		
Andrew Corcoran / Ancillary Civil/Stations Civil Engineering		
Kirk Bagnall / Drainage and Flood Risk		
Ayla Cooper / Geotechnical		
David Crilly / Telecommunications		
Kokob Kidane / Telecommunications		
Gerry Dissanaike / Bridges & Civil Structures		
Timothy Granger / Electrical and Plant		
Hamish Harrison / Electrical and Plant		
Naomi Ward / Highways		

D. Interdisciplinary Design Check Certificate

IDC Certificate

Project:	March to Wisbech Transport Corridor		
Our reference:	398128010 B	**Your reference:**	n/a
Prepared by:	Gavin Jennings	**Date:**	15/05/2020
Approved by:	Simon Barraclough	**Checked by:**	Robert Leather
Subject:	Interdisciplinary Design Check Certificate		

1 Purpose of this Document

The purpose of this document is to demonstrate the completion of the interdisciplinary check (IDC) process for the GRIP 3 Heavy Rail Multi-Disciplinary design for the March to Wisbech Transport Corridor Project. The following IDC meetings were held:

- Grade Separations IDC: 09/12/2019
- Through Alignment and Stations IDC 16/12/2019
- Option 4C and Ancillary Drawings 28/02/2020
- Post Survey Findings 14/04/2020

2 Meeting Attendees

The following attendees were present at the IDC meetings:

Table 2.1: Attendees at Grade Separations IDC

Discipline	Organisation	Name	Title
Bridges & Civil Structures	Mott MacDonald	Gerry Dissanaike	Bridges lead
Client	Cambridgeshire County Council	Kristian Mobbs	Highways
Client	Cambridgeshire County Council	Jack Eagle	Project Manager
Drainage and Flood Risk	Mott MacDonald	Megan Jones	Drainage Lead
Engineering Management	Mott MacDonald	Gavin Jennings	Contractors Engineering Manager
Quantity Surveying	Mott MacDonald	Stuart Stallwood	Lead Estimator
Geotechnical	Mott MacDonald	Richard Spence / Ayla Cooper	Geotechnical Lead
Highways	Mott MacDonald	Naomi Ward	Highways Lead
Project Management	Mott MacDonald	Robert Leather	Project Manager

Table 2.2: Attendees at Through Alignment and Stations IDC

Discipline	Organisation	Name	Title
Ancillary Civil/Stations Civil Engineering	Mott MacDonald	Andrew Corcoran	Civils Lead
Bridges & Civil Structures	Mott MacDonald	Gerry Dissanaike	Bridges lead
Client	Cambridgeshire County Council	Kristian Mobbs	Highways
Client	Cambridgeshire County Council	Jack Eagle	Project Manager
Drainage and Flood Risk	Mott MacDonald	Terry Chung / Cleopatra Meade	Drainage Lead
Electrical and Plant	Mott MacDonald	Timothy Granger	E&P Lead
Engineering Management	Mott MacDonald	Gavin Jennings	Contractors Engineering Manager
Quantity Surveying	Mott MacDonald	Melvyn Jones	Lead Estimator
Geotechnical	Mott MacDonald	Richard Spence / Ayla Cooper / Alan Willoner	Geotechnical Lead
Signalling	Mott MacDonald	Douglas Crawford	Signalling Lead
Telecommunications	Mott MacDonald	David Crilly / Kokob Kidane	Telecommunications Lead
Track	Mott MacDonald	Gavin Jennings	Principal Permanent Way Engineer

Table 2.3: Attendees at Option 4C and Ancillary Drawings IDC

Discipline	Organisation	Name	Title
Ancillary Civil/Stations Civil Engineering	Mott MacDonald	Andrew Corcoran	Civils Lead
Bridges & Civil Structures	Mott MacDonald	Gerry Dissanaike	Bridges lead
Drainage and Flood Risk	Mott MacDonald	Cleopatra Meade	Drainage Lead
Drainage and Flood Risk	Mott MacDonald	Kirk Bagnall	Drainage Lead
Drainage and Flood Risk	Mott MacDonald	Megan Jones	Drainage Lead
Electrical and Plant	Mott MacDonald	Timothy Granger	E&P Lead
Engineering Management	Mott MacDonald	Gavin Jennings	Contractors Engineering Manager
Highways	Mott MacDonald	Naomi Ward	Highways Lead
Signalling	Mott MacDonald	Douglas Crawford	Signalling Lead
Signalling	Mott MacDonald	Lawrence Kent	Signalling Lead
Telecommunications	Mott MacDonald	David Crilly	Telecommunications Lead
Telecommunications	Mott MacDonald	Kokob Kidane	Telecommunications
Track	Mott MacDonald	Gavin Jennings	Principal Permanent Way Engineer

Table 2.4: Attendees at Post Survey Findings IDC

Discipline	Organisation	Name	Title
Ancillary Civil/Stations Civil Engineering	Mott MacDonald	Andrew Corcoran	Civils Lead
Bridges & Civil Structures	Mott MacDonald	Lance Luk	Bridges lead
Drainage and Flood Risk	Mott MacDonald	Cleopatra Meade	Drainage Lead
Electrical and Plant	Mott MacDonald	Timothy Granger	E&P Lead
Engineering Management	Mott MacDonald	Gavin Jennings	Contractors Engineering Manager
Geotechnical	Mott MacDonald	Richard Spence / Ayla Cooper	Geotechnical Lead
Signalling	Mott MacDonald	Douglas Crawford	Signalling Lead
Telecommunications	Mott MacDonald	Kokob Kidane	Telecommunications
Track	Mott MacDonald	Gavin Jennings	Principal Permanent Way Engineer

3 Schedule of Drawings

The IDC was carried out with reference to the following design drawings.

Table 3.1: Drawings for Grade Separations IDC

No.	Document No.	Revision	Document Title
1	398128-MMD-00XX-DR-H-0101	P02	HIGHWAYS GENERAL ARRANGEMENT
2	398128-MMD-00XX-DR-H-0102	P02	HIGHWAYS GENERAL ARRANGEMENT
3	398128-MMD-00XX-DR-H-0103	P02	HIGHWAYS GENERAL ARRANGEMENT
4	398128-MMD-00XX-DR-H-0104	P02	HIGHWAYS GENERAL ARRANGEMENT
5	398128-MMD-00XX-DR-H-0105	P02	HIGHWAYS GENERAL ARRANGEMENT
6	398128-MMD-00XX-DR-H-0106	P02	HIGHWAYS GENERAL ARRANGEMENT
7	398128-MMD-00XX-DR-H-0107	P02	HIGHWAYS GENERAL ARRANGEMENT
8	398128-MMD-00XX-DR-H-0108	P02	HIGHWAYS GENERAL ARRANGEMENT
9	398128-MMD-00XX-DR-H-0109	P02	HIGHWAYS GENERAL ARRANGEMENT
10	398128-MMD-00XX-DR-H-0110	P02	HIGHWAYS GENERAL ARRANGEMENT
11	398128-MMD-00XX-DR-H-0111	P02	HIGHWAYS GENERAL ARRANGEMENT
12	398128-MMD-00XX-DR-H-0201	P02	HIGHWAYS GENERAL ARRANGEMENT
13	398128-MMD-00XX-DR-H-0202	P02	HIGHWAYS GENERAL ARRANGEMENT
14	398128-MMD-00XX-DR-H-0203	P02	HIGHWAYS GENERAL ARRANGEMENT
15	398128-MMD-00XX-DR-H-0301	P02	HIGHWAYS GENERAL ARRANGEMENT
16	398128-MMD-00XX-DR-H-0302	P02	HIGHWAYS GENERAL ARRANGEMENT
17	398128-MMD-00XX-DR-H-0321	P02	HIGHWAYS GENERAL ARRANGEMENT
18	398128-MMD-00XX-DR-H-0322	P02	HIGHWAYS GENERAL ARRANGEMENT
19	398128-MMD-00XX-DR-H-0323	P02	HIGHWAYS GENERAL ARRANGEMENT
20	398128-MMD-00XX-DR-H-0324	P02	HIGHWAYS GENERAL ARRANGEMENT
21	398128-MMD-00XX-DR-H-0401	P02	HIGHWAYS GENERAL ARRANGEMENT
22	398128-MMD-00XX-DR-H-0402	P02	HIGHWAYS GENERAL ARRANGEMENT
23	398128-MMD-00XX-DR-H-0501	P02	HIGHWAYS GENERAL ARRANGEMENT
24	398128-MMD-00XX-DR-H-1201	P02	HIGHWAYS TYPICAL CROSS SECTIONS
25	398128-MMD-00XX-DR-H-1202	P02	HIGHWAYS TYPICAL CROSS SECTIONS
26	398128-MMD-00XX-DR-H-3000	P01	COMBINED C2 UTILITIES PLAN
27	398128-MMD-00XX-DR-H-3001	P01	COMBINED C2 UTILITIES PLAN
28	398128-MMD-00XX-DR-H-3002	P01	COMBINED C2 UTILITIES PLAN
29	398128-MMD-00XX-DR-H-3003	P01	COMBINED C2 UTILITIES PLAN
30	398128-MMD-00XX-DR-H-3004	P01	COMBINED C2 UTILITIES PLAN
31	398128-MMD-00XX-DR-H-3005	P01	COMBINED C2 UTILITIES PLAN
32	398128-MMD-00XX-DR-H-3006	P01	COMBINED C2 UTILITIES PLAN
33	398128-MMD-00XX-DR-H-3007	P01	COMBINED C2 UTILITIES PLAN
34	398128-MMD-00XX-DR-H-3008	P01	COMBINED C2 UTILITIES PLAN
35	398128-MMD-00XX-DR-H-3009	P01	COMBINED C2 UTILITIES PLAN
36	398128-MMD-00XX-DR-H-3010	P01	COMBINED C2 UTILITIES PLAN
37	398128-MMD-00XX-DR-H-3011	P01	COMBINED C2 UTILITIES PLAN
38	398128-MMD-00XX-DR-H-3012	P01	COMBINED C2 UTILITIES PLAN

No.	Document No.	Revision	Document Title
39	398128-MMD-00XX-DR-H-3013	P01	COMBINED C2 UTILITIES PLAN
40	398128-MMD-00XX-DR-H-3014	P01	COMBINED C2 UTILITIES PLAN
41	398128-MMD-00XX-DR-H-3015	P01	COMBINED C2 UTILITIES PLAN
42	398128-MMD-00XX-DR-H-3016	P01	COMBINED C2 UTILITIES PLAN
43	398128-MMD-00XX-DR-H-3017	P01	COMBINED C2 UTILITIES PLAN
44	398128-MMD-00XX-DR-H-3018	P01	COMBINED C2 UTILITIES PLAN
45	398128-MMD-00-XX-DR-S-1001	P01	WEASENHAM BRIDGE
46	398128-MMD-00-XX-DR-S-1002	P01	WEASENHAM BRIDGE
47	398128-MMD-00-XX-DR-S-1003	P01	WEASENHAM BRIDGE
48	398128-MMD-00-XX-DR-S-2001	P01	A47 WISBECH BYPASS BRIDGE
49	398128-MMD-00-XX-DR-S-2002	P01	A47 WISBECH BYPASS BRIDGE
50	398128-MMD-00-XX-DR-S-2003	P01	A47 WISBECH BYPASS BRIDGE
51	398128-MMD-00-XX-DR-S-3001	P01	BROAD DROVE BRIDGE
52	398128-MMD-00-XX-DR-S-3002	P01	BROAD DROVE BRIDGE
53	398128-MMD-00-XX-DR-S-3003	P01	BROAD DROVE BRIDGE
54	398128-MMD-00-XX-DR-S-4001	P01	HOLLY BANK / CROOKED BANK BRIDGE
55	398128-MMD-00-XX-DR-S-4002	P01	HOLLY BANK / CROOKED BANK BRIDGE
56	398128-MMD-00-XX-DR-S-4003	P01	HOLLY BANK / CROOKED BANK BRIDGE
57	398128-MMD-00-XX-DR-S-7001	P01	COLDHAM BRIDGE
58	398128-MMD-00-XX-DR-S-7002	P01	COLDHAM BRIDGE
59	398128-MMD-00-XX-DR-S-7003	P01	COLDHAM BRIDGE
60	398128-MMD-00-XX-DR-S-8001	P01	ELM ROAD BRIDGE
61	398128-MMD-00-XX-DR-S-8002	P01	ELM ROAD BRIDGE
62	398128-MMD-00-XX-DR-S-8003	P01	ELM ROAD BRIDGE
63	398128-MMD-00-XX-DR-S-9001	P01	TWENTY FOOT RIVER BRIDGE
64	398128-MMD-00-XX-DR-S-9002	P01	TWENTY FOOT RIVER BRIDGE
65	398128-MMD-00-XX-DR-TP-0001	P02	INDICATIVE BOUNDARY PLAN
66	398128-MMD-00-XX-DR-TP-0002	P02	INDICATIVE BOUNDARY PLAN
67	398128-MMD-00-XX-DR-TP-0003	P02	INDICATIVE BOUNDARY PLAN
68	398128-MMD-00-XX-DR-TP-0004	P02	INDICATIVE BOUNDARY PLAN
69	398128-MMD-00-XX-DR-TP-0005	P02	INDICATIVE BOUNDARY PLAN
70	398128-MMD-00-XX-DR-TP-0006	P02	INDICATIVE BOUNDARY PLAN
71	398128-MMD-00-XX-DR-TP-0007	P02	INDICATIVE BOUNDARY PLAN
72	398128-MMD-00-XX-DR-G-0001	P01.1	TYPICAL EMBANKMENT DETAILS
73-86	Allocated to track drawings (for info) in register		
87	398128-MMD-00-XX-DR-D-0101	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT
88	398128-MMD-00-XX-DR-D-0102	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT
89	398128-MMD-00-XX-DR-D-0103	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT
90	398128-MMD-00-XX-DR-D-0104	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT

No.	Document No.	Revision	Document Title
91	398128-MMD-00-XX-DR-D-0201	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT
92	398128-MMD-00-XX-DR-D-0301	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT
93	398128-MMD-00-XX-DR-D-0302	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT
94	398128-MMD-00-XX-DR-D-0303	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT
95	398128-MMD-00-XX-DR-D-0401	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT
96	398128-MMD-00-XX-DR-D-0501	P01	PROPOSED HIGHWAY DRAINAGE GENERAL ARRANGEMENT

Table 3.2: Drawings for Through Alignment and Stations ID

No.	Document No.	Revision	Document Title
65	398128-MMD-00-XX-DR-TP-0001	P02	INDICATIVE BOUNDARY PLAN
66	398128-MMD-00-XX-DR-TP-0002	P02	INDICATIVE BOUNDARY PLAN
67	398128-MMD-00-XX-DR-TP-0003	P02	INDICATIVE BOUNDARY PLAN
68	398128-MMD-00-XX-DR-TP-0004	P02	INDICATIVE BOUNDARY PLAN
69	398128-MMD-00-XX-DR-TP-0005	P02	INDICATIVE BOUNDARY PLAN
70	398128-MMD-00-XX-DR-TP-0006	P02	INDICATIVE BOUNDARY PLAN
71	398128-MMD-00-XX-DR-TP-0007	P02	INDICATIVE BOUNDARY PLAN
73	398128-MMD-00-XX-DR-P-0001	P02.1	PLAN AND PROFILE
74	398128-MMD-00-XX-DR-P-0002	P02.1	PLAN AND PROFILE
75	398128-MMD-00-XX-DR-P-0003	P02.1	PLAN AND PROFILE
76	398128-MMD-00-XX-DR-P-0004	P02.1	PLAN AND PROFILE
77	398128-MMD-00-XX-DR-P-0005	P02.1	PLAN AND PROFILE
78	398128-MMD-00-XX-DR-P-0006	P02.1	PLAN AND PROFILE
79	398128-MMD-00-XX-DR-P-0007	P02.1	PLAN AND PROFILE
80	398128-MMD-00-XX-DR-P-0008	P02.1	PLAN AND PROFILE
81	398128-MMD-00-XX-DR-P-0009	P02.1	PLAN AND PROFILE
82	398128-MMD-00-XX-DR-P-0010	P02.1	PLAN AND PROFILE
83	398128-MMD-00-XX-DR-P-0011	P02.1	PLAN AND PROFILE
84	398128-MMD-00-XX-DR-P-0012	P02.1	PLAN AND PROFILE
85	398128-MMD-00-XX-DR-P-0013	P02.1	PLAN AND PROFILE
86	398128-MMD-00-XX-DR-P-0014	P01.1	PLAN AND PROFILE
97	398128-MMD-00-XX-SK-SG-0001	P01	MARCH OPTION 2A
98	398128-MMD-00-XX-SK-SG-0002	P01	MARCH OPTION 2B
99	398128-MMD-00-XX-DR-T-0001	P01	MARCH STATION
100	398128-MMD-00-XX-DR-T-0003	P01	WISBECH STATION
101	398128-MMD-00-XX-DR-C-0001	P01.1	WISBECH PROPOSED STATION
102	398128-MMD-00-XX-DR-C-0002	P01	MARCH STATION PROPOSED WORKS
103	398128-MMD-00-XX-DR-C-0100	P01	LINESIDE ANCILLARY CIVILS
104	398128-MMD-00-XX-DR-C-0101	P01	LINESIDE ANCILLARY CIVILS
105	398128-MMD-00-XX-DR-C-0102	P01	LINESIDE ANCILLARY CIVILS
106	398128-MMD-00-XX-DR-C-0103	P01	LINESIDE ANCILLARY CIVILS
107	398128-MMD-00-XX-DR-C-0104	P01	LINESIDE ANCILLARY CIVILS
108	398128-MMD-00-XX-DR-C-0105	P01	LINESIDE ANCILLARY CIVILS
109	398128-MMD-00-XX-DR-C-0106	P01	LINESIDE ANCILLARY CIVILS
110	398128-MMD-00-XX-DR-C-0107	P01	LINESIDE ANCILLARY CIVILS
111	398128-MMD-00-XX-DR-C-0108	P01	LINESIDE ANCILLARY CIVILS
112	398128-MMD-00-XX-DR-C-0109	P01	LINESIDE ANCILLARY CIVILS

113	398128-MMD-00-XX-DR-C-0110	P01	LINESIDE ANCILLARY CIVILS
114	398128-MMD-00-XX-DR-C-0111	P01	LINESIDE ANCILLARY CIVILS
115	398128-MMD-00-XX-DR-C-0112	P01	LINESIDE ANCILLARY CIVILS
116	398128-MMD-00-XX-DR-C-0113	P01	LINESIDE ANCILLARY CIVILS
117	398128-MMD-00-XX-DR-C-0114	P01	LINESIDE ANCILLARY CIVILS
118	398128-MMD-00-XX-DR-C-0115	P01	LINESIDE ANCILLARY CIVILS
126	398128-MMD-00-XX-DR-G-0002	P01.1	EXISTING RAILWAY EMBANKMENT
127	398128-MMD-00-XX-DR-H-1000	P01	WISBECH STATION
128	398128-MMD-00-XX-DR-H-1001	P01	MARCH STATION
129	398128-MMD-00-XX-DR-S-1100	P01	MARCH STATION FOOTBRIDGE
130	398128-MMD-00-XX-DR-S-1101	P01	MARCH STATION FOOTBRIDGE
131	398128-MMD-00-XX-DR-S-1102	P01	MARCH STATION FOOTBRIDGE
132	398128-MMD-00-XX-DR-S-1103	P01	MARCH STATION FOOTBRIDGE
133	398128-MMD-00-XX-DR-S-1104	P01	MARCH STATION FOOTBRIDGE
134	398128-MMD-00-XX-DR-S-1105	P01	MARCH STATION FOOTBRIDGE
135	398128-MMD-00-XX-DR-E-0001	P01	E&P SIGNALLING POWER
143	398128-MMD-00-XX-DR-D-1001	P01.1*	TRACK DRAINAGE
144	398128-MMD-00-XX-DR-D-1002	P01.1*	TRACK DRAINAGE
145	398128-MMD-00-XX-DR-D-1003	P01.1*	TRACK DRAINAGE
146	398128-MMD-00-XX-DR-D-1004	P01.1*	TRACK DRAINAGE
147	398128-MMD-00-XX-DR-D-1005	P01.1*	TRACK DRAINAGE
148	398128-MMD-00-XX-DR-D-1006	P01.1*	TRACK DRAINAGE
149	398128-MMD-00-XX-DR-D-1007	P01.1*	TRACK DRAINAGE
150	398128-MMD-00-XX-DR-D-1008	P01.1*	TRACK DRAINAGE
151	398128-MMD-00-XX-DR-D-1009	P01.1*	TRACK DRAINAGE
152	398128-MMD-00-XX-DR-D-1010	P01.1*	TRACK DRAINAGE
153	398128-MMD-00-XX-DR-D-1011	P01.1*	TRACK DRAINAGE
154	398128-MMD-00-XX-DR-D-1012	P01.1*	TRACK DRAINAGE

**Note drawings were presented as part of a drainage presentation rather than issued separately*

Table 3.3: Drawings for Option 4C and Ancillary Drawings IDC

No.	Document No.	Revision	Document Title
86	398128-MMD-00-XX-DR-P-0014	P01.1*	PLAN AND PROFILE
102	398128-MMD-00-XX-DR-C-0002	P03.1*	GENERAL ARRANGEMENT
103	398128-MMD-00-XX-DR-C-0100	P03.1*	GENERAL ARRANGEMENT
135	398128-MMD-00-XX-DR-E-0001	P02*	E&P SIGNALLING POWER
136	398128-MMD-00-XX-SK-SG-0003	P01	MARCH OPTION 4C
137	398128-MMD-00XX-DR-H-0112	P01	HIGHWAYS GENERAL ARRANGEMENT
138	398128-MMD-00XX-DR-H-3019	P01.1	COMBINED C2 UTILITIES PLAN
139	398128-MMD-00-XX-DR-C-0120	P01.1	OPTION 4C GENERAL ARRANGEMENT
140	398128-MMD-00-XX-DR-C-0121	P01.1	OPTION 4C GENERAL ARRANGEMENT
141	398128-MMD-00-XX-DR-D-0010	P01.1	WISBECH STATION CAR PARK
142	398128-MMD-00-XX-DR-D-0020	P01.1	MARCH STATION CAR PARK

**Updated drawing*

Table 3.4: Drawings for Post Survey Findings IDC

No.	Document No.	Revision	Document Title
102	398128-MMD-00-XX-DR-C-0002	P05.1*	GENERAL ARRANGEMENT
103	398128-MMD-00-XX-DR-C-0100	P05.1*	GENERAL ARRANGEMENT
126	398128-MMD-00-XX-DR-G-0002	P02.1*	EXISTING RAILWAY EMBANKMENT
158	398128-MMD-00-XX-DR-G-0003	P01	PROPOSED RETAINING WALL ALIGNMENT AND TYPICAL DETAIL
143	398128-MMD-00-XX-DR-D-1001	P02.1*	TRACK DRAINAGE
144	398128-MMD-00-XX-DR-D-1002	P02.1*	TRACK DRAINAGE
145	398128-MMD-00-XX-DR-D-1003	P02.1*	TRACK DRAINAGE
146	398128-MMD-00-XX-DR-D-1004	P02.1*	TRACK DRAINAGE
147	398128-MMD-00-XX-DR-D-1005	P02.1*	TRACK DRAINAGE
148	398128-MMD-00-XX-DR-D-1006	P02.1*	TRACK DRAINAGE
149	398128-MMD-00-XX-DR-D-1007	P02.1*	TRACK DRAINAGE
150	398128-MMD-00-XX-DR-D-1008	P02.1*	TRACK DRAINAGE
151	398128-MMD-00-XX-DR-D-1009	P02.1*	TRACK DRAINAGE
SKETCH	398128-MMD-00-XX-SK-S-0100	P01.1	WIG 2314 CHAIN BRIDGE METALWORK GENERAL ARRANGEMENT
SKETCH	398128-MMD-00-XX-SK-S-0101	P01.1	WIG 2314 CHAIN BRIDGE METALWORK GENERAL ARRANGEMENT
SKETCH	398128-MMD-00-XX-SK-S-0102	P01.1	WIG 2314 CHAIN BRIDGE TYPICAL DEFECTS
SKETCH	398128-MMD-00-XX-SK-S-0103	P01.1	WIG 2314 CHAIN BRIDGE TYPICAL DEFECTS
SKETCH	398128-MMD-00-XX-SK-S-0104	P01.1	WIG 2314 CHAIN BRIDGE PROPOSED METALWORK REPAIRS
SKETCH	398128-MMD-00-XX-SK-S-0200	P01.1	WIG 2315 MULBARY DRAIN METALWORK GENERAL ARRANGEMENT
SKETCH	398128-MMD-00-XX-SK-S-0201	P01.1	WIG 2315 MULBARY DRAIN TYPICAL DEFECTS
SKETCH	398128-MMD-00-XX-SK-S-0300	P01.1	WIG 2317 WALDERSEY DRAIN METALWORK GENERAL ARRANGEMENT
SKETCH	398128-MMD-00-XX-SK-S-0301	P01.1	WIG 2317 WALDERSEY DRAIN TYPICAL DEFECTS
SKETCH	398128-MMD-00-XX-SK-S-0400	P01.1	WIG 2319 REDMOOR DRAIN METALWORK GENERAL ARRANGEMENT
SKETCH	398128-MMD-00-XX-SK-S-0401	P01.1	WIG 2319 REDMOOR DRAIN TYPICAL DEFECTS

**Updated drawing*

4 Schedule of Interface Issues

Table 4.1: Interface issues for Grade Separations IDC

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
1	398128-MMD-00-XX-DR-TP-0004, 0006, 0007	Civil	Add design risk triangle (D39) for earthworks exceeding assumed NR boundary	G Jennings	A Corcoran	06/01/2020	Risk triangle added to drawings	06/01/20
2	398128-MMD-00XX-DR-H SERIES	Highways	Add/amend the following items: -OS Mapping disclaimer -DHEMR is doc No. 398128-MMD-00-XX-HS-U-0001	G Jennings	N Ward	06/01/2020	OS Disclaimer added to drawings. DHEMR reference updated.	07.01.20
3	398128-MMD-00XX-DR-H-0201 to 0203	Highways	Missing scheme number in title block	G Jennings	N Ward	06/01/2020	Scheme number added.	07.01.20
4	398128-MMD-00XX-DR-H-0101 to 0501	Highways	General “Arrangement” spelt wrong in title block	G Jennings	N Ward	06/01/2020	Corrected	07.01.20
5	398128-MMD-00XX-DR-H-3 SERIES	Highways	Confirm reference drawing is a model file?	G Jennings	N Ward	06/01/2020	Confirmed	07.01.20
6	398128-MMD-00XX-DR-H-3 SERIES	Highways	Add summary details for hazards in call out box	G Jennings	N Ward	06/01/2020	Added	07.01.20
7	398128-MMD-00-XX-DR-S SERIES (ELEVATIONS)	Bridges	Suggest adding dimensions from top rail to bride soffit (minimum) to highlight critical dimension. Add (minimum) dimension from track centreline to face of bridge	G Jennings	G Dissanaike	06/01/2020	Added	07.01.20
8	398128-MMD-00-XX-DR-S SERIES	Bridges	Sheet numbering to be updated and revision to be P01	G Jennings	G Dissanaike	06/01/2020	Updated	07.01.20
9	398128-MMD-00-XX-DR-S SERIES	Bridges	Applicable hazard triangles to be added to drawing	G Jennings	G Dissanaike	06/01/2020	Added where relevant	07.01.20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
10	398128-MMD-00-XX-DR-S-3 SERIES	Bridges	Broad “Drove” to be corrected	G Jennings	G Dissanaike	06/01/2020	Corrected	10-1-20
11	398128-MMD-00-XX-DR-S-9002	Bridges	Label existing surface	G Jennings	G Dissanaike	06/01/2020	Drawings updated	07.01.20
12	398128-MMD-00-XX-DR-G-0001	Geotech	Amend to Sheet 1 of 1	G Jennings	R Spence	06/01/2020	Updated	12/12/19
13	398128-MMD-00-XX-DR-S-1001, 398128-MMD-00-XX-DR-S-2001, 398128-MMD-00-XX-DR-S-3001, 398128-MMD-00-XX-DR-S-4001, 398128-MMD-00-XX-DR-S-7001, 398128-MMD-00-XX-DR-S-8001, 398128-MMD-00-XX-DR-S-9001	Bridges	Provide chainage (highways and track) so that bridge locations can be identified. If we’re not using NR drawing convention, we need a key. Colour conventions don’t seem to have been consistently applied. Need to clarify by applying drawing conventions correctly: We should only hatch elements that are being 'cut' through at the level of the plan. We should only use dashed lines on elements 'below'. If this plan is at carriageway level (nominally cut 100mm above the road surface level). parapets should be hatched, pavement edges should be solid outlines, deck outline and parapet retaining wall stems should be dashed lines, Retaining wall bases should not be shown. Needs section marks for the ‘typical elevation on bridge culvert’	R Leather	G Dissanaike	06/01/2020	Drawings updated	07.01.20
14	398128-MMD-00-XX-DR-S-1002, 398128-MMD-00-XX-DR-S-2002, 398128-MMD-00-XX-DR-S-3002,	Bridges	Colour conventions don’t seem to have been consistently applied. ‘Typical Elevation on Bridge culvert’ seems to be part elevation, part cross section.	R Leather	G Dissanaike	06/01/2020	Drawings updated	07.01.20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
	398128-MMD-00-XX-DR-S-4002, 398128-MMD-00-XX-DR-S-7002, 398128-MMD-00-XX-DR-S-8002, 398128-MMD-00-XX-DR-S-9002,		Need to clarify by applying drawing conventions correctly: We should only hatch elements that are being 'cut' through at the point of the section/elevation marks. We should only use dashed lines on elements that are 'hidden' We should only apply one hatch at any given location (on some drawings we have concrete hatch on top of soil hatch) 'Trim' lines should apply consistently to the whole cross section or be drawn as stepped					
15	General	Highways	Please show track chainage to allow each scheme to be located.	R Leather	N Ward	06/01/2020	Added	07.01.20
16	398128-MMD-00XX-DR-H-0109	Highways	Confirm if hazard H21 needs to be shown on drawing	G Jennings	N Ward	06/01/2020	Action for H21 is closed, so not necessary to show it on the drawing.	07.01.20
17	398128-MMD-00-XX-DR-G-0001	Geotech	Share drawing so revision is P01	G Jennings	R Spence	06/01/2020	Drawing to be shared	21/01/20
18	398128-MMD-00-XX-DR-D SERIES	Drainage	General "Arrangement" spelt wrong in title block	G Jennings	M Jones	06/01/2020	Updated	06/01/20
19	398128-MMD-00XX-DR-D SERIES	Drainage	Add/amend the following items: -OS Mapping disclaimer -DHEMR is doc No. 398128-MMD-00-XX-HS-U-0001	G Jennings	M Jones	06/01/2020	Updated	13/01/20
20	398128-MMD-00-XX-DR-S-1002, 398128-MMD-00-XX-DR-S-2002, 398128-MMD-00-XX-DR-S-3002, 398128-MMD-00-XX-DR-S-4002,	Bridges	Include proposed pile lengths on all drawings.	A Cooper	G Dissanaike	06/01/2020	Drawings updated	07-01-20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
	398128-MMD-00-XX-DR-S-7002 and 398128-MMD-00-XX-DR-S-8002							
21	398128-MMD-00-XX-DR-S-2001, 398128-MMD-00-XX-DR-S-3001, 398128-MMD-00-XX-DR-S-4001, 398128-MMD-00-XX-DR-S-7001 and 398128-MMD-00-XX-DR-S-8001	Bridges	All retaining walls to be replaced with reinforced soil walls.	A Cooper	G Dissanaike	06/01/2020	Drawings updated	07/01/20
22	398128-MMD-00XX-DR-H-01 SERIES	Highways	March Access Strategy – potential for use of road through prison as a Bypass for North South traffic. Potential to affect Scheme 1. Noted in reporting that no provision for changes under March Access Strategy. Note in design report.	K Mobbs J Eagle	N Ward	06/01/2020	Added to Section 10.2	09.01.20
23	398128-MMD-00-XX-DR-S-9001 New chain river bridge	Bridges	Clearance over waterway, assumed to match existing chain river bridge. Opportunity to further tighten this clearance (e.g. by matching existing highway bridge clearance)?	R Leather	G Dissanaike	06/01/2020	Clearance can be tightened once a detailed topo and flood study is carried out	10-01-20
24	398128-MMD-00-XX-DR-S-9001 New chain river bridge	Bridges	How have we determined span? Can this we reduced to save costs on earthworks?	R Leather	G Dissanaike	06/01/2020	Span based on vertical alignment information and allowance of flood risk. Scope to reduce span can be investigated when a detailed	10/1/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
							topo survey and flood study has been done.	
25	398128-MMD-00-XX-DR-S-9001 New Chain River bridge	Bridges	How have we decided on structural form? Opportunity to further minimise depth and reduce clearance?	R Leather	G Dissanaike	06/01/2020	Structural form based on span refer to response in 24	10/01/20
26	398128-MMD-00-XX-DR-TP-000 SERIES Boundaries drawings	Civils	Show full extent of existing byways and national cycle route in land boundaries drawings	N Ward	A Corcoran	06/01/2020	Byways and national cycle route added to drawings	06/01/20
27	398128-MMD-00-XX-DR-H-0501 - P02 A47 highways drawings	Highways	Wisbech Access has an alternative alignment for the A47 diversion. Note that alignment could move. Wisbech Access shows a bridge to the north. Opportunity to develop a scheme to the north of the existing alignment. To be noted as opportunity in reporting.	K Mobbs	N Ward	06/01/2020	Added to Section 10.2	09/01/20
28	398128-MMD-00-XX-DR-H-3 SERIES Utilities diversion drawings	Highways	Existing high-pressure gas main. C3 returns required as basis for utilities diversion costs.	K Mobbs	N Ward	06/01/2020	C3 estimates requested for inclusion in costing.	06/01/20
29	398128-MMD-00XX-DR-H-01 SERIES Highways alignment drawings scheme 1	Highways	Footpath on Elm Road north of Longhill Road to be removed.	K Bagnall	N Ward	06/01/2020	Changed to verge	06/01/20
30	398128-MMD-00-XX-DR-S SERIES	Bridges	Track team to check gauging standards for coordination with bridge clearances	G Jennings	G Jennings	06/01/2020	Min. track clearance should be 1625mm,this has been achieved based	21/01/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
							on the bridges drawings	
31	398128-MMD-00-XX-DR-S SERIES	Bridges	Clarify drainage route for back of wall drainage – weep holes etc… feeding into track drainage?	K Mobbs	G Dissanaike	06/01/2020	Feeding into track drainage refer to track drainage drawings	10/01/20
32	398128-MMD-00-XX-DR-S SERIES	Bridges	L walls retaining parapet. Consider whether heights of the vertical section of these walls can be reduced. Coordinate with Geotech team regarding possible use of reinforced earth. Consider whether both sets of walls are required (i.e. wing walls in 2 perpendicular directions are currently shown).	R Leather	G Dissanaike R Spence	06/01/2020	Drawings updated	07-01-20
33	398128-MMD-00-XX-DR-D SERIES	Drainage	Drainage assumption – ditches need to be separate to existing IDB ditches. Opportunity for efficiency by combining ditches to be highlighted in reporting and investigated at later GRIP stages.	R Leather	M Jones	06/01/2020	Confirmed with IDB, awaiting formal board review 15th Jan.	13/01/20
34	398128-MMD-00-XX-DR-D SERIES	Drainage	Drainage drawings need to be checked against existing utilities for clashes	K Bagnall	K Bagnall	06/01/2020	No combined utilities model at this stage. Added risk to drawings.	16/01/20
35	398128-MMD-00-XX-DR-TP-000 SERIES Boundaries drawings	Civils	Land boundary drawings need to be updated to account for drainage	R Leather	M Jones, N Ward, A Corcoran	06/01/2020	Land boundary drawings updated to incorporate proposed drainage design	06/01/20
36	398128-MMD-00-XX-DR-D SERIES	Drainage	Swales at toe of the embankment – geotechnical stability risk. Desirable to offset. Drainage team to agree offsets required with Geotech. Cross check with environmental.	R Spence	M Jones	06/01/2020	1m offset agreed. No drawing changes.	06/01/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
37	398128-MMD-00-XX-DR-D SERIES	Drainage	Noted that no records have been available to determine depth or existing ditches. Assumed culvert sizes are therefore required for pricing.	R Leather	M Jones	06/01/2020	Provided. Not included on drawing.	14/01/20
38	398128-MMD-00-XX-DR-D SERIES	Drainage	Assumed that abandoned roads will be made permeable. Confirm that this is reasonable on a case by case basis through discussions with highways team.	R Leather	M Jones	06/01/2020	To be confirmed at next stage.	20/01/20
39	398128-MMD-00-XX-DR-D SERIES	Drainage	Risk of linear kerb drain failures. Beany block drains vs alternatives. Confirm what has been assumed for pricing.	K Mobbs	M Jones	06/01/2020	ACO for pricing.	15/01/20
40	398128-MMD-00-XX-DR-G-0001	Geotech	Provide table for embankment improvement works to aid pricing	R Spence	R Spence	06/01/2020	Included	12/12/19
41	398128-MMD-00-XX-DR-G-0001	Geotech	Risk of local peat deposits (which may not work with stone columns). Geo to add as a risk item in reporting.	K Mobbs	R Spence	06/01/2020	Included	12/12/19
42	398128-MMD-00-XX-DR-TP-000 SERIES	Civil	Noted that Wisbech Access project has recently undertaken pricing exercises which used typical rates for local land purchase. K Mobbs to provide rates from Wisbech Access for reference.	R Leather	K Mobbs	06/01/2020	Provided	21/01/20
43	398128-MMD-00-XX-DR-D SERIES	Drainage	In the numbering on the drawings there is no sheet 5 but there is a sheet 11. The numbering in the titles need to be reconfigured	G Jennings	M Jones	06/01/2020	Updated	07/01/20
44	398128-MMD-00-XX-DR-D SERIES	Drainage	Confirm if hazards 55-61 need to be shown on the drawings and if so, updated the drawings and close out in the register	G Jennings	M Jones	06/01/2020	Updated	20/01/20
45	398128-MMD-00-XX-DR-S SERIES	Bridges	Confirm if hazard H66 is to be shown on drawings	G. Jennings	G Dissanaike	06/01/2020	Not applicable as structure is not prestressed.	13/02/20
46	398128-MMD-00-XX-DR-G-0001	Geotech	Confirm if the following hazards need to be added to the drawings: D21, H44, D39, H68, D40, H84, H85	G. Jennings	R Spence	06/01/2020	Relevant hazards have been added to appropriate	12/12/19

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
							disciplines drawings.	

Table 4.2: Interface issues for Through Alignment and Stations IDC

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
1	398128-MMD-00-XX-DR-P-0014	Track	For R165m, hazard triangle should be H14 rather than D08	G. Jennings	G. Jennings	06/01/2020	R165m curve removed	21/01/2020
2	398128-MMD-00-XX-DR-P-0013	Track	Add hazard triangle H81 for buffer stop overrun risk zone	G. Jennings	G. Jennings	06/01/2020	Complete	20/12/2020
3	398128-MMD-00-XX-DR-P SERIES	Track	Add Hazard triangle H86 (buried or overhead services) at the following locations: 138+575 138+650 Clarkes Level Xing 142+500 Sheldruch Level xing 143+500 147+700 Redmoor Lane L Xing 148+900 149+400	G. Jennings	G. Jennings	06/01/2020	Complete	20/12/2020
4	398128-MMD-00-XX-DR-P SERIES	Track	Share drawings so revision is P02	G. Jennings	G. Jennings	06/01/2020	Complete	20/12/2020
5	398128-MMD-00-XX-DR-T-000 SERIES	Telecoms	Confirm if the following hazards need be shown in the drawings: D31, D32, D33, H53	G. Jennings	D Crilly	06/01/2020	Completed D32 shown in drawing	08/01/2020
6	398128-MMD-00-XX-DR-P-0013	Track	93½ MP position is not correct. (may also appear on civils drawings)	D. Crawford	G. Jennings	06/01/2020	Revised on drawing	20/12/2020
7	398128-MMD-00-XX-DR-P-0002	Track	Existing East Junction Points are 35A (not 45A) Consider indicating 35B traps are removed?	D. Crawford	G. Jennings	06/01/2020	Note added	20/12/2020
8	398128-MMD-00-XX-DR-P-0002	Track	On East Curve, 1st Signal to be relocated is ME55 (at 138.530) 2nd relocated Signal 'ME36' at 138.432, with cabinet to south not Commented?	D. Crawford	G. Jennings	06/01/2020	Note for signal ME36 added	20/12/2020

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
9	398128-MMD-00-XX-DR-P-0002	Track	Track through platform 3 has no name. Name on Signalling Sketch is ‘Up Passenger Loop’ Note this name could be amended for different Option	D. Crawford	G. Jennings	06/01/2020	Up Passenger note text added	20/12/2020
10	398128-MMD-00-XX-DR-P SERIES	Track	Track Single Line Diagram with speeds: Shows non-preferred Option 2A.	D. Crawford	G. Jennings	06/01/2020	Changed to 2B	20/12/2020
11	398128-MMD-00-XX-DR-P SERIES	Track	Track single line diagram chainages should be rechecked against the latest bridge positions and given to the nearest metre	D. Crawford	G. Jennings	06/01/2020	Chainages updated	20/12/2020
12	398128-MMD-00-XX-DR-C-0110	Civils	Risk D30 to be added to Waldersea drain underbridge	A. Corcoran	A. Corcoran	06/01/2020	Risk added to drawing	20/12/19
13	398128-MMD-00-XX-DR-C-0109 – 0111	Civils	Risk H67 to be added to cycle route	A. Corcoran	A. Corcoran	06/01/2020	Risk added to drawings	20/12/19
14	398128-MMD-00-XX-DR-C-0107	Civils	Potential to provide access point in both boundaries to access both sides of cess walkway	A. Corcoran	A. Corcoran	06/01/2020	Access provided in both sides at Coldham and Newbridge Lane LC	20/12/19
15	398128-MMD-00-XX-DR-H-1000	Civils / Highways	Platform ramp may need to be widened following comments from ped-modelling team – review impact on car park layout around blue badge bays (TBC with ped-modelling team)	A. Corcoran	A. Corcoran / N. Ward	06/01/2020	Ramp widened and run off area provided based on guidance from ped-modelling team	07/01/2020
16	398128-MMD-00-XX-DR-C-0111	Highways	Kerb line of bridleway at Crooked Bank does not allow through route to access point	A. Corcoran	N. Ward	06/01/2020	Note added to drawing addressing	20/12/19

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
							access in area	
17	398128-MMD-00-XX-DR-C-0109 – 0111	Civils / Drainage	Is it preferred to swap the cycle route / drainage ditch (cycle route to western boundary) – this would still swing in at Waldersea underbridge	A. Corcoran	T. Chung / A. Corcoran	06/01/2020	Cycle route to remain trackside of drain	16/12/19
18	398128-MMD-00-XX-DR-D SERIES	Drainage	Confirm approach to cross drainage ditch to maintain fence	A. Corcoran	T. Chung/ A. Corcoran	06/01/2020	Maintenance via walking area to outside of drainage ditch – approach noted on Civils drawings	20/12/19
19	398128-MMD-00-XX-DR-C-0103 / 0107	Drainage	Drainage ditch to be diverted around proposed cable trough/UTX and REB	A. Corcoran	T. Chung	06/01/2020	Done. Diverted where required	03/01/20
20	398128-MMD-00-XX-DR-D-SERIES	Drainage	Can we locally pipe the drainage ditch at the access points and cycle route access?	A. Corcoran	T. Chung	06/01/2020	Yes. Piped sections shown on drawings. Risk of shallow pipe added to drawings	06/01/20
21	398128-MMD-00-XX-DR-C-0002	Drainage	Platform drainage assumed to tie into existing platform drainage at March – if current drainage falls to track this will no longer be the case, have we got capacity in the track drainage to take the platform drainage?	A. Corcoran	T. Chung	06/01/2020	Spare capacity checked and available in drainage network	10/01/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
22	398128-MMD-00-XX-DR-C SERIES	Telecoms	Confirm if walkway required for SPTs	A. Corcoran	D. Crilly	06/01/2020	To be cared out at the GRIP 4	06/02/2020
23	398128-MMD-00-XX-DR-T-0001	Telecoms	MCH-CAM-018 & 019 restricting passenger flow from footbridge lift, can we relocate closer to LC or towards fence line?	A. Corcoran	D. Crilly	06/01/2020	Updated	08/01/2020
24	398128-MMD-00-XX-DR-T-0001	Telecoms	Risk that MCH-CAM-016 & 017 may be obstructed by existing canopy support column	A. Corcoran	D. Crilly	06/01/2020	No change Cameras view will not be obscured	08/01/202
25	398128-MMD-00-XX-DR-T-0003	Telecoms	WCH-CAM-004 & 005 restricting passenger flow, can we relocate closer to stairs/ramp	A. Corcoran	D. Crilly	06/01/2020	Updated	08/01/2020
26	398128-MMD-00-XX-DR-P-0005 / 0009 / 0011	Track	Earthworks shown into twenty foot river / Waldersea Drain / Redmoor underbridge	A. Corcoran	G. Jennings	06/01/2020	Earthworks removed for bridges	21/01/2020
27	398128-MMD-00-XX-DR-P-0001	Track	Earthworks shown into Platform 4	A. Corcoran	G. Jennings	06/01/2020	Earthworks updated	20/12/19
28	398128-MMD-00-XX-DR-P-0007	Track	Earthworks shown over boundary line into adjacent properties. Do we need to be this close to the eastern boundary at this point?	A. Corcoran	G. Jennings	06/01/2020	Earthworks to be refined at next stage with detailed survey. Covered by item D39 in risk register	21/01/20
29	398128-MMD-00-XX-DR-E-0001	E&P	PSP and DNO at March and Wisbech location to be confirmed	A. Corcoran	T. Granger	06/01/2020	PSP and DNO locations have now been confirmed at both stations.	09/01/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
30	398128-MMD-00-XX-DR-G-0002	Geotech	Can we show project chainage/kilometrage?	A. Corcoran	R. Spence	06/01/2020	Updated.	18/12/19
31	398128-MMD-00-XX-DR-G-0002	Geotech	Width on top of embankment suggests only 700mm	A. Corcoran	R. Spence	06/01/2020	Detail shows worst case where the distance from track edge to embankment crest is reduced. More conservative for pricing.	18/12/19
32	398128-MMD-00-XX-DR-C-0115	Civils	At Wisbech, Speed sign shown at ch 150.335 (it is 150.330 on signalling plan)	D. Crawford	A. Corcoran	06/01/2020	Sign relocated to 150.330	20/12/19
33	398128-MMD-00-XX-DR-C-0115	Civils /Telecoms	At Wisbech station, The Signalling Sketch has a Telephone on the platform for train drivers (position tbc). There does not appear to be one on this Civils drawing.	D. Crawford	A. Corcoran	06/01/2020	Telephone added to low mileage end of platform	20/12/19
34	398128-MMD-00-XX-DR-SK-0002 /0001	Signalling	At Wisbech, Civils drawing -DR-C-0115 has Loc cabinets on platform side at 150.400.	D. Crawford	D. Crawford	06/01/2020	Loc position amended on Sig Sketch	06/01/20
35	398128-MMD-00-XX-DR-SK-0002/ 0001	Signalling	At March, Civils drawing -DR-C-0002 has Loc cabinets on platform side at 138.360.	D. Crawford	D. Crawford	06/01/2020	Loc position amended on Sig Sketch	06/01/20
36	398128-MMD-00-XX-DR-P-0002	Track/Civils	March Platform 3 is shown 55m (+47m future extension) On Civils drawing (-DR-C-0002), and Signalling Sketch, usable platform surface is 109m long.	D. Crawford	G. Jennings	06/01/2020	55m is calculated operational platform length. 109m is the length of platform to	18/12/2019

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
							be renovated and opened up to the public. No change proposed to drawings	
37	398128-MMD-00-XX-DR-C-0002	Civils/ Signalling/ Bridges?	On Signalling Sketch (-DR-SK-0002) an OFF indicator is provided at Ely end of March Platform 3 (exact position TBC). Can this be suspended from the new Footbridge at 138.271? TRTS button (in small cabinet) could be mounted on fence (or short post by fence line) at 138.300.	D. Crawford	A. Corcoran	06/01/2020	OFF indicator located on cantilevered column at ch. 138.295km, as agreed with Signalling and Telecoms	09/01/2020
38	398128-MMD-00-XX-DR-C-0002	Civils/ Telecoms	At March, SPTs for ME302 and ME301 could be placed at platform end fences.	D. Crawford	A. Corcoran	06/01/2020	SPTs placed at either end of platform	20/12/19
39	398128-MMD-00-XX-DR-C-0002	Civils	At March, relocated LOCs 138.232, it would be easier for construction if new LOCs were clear of existing trough route.	D. Crawford	A. Corcoran	06/01/2020	LOC 85/71 relocated, as agreed with Signalling	20/12/19
40	398128-MMD-00-XX-DR-SK-0002/ 0001	Signalling	On March West Curve, E&P (drawing 398128-MMD-00-XX-DR-E-0001) provides FSP at 00/06(W), so LOC should be shown on Signalling Sketch.	D. Crawford	D. Crawford	06/01/2020	Loc shown on Sig Sketch	06/01/20
41	398128-MMD-00-XX-DR-P-0012	Track	Value Engineering Opportunity - could drainage ditch be on inside of curve on approach to Wisbech to save on formation?	T. Chung / C Meade	G. Jennings	06/01/2020	Added to GRIP 3 Report as opportunity	21/01/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
42	Track Drainage presentation	Drainage	Check coordination with other assets at March station, particularly proposed cable trough running alongside existing platform 4	A. Corcoran	T. Chung / C Meade	06/012020	Drainage checked and depth will not to clash with other assets	03/01/20
43	Track Drainage presentation	Drainage	March station – consider allowance for platform drainage falling to track drainage	A. Corcoran	T. Chung / C Meade	06/012020	Spare capacity checked and available in drainage network	10/01/20
44	General	-	Kristian Mobbs to provide indicative land purchase costs for potential input to costings	G. Jennings	K. Mobbs	06/01/2020	Provided	21/02/20
45	Track Drainage presentation	Drainage	Station carparks should be considered Network Rail asset rather than highways	K. Nobbs	T. Chung / C Meade / M. Jones	06/01/2020	Noted	20/01/20
46	398128-MMD-00-XX-DR-P SERIES	Track	Earthworks need to be re-run for latest drainage channel designs as per .pdf mark-ups to get accurate figures	T. Chung / C Meade	G. Jennings	06/01/2020	Updated	21/01/20
47	Track Drainage presentation	Drainage	Do different track options (2A/2B) affect drainage design layout?	T. Granger	T. Chung / C Meade	06/01/2020	Current layout based on 2B option with double track. Option 2A would reduce the drainage requirement	19/12/19
48	398128-MMD-00-XX-DR-C-0109 - 0111	Civils	Cycleway falls within NR boundary, does that lead to issues for cycleway ownership and maintenance? Current assumption is ok but there may a requirement for future land purchase.	K. Mobbs	A. Corcoran	06/01/2020	Current approach retained and maintenance of cycleway outlined as a risk	20/12/19

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
49	398128-MMD-00-XX-DR-T-0001	Telecoms	Car park likely to be controlled by Greater Anglia franchise so needs to be considered in design	K. Mobbs	D. Crilly	06/01/2020	Included	08/01/2020
50	398128-MMD-00-XX-DR-T-0001	Telecoms	Existing pedestrian bridge will be retained so should be considered in telecoms design	G. Jennings	D. Crilly	06/01/2020	Considered and closed	08/01/2020
51	398128-MMD-00-XX-DR-T-0001	Civils/E&P	CCTV will need to be placed on separate columns to lighting. Check for shadowing on lighting columns	D. Crilly	T. Granger / A Corcoran	06/01/2020	Proposed CCTV columns do not cause shadowing clashes with proposed lighting columns	13/01/2020
52	398128-MMD-00-XX-DR-T-0001	Telecoms	CAM 016/017 – may be clash with platform canopy column	A. Corcoran	D. Crilly	06/01/2020	See comment 24 above	08/01/2020
53	398128-MMD-00-XX-DR-T-0001	Telecoms	Any requirement for Driver Only Operation (DOO)?	T. Granger	D. Crilly	06/01/2020	Proposed operational platform is straight	16/12/2019
54	398128-MMD-00-XX-DR-T-0003	Telecoms	Wisbech – coverage for cycle racks and carpark required	G. Jennings	D. Crilly	06/01/2020	Included	08/01/2020
55	398128-MMD-00-XX-DR-T SERIES	Telecoms	Where do feeds from security cameras go to?	T. Granger	D. Crilly	06/01/2020	Separate control centre (TOC)	16/12/2019
56	398128-MMD-00-XX-DR-T SERIES	Telecoms/E&P	Are Ticket vending Machines (TVMs) required?	D. Crilly	R. Leather	06/01/2020	To be captured at GRIP 4 through discussions with the TOC	06/02/2019

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
57	398128-MMD-00-XX-DR-T-0003	Telecoms	Does intermediate cabinet need to be fenced off? Small fence and gate would be preference	A. Corcoran	D. Crilly	06/01/2020	Telecoms cabinet will be fenced off	08/01/2020
58	398128-MMD-00-XX-DR-T-0003	Telecoms / E&P	Wisbech station – put cabinets behind staircase so they can be fenced off.	D. Crilly	D. Crilly / T. Granger / A. Corcoran	06/01/2020	Telecoms cabinet will be fenced off. E&P DNO cabinet to be installed in fenceline so accessible by DNO operator (without needing to open locked gate)	09/01/2020
59	398128-MMD-00-XX-DR-C-0002	Civils / Telecoms	Trough route alongside platform 4. Final location to be confirmed based on coordination with telecoms and drainage	D. Crilly	A. Corcoran	06/01/2020	Trough route agreed	08/01/2020
60	398128-MMD-00-XX-DR-C SERIES	Civils	Has DDA compliance been considered?	K. Mobbs	A. Corcoran	06/01/2020	Yes, all station design DDA compliant – additional consideration given by ped modelling	06/01/20
61	398128-MMD-00-XX-DR-H-1000 and 1001	Civils	How has the number of carparking spaces been determined?	K. Mobbs	A. Corcoran	06/01/2020	Based on demand modelling and station category (E) – full breakdown	06/01/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
							included in report	
62	398128-MMD-00-XX-DR-C-0100	Civils	Infrastructure is in close proximity to the pond to the west of the March East curve. Is there a hazard or design risk that needs to be considered? It was noted that this is not in a flooding zone	G. Jennings	A. Corcoran	06/01/2020	Guard rail provided adjacent to infrastructure to mitigate risk. Hazard triangle also added to highlight retained risk.	20/12/19
63	398128-MMD-00-XX-DR-C-0107	Civils	Clash with REB foundation and drainage channel at Coldham Loop? A piped solution may be required.	C. Meade	A. Corcoran	06/01/2020	REB relocated in agreement with Signalling and E&P	06/01/20
64	398128-MMD-00-XX-DR-C-0107	Civils	Palisade fencing required around REB at Coldham	T. Granger	A. Corcoran	06/01/2020	Palisade fence provided	06/01/20
65	398128-MMD-00-XX-DR-C-0115	Track /Signalling/ Telecoms	The location case (LOC) north of Wisbech station has been relocated in the civil model and needs to be updated in the other drawings	A. Corcoran	G. Jennings / D. Crawford / D. Crilly	06/01/2020	(Sig item 34)	Closed
66	398128-MMD-00-XX-DR-C-0115	Civils	Is there an opportunity to use the scrap yard land to improve carpark design, given that land purchase will be required for the access road anyway	K. Mobbs	A. Corcoran	06/01/2020	Log in report as opportunity	16/12/19
67	398128-MMD-00-XX-DR-H-1001	Civils	March carpark. Is there opportunity to reduce carpark size? There is an Fenland Council masterplan for the station which includes a new carpark (https://www.fenland.gov.uk/media/14799/March-Railway-Station-	K. Mobbs / J Eagle	A. Corcoran	06/01/2020	Log in report as opportunity	16/12/19

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
			Masterplan/pdf/March_Masterplan_adopted_2016.pdf)					
68	398128-MMD-00-XX-DR-G-0002	Geotech	In addition to the cess walkway there is a drainage channel which is located on the opposite side of the track to the cess walkway. Can the drainage channel be readily incorporated into the embankment design?	G. Jennings	Richard Spence / Ayla Cooper / Alan Willoner	06/01/2020	Unique designs for each section will be included in next phase.	18/12/19
69	398128-MMD-00-XX-DR-G-0002	Geotech	How will the toe of the embankment be drained e.g. using the channel detail	G. Jennings	Richard Spence / Ayla Cooper / Alan Willoner	06/01/2020	Filter drains located at the toe of embankment.	23/01/20
70	398128-MMD-00-XX-DR-G-0002	Geotech	Risk that slacker slopes due to ground conditions could lead to extra land purchase	K. Mobbs	Richard Spence / Ayla Cooper / Alan Willoner	06/01/2020	Hazard has been included on drawing.	18/12/19
71	398128-MMD-00-XX-DR-G-0002	Geotech / Drainage	Wisbech station – potential clash with drainage attenuation. Check if there is a risk here and whether further coordination is required	C. Meade	Richard Spence / Ayla Cooper / Alan Willoner	06/01/2020	Attenuation is within proposed car park sub-base.	20/01/20
72	398128-MMD-00-XX-DR-S SERIES	Bridges	Construction sequencing and possession strategy will need to be considered for input to estimating due to bridge being located over operational railway	K. Mobbs	G Dissanaike	06/01/2020	This will be highlighted in BOQ for QS	07/02/20
73	398128-MMD-00-XX-DR-S SERIES	Bridges	Is bridge going to be enclosed?	T. Granger	G Dissanaike	06/01/2020	Yes , framing shown on drawings to support single skin Kalzip 50/333	07-01-20
74	398128-MMD-00-XX-DR-S SERIES	Bridges	Noted that the design appears to provide plenty of options for cable management.	T. Granger	G Dissanaike	06/01/2020	Agreed	06-01-20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
75	398128-MMD-00-XX-DR-E-0001	E&P	Lighting tbc for platform ramp at Wisbech. Needs to be updated	T. Granger	T. Granger	06/01/2020	Proposed LED illuminated handrail specified at this GRIP stage, an option to utilise double outreach brackets also stated but confirmation of arrangement shall be done at GRIP 4.	13/01/2020
76	398128-MMD-00-XX-DR-E-0001	E&P	DNO Supply at Coldham? Has this been confirmed? Could be cost implications	K. Mobbs	T. Granger	06/01/2020	Due to the historic DNO supply at this location, it is understood that a DNO connection shall be feasible and not cost prohibitive to the project; an application for a DNO connection shall be made at GRIP4.	09/01/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
77	398128-MMD-00-XX-SK-SG-0001 and 0002	Signalling	Check that “OFF” sign can be hung from Ped bridge	D. Crawford	D. Crawford	06/01/2020	See item 37.	06/01/20

Table 4.3: Interface issues for Option 4C and Ancillary Drawings IDC

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
1	398128-MMD-00-XX-DR-P-0014	Track	New crossover introduced as part of Option 4C. Can we assume that crossover will work with existing track drainage?	G. Jennings	C. Meade	06/02/2020	Yes, this is a reasonable assumption with the existing catchpit visible from platform 1	02/03/2020
2	398128-MMD-00-XX-DR-D-0010	Drainage	Drawing shows drainage for the alternative road route to link up with Oldfield Lane. Is this deliberate?	G. Jennings.	K. Bagnall	06/02/2020	Yes, this is the preferred road configuration	28/02/2020
3	398128-MMD-00-XX-DR-E-0001	E&P	Drawing doesn't show the additional crossover for 4C. Note this is not critical for this design so doesn't have to be shown	G. Jennings.	T. Granger	06/02/2020	No action taken	28/02/2020
4	398128-MMD-00XX-DR-D-0020	Drainage	How will Platform surfacing and footbridge be drained into car park permeable paving?	A. Corcoran	M. Jones	06/02/2020	Route from platforms to permeable paving TBC following drainage surveys.	02/03/2020
5	398128-MMD-00XX-DR-C-0120 & 0121	Civils	No meterage line shown as meterage ends with track model extents. Meterage called out at specific infrastructure locations. Approach to be agreed.	A. Corcoran	G. Jennings	06/02/2020	Suggested approach is acceptable at this stage	28/02/2020
6	398128-MMD-00XX-DR-C-0120 & 0121	Civils	Exact location of LOCs selected based on signalling drawing and existing infrastructure (estimated from Routeview). Approach and positions to be agreed	A. Corcoran	D. Crawford	06/02/2020	Agreed at IDC	28/02/2020
7	398128-MMD-00-XX-DR-H-0112	Drainage	Has drainage and boundary drawings considered the additional highways detail?	N. Ward	M. Jones / A. Corcoran	06/02/2020	Boundary drawings updated to reflect additional land take	02/03/2020
9	398128-MMD-00-XX-DR-C-0002	Civils	Add next step to Section 12 of report about canopy clearance	G. Jennings.	A. Corcoran	06/02/2020	Text added to report to suggest gauging review is undertaken at following stage.	28/02/2020
10	398128-MMD-00-XX-DR-D-0010	Highways	Check bend at Wisbech station and proximity to watercourse	K. Bagnall	A. Corcoran	06/02/2020	Drawing 398128-MMD-00-XX-DR-H-1000	28/02/2020

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
							highlights tight curvature and need for widening of the highway	
11	398128-MMD-00-XX-DR-D-0010	Highways	Check compatibility of kerbs between drainage and highways for carparks	K. Bagnall	A. Corcoran	06/02/2020	Kerbs shown in car park drawings align with drainage assumptions made	02/03/2020

Table 4.4: Interface issues for Post Survey Findings IDC

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
1	398128-MMD-00-XX-DR-C-0100	Civils	Check interface with proposed retaining wall north of Norwood Rd Overbridge and proposed trackside infrastructure	G. Jennings	A. Corcoran / R. Spence / C. Meade	17/04/2020	Proposed drain invert level allows sufficient depth to pass beneath civil assets. Concrete haunch over the pipe required for protection at location of assets. Retaining wall to be offset 1m from back of walkway and locally pass around any infrastructure bases. Noise barrier to be moved behind proposed retaining wall.	11/05/20
2	398128-MMD-00-XX-DR-C-0100	Civils	Damaged gabion baskets under Norwood Rd overbridge could impact walkway location. Amend risk D43 to state this?	A. Cooper	A. Corcoran	17/04/2020	Hazard D43 in DHEMR updated to capture potential risk from slope failure	15/04/20
3	398128-MMD-00-XX-DR-D-1002	Track Drainage	Update earthworks to show retaining wall	G. Jennings	C. Meade	17/04/2020	Updated	11/05/20
4	398128-MMD-00-XX-DR-G-0003	Geotech	Model retaining wall in 3D for input track to earthworks	G. Jennings	R. Spence	17/04/2020	Retaining wall has been modelled and passed to Track team.	23/04/20
5	398128-MMD-00-XX-SK-S-010x SERIES	Bridges	Chain river bridge – update report for demolish and rebuild of abutment to give conservative build pricing	G. Jennings	L. Luk	17/04/2020	Report updated	11/05/20
6	398128-MMD-00-XX-DR-G-0002	Geotech	Add recommendation to report – resolve ditch, walkway and embankment detail at next design stage	G. Jennings	R. Spence	17/04/2020	Hazard D39 in DHEMR updated to capture	23/04/20

Ref	Document No.	Discipline	Issue	Raised by	Response by	Date Due	Response	Date Closed
			Update risk D39 to state that it impacts existing infrastructure				potential clashes with existing infrastructure.	
7	398128-MMD-00-XX-DR-G-0003	Geotech	Remodel retaining wall for Location cabinets (LOCs) and noise wall	G. Jennings	R. Spence	17/04/2020	Retaining walls remodelled ensuring 300mm spacing between retaining wall and LOCs as agreed with Civils Designer AC.	23/04/20

A. Attendance Registers

Table 4.5: Attendees at Grade Separations IDC

Discipline	Organisation	Name	Title	Signature	Date
Bridges & Civil Structures	Mott MacDonald	Gerry Dissanaike	Bridges lead	[redacted]	9.12.19
Client	Cambridgeshire County Council	Kristian Mobbs	Highways		9.12.19
Client	Cambridgeshire County Council	Jack Eagle	Project Manager		9.12.19
Drainage and Flood Risk	Mott MacDonald	Megan Jones	Drainage Lead		Digitally signed by Megan Jones DN: cn=Megan Jones, c=GB, o=Mott MacDonald, email=megan.jones@mottmac.com Location: Sheffield Date: 2020.03.03 13:02:00
Engineering Management	Mott MacDonald	Gavin Jennings	Contractors Engineering Manager		09-12-19
Quantity Surveying	Mott MacDonald	Stuart Stallwood	Lead Estimator		9/12/19
Geotechnical	Mott MacDonald	Richard Spence / Ayla Cooper	Geotechnical Lead		9/12/19 9/12/19
Highways	Mott MacDonald	Naomi Ward	Highways Lead		09.12.19
Project Management	Mott MacDonald	Robert Leather	Project Manager		9/12/19

Table 4.6: Attendees at Through Alignment and Stations IDC

Discipline	Organisation	Name	Title	Signature	Date
Ancillary Civil/Stations Civil Engineering	Mott MacDonald	Andrew Corcoran	Civils Lead	[redacted]	16/12/19
Bridges & Civil Structures	Mott MacDonald	Gerry Dissanaike	Bridges lead		16/12/19
Client	Cambridgeshire County Council	Kristian Mobbs	Highways		16/12/19
Client	Cambridgeshire County Council	Jack Eagle	Project Manager		16/12/19
Drainage and Flood Risk	Mott MacDonald	Terry Chung / Cleopatra Meade	Drainage Lead		16/12/19
Electrical and Plant	Mott MacDonald	Timothy Granger	E&P Lead		16/12/19
Engineering Management	Mott MacDonald	Gavin Jennings	Contractors Engineering Manager		16-12-19
Quantity Surveying	Mott MacDonald	Melvyn Jones	Lead Estimator		16/12/19
Geotechnical	Mott MacDonald	Richard Spence / Ayla Cooper / Alan Willoner	Geotechnical Lead		16-12-19
Highways	Mott MacDonald	Naomi Ward	Highways Lead	[did not attend]	
Signalling	Mott MacDonald	Douglas Crawford	Signalling Lead	[redacted]	16-12-19
Telecommunications	Mott MacDonald	David Crilly / Kokob Kidane	Telecommunications Lead		16/12/19
Track	Mott MacDonald	Gavin Jennings	Principal Permanent Way Engineer		16-12-19

Table 4.7: Attendees at Option 4C and Ancillary Drawings IDC

Discipline	Organisation	Name	Title	Signature
Ancillary Civil/Stations Civil Engineering	Mott MacDonald	Andrew Corcoran	Civils Lead	[redacted]
Bridges & Civil Structures	Mott MacDonald	Gerry Dissanaike	Bridges lead	[redacted]
Drainage and Flood Risk	Mott MacDonald	Cleopatra Meade	Drainage Lead	[redacted]
Drainage and Flood Risk	Mott MacDonald	Kirk Bagnall	Drainage Lead	[redacted]
Drainage and Flood Risk	Mott MacDonald	Megan Jones	Drainage Lead	[redacted]
Electrical and Plant	Mott MacDonald	Timothy Granger	E&P Lead	[redacted]
Engineering Management	Mott MacDonald	Gavin Jennings	Contractors Engineering Manag	[redacted]
Highways	Mott MacDonald	Naomi Ward	Highways Lead	[redacted]
Signalling	Mott MacDonald	Douglas Crawford	Signalling Lead	[redacted]
Signalling	Mott MacDonald	Lawrence Kent	Signalling Lead	[redacted]
Telecommunications	Mott MacDonald	David Crilly	Telecommunication Lead	[redacted]
Telecommunications	Mott MacDonald	Kokob Kidane	Telecommunication	[redacted]
Track	Mott MacDonald	Gavin Jennings	Principal Permanen Way Engineer	[redacted]

Table 4.8: Attendees at Post Survey Findings IDC

Discipline	Organisation	Name	Title	Signature
Ancillary Civil/Stations Civil Engineering	Mott MacDonald	Andrew Corcoran	Civils Lead	[redacted]
Bridges & Civil Structures	Mott MacDonald	Lance Luk	Bridges lead	[redacted]
Drainage and Flood Risk	Mott MacDonald	Cleopatra Meade	Drainage Lead	[redacted]
Electrical and Plant	Mott MacDonald	Timothy Granger	E&P Lead	[redacted]
Engineering Management	Mott MacDonald	Gavin Jennings	Contractors Engineering Manager	[redacted]
Geotechnical	Mott MacDonald	Richard Spence / Ayla Cooper	Geotechnical Lead	[redacted]
Signalling	Mott MacDonald	Douglas Crawford	Signalling Lead	[redacted]
Telecommunications	Mott MacDonald	Kokob Kidane	Telecommunications	[redacted]
Track	Mott MacDonald	Gavin Jennings	Principal Permanent Way Engineer	[redacted]

E. Not Used

F. Calculations

F.1 Track

Site / Job	398128 - March to Wisbech Transport Corridor	Line	Down Main
Stage	GRIP 3 Design		

Des. Ref.		Rev	1	Designer	M. Karpinski	Checker	M. Zygmunt
Calc Ref.		Rev		Designer		Checker	

Approver: C. Mannion
Approver:

Mott MacDonald
Elements version 5.01

		Precision	2 dp			Enforce Reg. L=2 x speed?	Yes				
Gravity (G)	9.80665 m/s/s	Ruleset	NR			Enforce TL=2 x speed?	No	Gauge	1432 mm		
Start metreage	138665.8 m	VT Length	12.2 m	User VT Length	6 m	Enforce cant limit on low R?	Yes	Rail Head Width	70 mm		
Speed Units	mph	Min R	125 m	Negative Cant Limit	80 mm	Enforce max Def on low R?	No	Rail Centres	1502 mm	Cant Constant	11.82

Element No.	Geom Type	V mph	Bearing /Radius Δdeg or m	L m	Metreage Rising m	Rev. Total m	T. Len. if Rev. m	Track Type	Track Type	Normal Limits E mm	Normal Limits D mm	Normal Limits RgE mm/s	Normal Limits CG Min 1 in	Normal Limits CG Max 1 in	Normal Limits RgD mm/s	Exceptional Limits E mm	Exceptional Limits D mm	Exceptional Limits RgE mm/s	Exceptional Limits CG Min 1 in	Exceptional Limits CG Max 1 in	Exceptional Limits RgD mm/s	Speed Conversions kph	Speed Conversions m/s	Ind E. Trans m	Calculations E+D mm	E mm	D mm	ΔE mm	ΔD mm	RgE mm	Cant Grad 1 in	RgD mm	Ve mph	Curve Diagram	Text for CAD (Take care - don't delete the formulas) No.	Text A	Text B	D score Widget 1925.0
1	Str.	60	0	172.3	138665.84			CWR		150	110					180	150					96.6	26.82		0	0	0						0		1	Str. L = 172.274m		0.0
2	Trans	60		40	138838.11				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	40				50	51.54	33.53	800	34.56			2	Trans L = 40m. RoCE = 33.53mm/s CG = 1 in 800, RoCD = 34.56mm/s		0.0
3	Cve.	60	1085	162.3	138878.11	0		CWR		150	110					180	150					96.6	26.82		101.54	50	51.54						42		3	R= 1085m L = 162.25m E = 50mm D = 51.54mm	Vm = 42mph	8362.4
4	Trans	60		30	139040.36				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	30				0	18.08	0	INF	16.16			4	Trans L = 30m. RoCE = 0mm/s, RoCD = 16.16mm/s		0.0
5	Cve.	60	1320	262.8	139070.36	0		CWR		150	110					180	150					96.6	26.82		83.46	50	33.46						46		5	R= 1320m L = 262.8m E = 50mm D = 33.46mm	Ve = 46mph	8793.3
6	Trans	60		40	139333.16				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	40				50	33.46	33.53	800	22.43			6	Trans L = 40m. RoCE = 33.53mm/s CG = 1 in 800, RoCD = 22.43mm/s		0.0
7	Rev.	60	0	0	139373.16	0	Rev	CWR		150	110					180	150					96.6	26.82		0	0	0						0	*	7	Rev. L = 0m E = 0mm D = 0mm		0.0
8	Trans	60		40	139373.16				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	40				45	31.93	30.17	889	21.41			8	Trans L = 40m. RoCE = 30.17mm/s CG = 1 in 889, RoCD = 21.41mm/s		0.0
9	Cve.	60	-1432	59.62	139413.16	0		CWR		150	110					180	150					96.6	26.82		-76.93	-45	-31.93						45		9	R= 1432m L = 59.62m E = 45mm D = 31.93mm	Ve = 45mph	1903.7
10	Trans	60		30	139472.78				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	30				0	12.75	0	INF	11.4			10	Trans L = 30m. RoCE = 0mm/s, RoCD = 11.4mm/s		0.0
11	Cve.	60	-1228.5	196.2	139502.78	0		CWR		150	110					180	150					96.6	26.82		-89.68	-45	-44.68						42		11	R= 1228.5m L = 196.22m E = 45mm D = 44.68mm	Ve = 42mph	8767.1
12	Trans	60		40	139699				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	40				45	44.68	30.17	889	29.96			12	Trans L = 40m. RoCE = 30.17mm/s CG = 1 in 889, RoCD = 29.96mm/s		0.0
13	Str.	60	0	3805	139739	0		CWR		150	110					180	150					96.6	26.82		0	0	0						0		13	Str. L = 3805.2m		0.0
14	Trans	60		40	143544.2				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	40				0	36.72	0	INF	24.62			14	Trans L = 40m. RoCE = 0mm/s, RoCD = 24.62mm/s		0.0
15	Cve.	60	3000	177.1	143584.2	0		CWR		150	110					180	150					96.6	26.82		36.72	0	36.72						NEG		15	R= 3000m L = 177.132m E = 0mm D = 36.72mm		6504.3
16	Trans	60		40	143761.34				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	40				0	36.72	0	INF	24.62			16	Trans L = 40m. RoCE = 0mm/s, RoCD = 24.62mm/s		0.0
17	Str.	60	0	5721	143801.34	0		CWR		150	110					180	150					96.6	26.82		0	0	0						0		17	Str. L = 5720.992m		0.0
18	VT	60		12.2	149522.33				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	12.2				0	5.51	0	INF	12.11			18	VT RoCD = 12.11mm/s		0.0
19	Cve.	60	20000	70.32	149522.33	0		CWR		150	110					180	150					96.6	26.82		5.51	0	5.51						NEG		19	R= 20000m L = 70.319m E = 0mm D = 5.51mm		387.5
20	VT	60		12.2	149592.65				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	12.2				0	5.51	0	INF	12.11			20	VT RoCD = 12.11mm/s		0.0
21	Str.	60	0	271.1	149592.65	0		CWR		150	110					180	150					96.6	26.82		0	0	0						0		21	Str. L = 271.1m		0.0
22	Trans	60		35	149863.75				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	35				35	39.69	26.82	1000	30.41			22	Trans L = 35m. RoCE = 26.82mm/s CG = 1 in 1000, RoCD = 30.41mm/s		0.0
23	Cve.	60	1475	53.7	149898.75	0		CWR		150	110					180	150					96.6	26.82		74.69	35	39.69						41		23	R= 1475m L = 53.7m E = 35mm D = 39.69mm	Ve = 41mph	2131.4
24	Trans	60		35	149952.45				PS PL			35	400	1500	35			55	400	2500	55	96.6	26.82	35				35	39.69	26.82	1000	30.41			24	Trans L = 35m. RoCE = 26.82mm/s CG = 1 in 1000, RoCD = 30.41mm/s		0.0
25	Str.	45	0	46.36	149987.45	0		CWR		150	110					180	150					72.4	20.12		0	0	0						0		25	Str. L = 46.361m		0.0
26	Trans	45		40	150033.81				PS PL			35	400	1500	35			55	400	2500	55	72.4	20.12	40				0	62	0	INF	31.19			26	Trans L = 40m. RoCE = 0mm/s, RoCD = 31.19mm/s		0.0
27	Cve.	45	1000	111.1	150073.81	0		CWR		150	110					180	150					72.4	20.12		62	0	62						NEG		27	R= 1000m L = 111.088m E = 0mm D = 62mm		6887.5
28	Trans	30		30	150184.9				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	30				0	2.81	0	INF	1.26			28	Trans L = 30m. RoCE = 0mm/s, RoCD = 1.26mm/s		0.0
29	Cve.	30	425	43	150214.9	0		CWR		150	110					180	150					48.3	13.41		64.81	0	64.81						NEG		29	R= 425m L = 42.997m E = 0mm D = 64.81mm		2786.6
30	Trans	30		30	150257.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	30				0	64.81	0	INF	28.97			30	Trans L = 30m. RoCE = 0mm/s, RoCD = 28.97mm/s		0.0
31	Str.	30		122	150287.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		31	Str. L = 122m		0.0
32	ICOB	30	0,0,0	0	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	0				0	0	0	INF	0			32	Inst. Change of Bearing (0º 0' 0") RoCD = 0mm/s		0.0
33	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		33	Str. L = 0m		0.0
34	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			34	VT RoCD = 0mm/s		0.0
35	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		35	Str. L = 0m		0.0
36	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			36	VT RoCD = 0mm/s		0.0
37	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		37	Str. L = 0m		0.0
38	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			38	VT RoCD = 0mm/s		0.0
39	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		39	Str. L = 0m		0.0
40	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			40	VT RoCD = 0mm/s		0.0
41	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		41	Str. L = 0m		0.0
42	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			42	VT RoCD = 0mm/s		0.0
43	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		43	Str. L = 0m		0.0
44	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			44	VT RoCD = 0mm/s		0.0
45	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		45	Str. L = 0m		0.0
46	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			46	VT RoCD = 0mm/s		0.0
47	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		47	Str. L = 0m		0.0
48	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			48	VT RoCD = 0mm/s		0.0
49	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		49	Str. L = 0m		0.0
50	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			50	VT RoCD = 0mm/s		0.0
51	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		51	Str. L = 0m		0.0
52	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			52	VT RoCD = 0mm/s		0.0
53	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		53	Str. L = 0m		0.0
54	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			54	VT RoCD = 0mm/s		0.0
55	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		55	Str. L = 0m		0.0
56	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			56	VT RoCD = 0mm/s		0.0
57	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		57	Str. L = 0m		0.0
58	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			58	VT RoCD = 0mm/s		0.0
59	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		59	Str. L = 0m		0.0
60	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			60	VT RoCD = 0mm/s		0.0
61	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		61	Str. L = 0m		0.0
62	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			62	VT RoCD = 0mm/s		0.0
63	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		63	Str. L = 0m		0.0
64	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			64	VT RoCD = 0mm/s		0.0
65	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		65	Str. L = 0m		0.0
66	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			66	VT RoCD = 0mm/s		0.0
67	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		67	Str. L = 0m		0.0
68	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			68	VT RoCD = 0mm/s		0.0
69	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		69	Str. L = 0m		0.0
70	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			70	VT RoCD = 0mm/s		0.0
71	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		71	Str. L = 0m		0.0
72	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			72	VT RoCD = 0mm/s		0.0
73	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		73	Str. L = 0m		0.0
74	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			74	VT RoCD = 0mm/s		0.0
75	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		75	Str. L = 0m		0.0
76	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			76	VT RoCD = 0mm/s		0.0
77	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		77	Str. L = 0m		0.0
78	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			78	VT RoCD = 0mm/s		0.0
79	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		79	Str. L = 0m		0.0
80	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			80	VT RoCD = 0mm/s		0.0
81	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		81	Str. L = 0m		0.0
82	VT	30		12.2	150409.89				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2				0	0	0	INF	0			82	VT RoCD = 0mm/s		0.0
83	Str.	30	0	0	150409.89	0		CWR		150	110					180	150					48.3	13.41		0	0	0						0		83	Str. L = 0m		0.0

Mott MacDonald

Elements version 5.01

Site / Job	398128 - March to Wisbech Transport Corridor	Line	Up Main
Stage	GRIP 3 Design		
Des. Ref.		Rev	1
Calc Ref.		Rev	

Designer	M.Urban	Checker	M. Zygmunt	Approver	C. Mannion
Designer		Checker		Approver	

Gravity (G)	9.80665 m/s/s	Precision	2 dp	Enforce Reg. L=2 x speed?	Yes
Start metreage	138086.8 m	Ruleset	NR	Enforce TL=2 x speed?	No
Speed Units	mph	VT Length	12.2 m	Enforce cant limit on low R?	Yes
		Min R	125 m	Enforce max Def on low R?	No
		User VT Length	6 m	Negative Cant Limit	80 mm

Gauge	1432 mm
Rail Head Width	70 mm
Rail Centres	1502 mm
Cant Constant	11.82

Text for CAD: *Take care - don't delete the formulas*

No.	Geom Type	V mph	Bearing /Radius Δdeg or m	L m	Metreage Rising m	Rev. Total m	T. Len. if Rev. m	Track Type	Normal Limits E mm	Normal Limits D mm	Normal Limits RgE mm/s	Normal Limits CG Min 1 in	Normal Limits CG Max 1 in	Normal Limits RgD mm/s	Exceptional Limits E mm	Exceptional Limits D mm	Exceptional Limits RgE mm/s	Exceptional Limits CG Min 1 in	Exceptional Limits CG Max 1 in	Exceptional Limits RgD mm/s	Speed Conversions kph	Speed Conversions m/s	Ind E. Trans m	Calculations E+D mm	E mm	D mm	ΔE mm	ΔD mm	RgE mm	Cant Grad 1 in	RgD mm	Ve mph	Curve Diagram	No.	Text A	Text B	D score Widget 995.2
1	Str.	20	0	0	138086.76			CWR	150	110					180	150					32.2	8.94		0	0	0						0		1	Str. L = 0m		0.0
2	VT	20		12.2	138086.76			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	49.95	0	INF	36.6		)	2	VT RoCD = 36.6mm/s		0.0
3	Cve.	20	245.05	26.5	138086.76	0		CWR	150	110					180	150					32.2	8.94		49.95	0	49.95						NEG	(	3	R= 245.05m L = 26.5m E = 0mm D = 49.95mm		1323.7
4	VT	20		12.2	138113.26			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	22.75	0	INF	16.67		>	4	VT RoCD = 16.67mm/s		0.0
5	Cve.	20	450	38.61	138113.26	0		CWR	150	110					180	150					32.2	8.94		27.2	0	27.2						NEG	(	5	R= 450m L = 38.61m E = 0mm D = 27.2mm		1050.2
6	Trans	20		25	138151.87			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	25	© Mott MacDonald 2015			0	27.2	0	INF	9.73		)	6	Trans L = 25m. RoCE = 0mm/s, RoCD = 9.73mm/s		0.0
7	Rev.	20		0	138176.87	0	Rev	CWR	150	110					180	150					32.2	8.94		0	0	0						0	*	7	Rev. L = 0m E = 0mm D = 0mm		0.0
8	Trans	20		35	138176.87			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	35	© Mott MacDonald 2015			0	54.16	0	INF	13.83		(	8	Trans L = 35m. RoCE = 0mm/s, RoCD = 13.83mm/s		0.0
9	Cve.	20	-226	30.11	138211.87	0		CWR	150	110					180	150					32.2	8.94		-54.16	0	-54.16						NEG	)	9	R= 226m L = 30.11m E = 0mm D = 54.16mm		1630.8
10	VT	20		12.2	138241.98			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	41.92	0	INF	30.72		<	10	VT RoCD = 30.72mm/s		0.0
11	Cve.	20	-1000	72.12	138241.98	0		CWR	150	110					180	150					32.2	8.94		-12.24	0	-12.24						NEG	)	11	R= 1000m L = 72.12m E = 0mm D = 12.24mm		882.7
12	VT	20		12.2	138314.1			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	12.24	0	INF	8.97		(	12	VT RoCD = 8.97mm/s		0.0
13	Str.	20	0	54.1	138314.1	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		13	Str. L = 54.1m		0.0
14	Trans	20		25	138368.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	25	© Mott MacDonald 2015			0	79.31	0	INF	28.36		)	14	Trans L = 25m. RoCE = 0mm/s, RoCD = 28.36mm/s		0.0
15	Cve.	20	154.34	98.02	138393.2	0		CWR	150	110					180	150					32.2	8.94		79.31	0	79.31						NEG	(	15	R= 154.34m L = 98.02m E = 0mm D = 79.31mm		7774.0
16	VT	20		12.2	138491.22			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0.59	0	INF	0.43		>	16	VT RoCD = 0.43mm/s		0.0
17	Cve.	20	153.21	52.98	138491.22	0		CWR	150	110					180	150					32.2	8.94		79.9	0	79.9						NEG	(	17	R= 153.21m L = 52.98m E = 0mm D = 79.9mm		4233.1
18	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	19	0	INF	13.92		>	18	VT RoCD = 13.92mm/s		0.0
19	Cve.	20	201	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		60.9	0	60.9						NEG	(	19	R= 201m L = 0m E = 0mm D = 60.9mm		0.0
20	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	4.91	0	INF	3.6		>	20	VT RoCD = 3.6mm/s		0.0
21	Cve.	20	186	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		65.81	0	65.81						NEG	(	21	R= 186m L = 0m E = 0mm D = 65.81mm		0.0
22	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	65.81	0	INF	48.22		)	22	VT RoCD = 48.22mm/s		0.0
23	Str.	20	0		138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		23	Str. L = m		0.0
24	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			24	VT RoCD = 0mm/s		0.0
25	Str.	20			138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		25	Str. L = m		0.0
26	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			26	VT RoCD = 0mm/s		0.0
27	Str.	20	0		138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		27	Str. L = m		0.0
28	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			28	VT RoCD = 0mm/s		0.0
29	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		29	Str. L = 0m		0.0
30	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			30	VT RoCD = 0mm/s		0.0
31	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		31	Str. L = 0m		0.0
32	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			32	VT RoCD = 0mm/s		0.0
33	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		33	Str. L = 0m		0.0
34	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			34	VT RoCD = 0mm/s		0.0
35	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		35	Str. L = 0m		0.0
36	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			36	VT RoCD = 0mm/s		0.0
37	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		37	Str. L = 0m		0.0
38	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			38	VT RoCD = 0mm/s		0.0
39	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		39	Str. L = 0m		0.0
40	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			40	VT RoCD = 0mm/s		0.0
41	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		41	Str. L = 0m		0.0
42	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			42	VT RoCD = 0mm/s		0.0
43	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		43	Str. L = 0m		0.0
44	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			44	VT RoCD = 0mm/s		0.0
45	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		45	Str. L = 0m		0.0
46	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			46	VT RoCD = 0mm/s		0.0
47	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		47	Str. L = 0m		0.0
48	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			48	VT RoCD = 0mm/s		0.0
49	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		49	Str. L = 0m		0.0
50	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			50	VT RoCD = 0mm/s		0.0
51	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		51	Str. L = 0m		0.0
52	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			52	VT RoCD = 0mm/s		0.0
53	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		53	Str. L = 0m		0.0
54	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			54	VT RoCD = 0mm/s		0.0
55	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		55	Str. L = 0m		0.0
56	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			56	VT RoCD = 0mm/s		0.0
57	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		57	Str. L = 0m		0.0
58	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			58	VT RoCD = 0mm/s		0.0
59	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		59	Str. L = 0m		0.0
60	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			60	VT RoCD = 0mm/s		0.0
61	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		61	Str. L = 0m		0.0
62	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			62	VT RoCD = 0mm/s		0.0
63	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		63	Str. L = 0m		0.0
64	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			64	VT RoCD = 0mm/s		0.0
65	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		65	Str. L = 0m		0.0
66	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			66	VT RoCD = 0mm/s		0.0
67	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		67	Str. L = 0m		0.0
68	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			68	VT RoCD = 0mm/s		0.0
69	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		69	Str. L = 0m		0.0
70	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			70	VT RoCD = 0mm/s		0.0
71	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		71	Str. L = 0m		0.0
72	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			72	VT RoCD = 0mm/s		0.0
73	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		73	Str. L = 0m		0.0
74	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			74	VT RoCD = 0mm/s		0.0
75	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		75	Str. L = 0m		0.0
76	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			76	VT RoCD = 0mm/s		0.0
77	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		77	Str. L = 0m		0.0
78	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			78	VT RoCD = 0mm/s		0.0
79	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		79	Str. L = 0m		0.0
80	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			80	VT RoCD = 0mm/s		0.0
81	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		81	Str. L = 0m		0.0
82	VT	20		12.2	138544.2			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2	© Mott MacDonald 2015			0	0	0	INF	0			82	VT RoCD = 0mm/s		0.0
83	Str.	20	0	0	138544.2	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0		83	Str. L = 0m		0.0

Mott MacDonald	Site / Job	398128 - March to Wisbech Transport Corridor				Line	Up Main
	Stage	GRIP 3 Design					
	Des. Ref.		Rev	1	Designer M.Urban	Checker M. Zygmunt	Approver C. Mannion
	Calc Ref.		Rev		Designer	Checker	Approver

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Elements version 5.01

		Precision	2 dp	Enforce Reg. L=2 x speed?	Yes
Gravity (G)	9.80665 m/s/s	Ruleset	NR	Enforce TL=2 x speed?	No
Start metreage	138086.8 m	VT Length	12.2 m	User VT Length 6 m	Enforce cant limit on low R? Yes
Speed Units	mph	Min R	125 m	Negative Cant Limit 80 mm	Enforce max Def on low R? No

Gauge	1432 mm
Rail Head Width	70 mm
Rail Centres	1502 mm
Cant Constant	11.82

No.	Geom Type	V mph	Bearing /Radius ∆deg or m	L m	Element Metreage Rising m	Rev. Total m	T. Len. if Rev. m	Track Type		Normal Limits E mm	D mm	RgE mm/s	CG Min 1 in	CG Max 1 in	RgD mm/s	Exceptional Limits E mm	D mm	RgE mm/s	CG Min 1 in	CG Max 1 in	RgD mm/s	Speed Conversions kph	m/s	Ind E. Trans m
1	Str.	20	0	0	138086.76			CWR		150	110					180	150					32.2	8.94	
2	VT	20		12.2	138086.76				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
3	Cve.	20	245.05	26.5	138086.76	0		CWR		150	110					180	150					32.2	8.94	
4	VT	20		12.2	138113.26				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
5	Cve.	20	450	36.21	138113.26	0		CWR		150	110					180	150					32.2	8.94	
6	Trans	20		25	138149.47				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	25
7	Rev.	20		0	138174.47	0	Rev	CWR		150	110					180	150					32.2	8.94	
8	Trans	20		35	138174.47				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	35
9	Cve.	20	-226	31.11	138209.47	0		CWR		150	110					180	150					32.2	8.94	
10	VT	20		12.2	138240.58				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
11	Cve.	20	-1000	72.12	138240.58	0		CWR		150	110					180	150					32.2	8.94	
12	VT	20		12.2	138312.7				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
13	Str.	20	0	55.3	138312.7	0		CWR		150	110					180	150					32.2	8.94	
14	Trans	20		25	138368				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	25
15	Cve.	20	150	169	138393	0		CWR		150	110					180	150					32.2	8.94	
16	VT	20		12.2	138562.01				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
17	Cve.	20	172.5	30	138562.01	0		CWR		150	110					180	150					32.2	8.94	
18	Trans	20		25	138592.01				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	25
19	Str.	20	0	30	138617.01	0		CWR		150	110					180	150					32.2	8.94	
20	VT	20		12.2	138647.01				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
21	Cve.	20	-300	22.3	138647.01	0		CWR		150	110					180	150					32.2	8.94	
22	VT	20		12.2	138669.31				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
23	Str.	20	0	17.35	138669.31	0		CWR		150	110					180	150					32.2	8.94	
24	Trans	20		12.98	138686.66				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.98
25	Cve.	20	-245.05	12.35	138699.64	0		CWR		150	110					180	150					32.2	8.94	
26	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
27	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
28	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
29	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
30	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
31	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
32	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
33	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
34	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
35	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
36	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
37	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
38	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
39	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
40	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
41	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
42	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
43	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
44	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
45	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
46	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
47	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
48	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
49	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
50	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
51	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
52	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
53	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
54	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
55	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
56	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
57	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
58	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
59	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
60	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
61	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
62	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
63	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
64	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
65	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
66	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
67	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
68	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
69	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
70	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
71	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
72	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
73	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
74	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
75	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
76	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
77	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
78	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
79	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
80	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
81	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	
82	VT	20		12.2	138711.99				PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
83	Str.	20	0	0	138711.99	0		CWR		150	110					180	150					32.2	8.94	

No.	Calculations E+D mm	E mm	D mm	ΔE mm	ΔD mm	RgE mm	Cant Grad 1 in	RgD mm	Ve mph	Text for CAD (Take care - don't delete the formulas) No.	Text A	Text B	D score Widget 1547.3
1	0	0	0						0	1	Str. L = 0m		0.0
2				0	49.95	0	INF	36.6		2	VT RoCD = 36.6mm/s		0.0
3	49.95	0	49.95						NEG	3	R= 245.05m L = 26.5m E = 0mm D = 49.95mm		1323.7
4				0	22.75	0	INF	16.67		4	VT RoCD = 16.67mm/s		0.0
5	27.2	0	27.2						NEG	5	R= 450m L = 36.21m E = 0mm D = 27.2mm		984.9
6				0	27.2	0	INF	9.73		6	Trans L = 25m. RoCE = 0mm/s, RoCD = 9.73mm/s		0.0
7	0	0	0						0	7	Rev. L = 0m E = 0mm D = 0mm		0.0
8				0	54.16	0	INF	13.83		8	Trans L = 35m. RoCE = 0mm/s, RoCD = 13.83mm/s		0.0
9	-54.16	0	-54.16						NEG	9	R= 226m L = 31.11m E = 0mm D = 54.16mm		1684.9
10				0	41.92	0	INF	30.72		10	VT RoCD = 30.72mm/s		0.0
11	-12.24	0	-12.24						NEG	11	R= 1000m L = 72.12m E = 0mm D = 12.24mm		882.7
12				0	12.24	0	INF	8.97		12	VT RoCD = 8.97mm/s		0.0
13	0	0	0						0	13	Str. L = 55.3m		0.0
14				0	81.61	0	INF	29.18		14	Trans L = 25m. RoCE = 0mm/s, RoCD = 29.18mm/s		0.0
15	81.61	0	81.61						NEG	15	R= 150m L = 169.01m E = 0mm D = 81.61mm		13792.9
16				0	10.65	0	INF	7.8		16	VT RoCD = 7.8mm/s		0.0
17	70.96	0	70.96						NEG	17	R= 172.5m L = 30m E = 0mm D = 70.96mm		2128.8
18				0	70.96	0	INF	25.38		18	Trans L = 25m. RoCE = 0mm/s, RoCD = 25.38mm/s		0.0
19	0	0	0						0	19	Str. L = 30m		0.0
20				0	40.8	0	INF	29.9		20	VT RoCD = 29.9mm/s		0.0
21	-40.8	0	-40.8						NEG	21	R= 300m L = 22.3m E = 0mm D = 40.8mm		909.8
22				0	40.8	0	INF	29.9		22	VT RoCD = 29.9mm/s		0.0
23	0	0	0						0	23	Str. L = 17.35m		0.0
24				0	49.95	0	INF	34.4		24	Trans L = 12.98m. RoCE = 0mm/s, RoCD = 34.4mm/s		0.0
25	-49.95	0	-49.95						NEG	25	R= 245.05m L = 12.35m E = 0mm D = 49.95mm		616.9
26				0	49.95	0	INF	36.6		26	VT RoCD = 36.6mm/s		0.0
27	0	0	0						0	27	Str. L = 0m		0.0
28				0	0	0	INF	0		28	VT RoCD = 0mm/s		0.0
29	0	0	0						0	29	Str. L = 0m		0.0
30				0	0	0	INF	0		30	VT RoCD = 0mm/s		0.0
31	0	0	0						0	31	Str. L = 0m		0.0
32				0	0	0	INF	0		32	VT RoCD = 0mm/s		0.0
33	0	0	0						0	33	Str. L = 0m		0.0
34				0	0	0	INF	0		34	VT RoCD = 0mm/s		0.0
35	0	0	0						0	35	Str. L = 0m		0.0
36				0	0	0	INF	0		36	VT RoCD = 0mm/s		0.0
37	0	0	0						0	37	Str. L = 0m		0.0
38				0	0	0	INF	0		38	VT RoCD = 0mm/s		0.0
39	0	0	0						0	39	Str. L = 0m		0.0
40				0	0	0	INF	0		40	VT RoCD = 0mm/s		0.0
41	0	0	0						0	41	Str. L = 0m		0.0
42				0	0	0	INF	0		42	VT RoCD = 0mm/s		0.0
43	0	0	0						0	43	Str. L = 0m		0.0
44				0	0	0	INF	0		44	VT RoCD = 0mm/s		0.0
45	0	0	0						0	45	Str. L = 0m		0.0
46				0	0	0	INF	0		46	VT RoCD = 0mm/s		0.0
47	0	0	0						0	47	Str. L = 0m		0.0
48				0	0	0	INF	0		48	VT RoCD = 0mm/s		0.0
49	0	0	0						0	49	Str. L = 0m		0.0
50				0	0	0	INF	0		50	VT RoCD = 0mm/s		0.0
51	0	0	0						0	51	Str. L = 0m		0.0
52				0	0	0	INF	0		52	VT RoCD = 0mm/s		0.0
53	0	0	0						0	53	Str. L = 0m		0.0
54				0	0	0	INF	0		54	VT RoCD = 0mm/s		0.0
55	0	0	0						0	55	Str. L = 0m		0.0
56				0	0	0	INF	0		56	VT RoCD = 0mm/s		0.0
57	0	0	0						0	57	Str. L = 0m		0.0
58				0	0	0	INF	0		58	VT RoCD = 0mm/s		0.0
59	0	0	0						0	59	Str. L = 0m		0.0
60				0	0	0	INF	0		60	VT RoCD = 0mm/s		0.0
61	0	0	0						0	61	Str. L = 0m		0.0
62				0	0	0	INF	0		62	VT RoCD = 0mm/s		0.0
63	0	0	0						0	63	Str. L = 0m		0.0
64				0	0	0	INF	0		64	VT RoCD = 0mm/s		0.0
65	0	0	0						0	65	Str. L = 0m		0.0
66				0	0	0	INF	0		66	VT RoCD = 0mm/s		0.0
67	0	0	0						0	67	Str. L = 0m		0.0
68				0	0	0	INF	0		68	VT RoCD = 0mm/s		0.0
69	0	0	0						0	69	Str. L = 0m		0.0
70				0	0	0	INF	0		70	VT RoCD = 0mm/s		0.0
71	0	0	0						0	71	Str. L = 0m		0.0
72				0	0	0	INF	0		72	VT RoCD = 0mm/s		0.0
73	0	0	0						0	73	Str. L = 0m		0.0
74				0	0	0	INF	0		74	VT RoCD = 0mm/s		0.0
75	0	0	0						0	75	Str. L = 0m		0.0
76				0	0	0	INF	0		76	VT RoCD = 0mm/s		0.0
77	0	0	0						0	77	Str. L = 0m		0.0
78				0	0	0	INF	0		78	VT RoCD = 0mm/s		0.0
79	0	0	0						0	79	Str. L = 0m		0.0
80				0	0	0	INF	0		80	VT RoCD = 0mm/s		0.0
81	0	0	0						0	81	Str. L = 0m		0.0
82				0	0	0	INF	0		82	VT RoCD = 0mm/s		0.0
83	0	0	0						0	83	Str. L = 0m		0.0

Mott MacDonald	Site / Job	398128 - March to Wisbech Transport Corridor						Line	Up Main
	Stage	GRIP 3 Design							
	Des. Ref.		Rev	1	Designer	M.Urban	Checker	M. Zygmunt	Approver C. Mannion
Elements version 5.01	Calc Ref.		Rev		Designer		Checker		Approver

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		Precision	2 dp			Enforce Reg. L=2 x speed?	Yes		Gauge	1432	mm
Gravity (G)	9.80665 m/s/s	Ruleset	NR			Enforce TL=2 x speed?	No		Rail Head Width	70	mm
Start metreage	138318.9 m	VT Length	12.2 m	User VT Length	6 m	Enforce cant limit on low R?	Yes		Rail Centres	1502	mm
Speed Units	mph	Min R	125 m	Negative Cant Limit	80 mm	Enforce max Def on low R?	No		Cant Constant	11.82	

No.	Geom Type	V mph	Bearing /Radius Δdeg or m	L m	Element Metreage Rising m	Rev. Total m	T. Len. if Rev. m	Track Type	Normal Limits E mm	Normal Limits D mm	Normal Limits RgE mm/s	Normal Limits CG Min 1 in	Normal Limits CG Max 1 in	Normal Limits RgD mm/s	Exceptional Limits E mm	Exceptional Limits D mm	Exceptional Limits RgE mm/s	Exceptional Limits CG Min 1 in	Exceptional Limits CG Max 1 in	Exceptional Limits RgD mm/s	Speed Conversions kph	Speed Conversions m/s	Ind E. Trans m
1	Str.	20	0	0	138318.86			CWR	150	110					180	150					32.2	8.94	
2	VT	20		12.2	138318.86			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
3	Cve.	20	245.767	26.6	138318.86	0		CWR	150	110					180	150					32.2	8.94	
4	VT	20		12.2	138345.46			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
5	Cve.	20	221	16.11	138345.46	0		CWR	150	110					180	150					32.2	8.94	
6	VT	20		12.2	138361.57			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
7	Cve.	20	307.6	52.4	138361.57	0		CWR	150	110					180	150					32.2	8.94	
8	Trans	20		25	138413.97			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	25
9	Cve.	20	160	53.44	138438.97	0		CWR	150	110					180	150					32.2	8.94	
10	VT	20		12.2	138492.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
11	Cve.	20	201	56	138492.41	0		CWR	150	110					180	150					32.2	8.94	
12	VT	20		12.2	138548.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
13	Cve.	20	168	19	138548.41	0		CWR	150	110					180	150					32.2	8.94	
14	VT	20		12.2	138567.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
15	Cve.	20	186	39.2	138567.41	0		CWR	150	110					180	150					32.2	8.94	
16	VT	20		12.2	138606.61			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
17	Cve.	20	200	12.42	138606.61	0		CWR	150	110					180	150					32.2	8.94	
18	VT	20		12.2	138619.03			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
19	Str.	20		0	138619.03	0		CWR	150	110					180	150					32.2	8.94	
20	VT	20		12.2	138619.03			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
21	Str.	20		0	138619.03	0		CWR	150	110					180	150					32.2	8.94	
22	VT	20		12.2	138619.03			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
23	Str.	20	0	0	138619.03	0		CWR	150	110					180	150					32.2	8.94	
24	Trans	20		12.98	138619.03			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.98
25	Str.	20		12.2	138632.01	0		CWR	150	110					180	150					32.2	8.94	
26	ICOB	20	0	0	138644.21			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	0
27	Str.	20		12.2	138644.21	0		CWR	150	110					180	150					32.2	8.94	
28	ICOB	20	0	0	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	0
29	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
30	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
31	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
32	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
33	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
34	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
35	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
36	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
37	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
38	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
39	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
40	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
41	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
42	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
43	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
44	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
45	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
46	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
47	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
48	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
49	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
50	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
51	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
52	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
53	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
54	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
55	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
56	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
57	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
58	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
59	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
60	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
61	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
62	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
63	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
64	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
65	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
66	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
67	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
68	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
69	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
70	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
71	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
72	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
73	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
74	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
75	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
76	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
77	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
78	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
79	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
80	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
81	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	
82	VT	20		12.2	138656.41			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2
83	Str.	20	0	0	138656.41	0		CWR	150	110					180	150					32.2	8.94	

No.	Calculations E+D mm	E mm	D mm	ΔE mm	ΔD mm	RgE mm	Cant Grad 1 in	RgD mm	Ve mph	Curve Diagram	Text for CAD (Take care - don't delete the formulas) No.	Text A	Text B	D score Widget 708.0
1	0	0	0						0		1	Str. L = 0m		0.0
2	© Mott MacDonald 2015			0	49.81	0	INF	36.5		)	2	VT RoCD = 36.5mm/s		0.0
3	49.81	0	49.81						NEG	(	3	R= 245.767m L = 26.6m E = 0mm D = 49.81mm		1324.9
4	© Mott MacDonald 2015			0	5.58	0	INF	4.09		>	4	VT RoCD = 4.09mm/s		0.0
5	55.39	0	55.39						NEG	(	5	R= 221m L = 16.11m E = 0mm D = 55.39mm		892.3
6	© Mott MacDonald 2015			0	15.59	0	INF	11.42		>	6	VT RoCD = 11.42mm/s		0.0
7	39.8	0	39.8						NEG	(	7	R= 307.6m L = 52.4m E = 0mm D = 39.8mm		2085.5
8	© Mott MacDonald 2015			0	36.71	0	INF	13.13			8	Trans L = 25m. RoCE = 0mm/s, RoCD = 13.13mm/s		0.0
9	76.51	0	76.51						NEG	(	9	R= 160m L = 53.44m E = 0mm D = 76.51mm		4088.7
10	© Mott MacDonald 2015			0	15.61	0	INF	11.44		>	10	VT RoCD = 11.44mm/s		0.0
11	60.9	0	60.9						NEG	(	11	R= 201m L = 56m E = 0mm D = 60.9mm		3410.4
12	© Mott MacDonald 2015			0	11.96	0	INF	8.76		>	12	VT RoCD = 8.76mm/s		0.0
13	72.86	0	72.86						NEG	(	13	R= 168m L = 19m E = 0mm D = 72.86mm		1384.3
14	© Mott MacDonald 2015			0	7.05	0	INF	5.17		>	14	VT RoCD = 5.17mm/s		0.0
15	65.81	0	65.81						NEG	(	15	R= 186m L = 39.2m E = 0mm D = 65.81mm		2579.8
16	© Mott MacDonald 2015			0	4.6	0	INF	3.37		>	16	VT RoCD = 3.37mm/s		0.0
17	61.21	0	61.21						NEG	(	17	R= 200m L = 12.423m E = 0mm D = 61.21mm		760.4
18	© Mott MacDonald 2015			0	61.21	0	INF	44.85		)	18	VT RoCD = 44.85mm/s		0.0
19	0	0	0						0		19	Str. L = 0m		0.0
20	© Mott MacDonald 2015			0	0	0	INF	0			20	VT RoCD = 0mm/s		0.0
21	0	0	0						0		21	Str. L = 0m		0.0
22	© Mott MacDonald 2015			0	0	0	INF	0			22	VT RoCD = 0mm/s		0.0
23	0	0	0						0		23	Str. L = 0m		0.0
24	© Mott MacDonald 2015			0	0	0	INF	0			24	Trans L = 12.98m. RoCE = 0mm/s, RoCD = 0mm/s		0.0
25	0	0	0						0		25	Str. L = 12.2m		0.0
26	© Mott MacDonald 2015			0	0	0	INF	0			26		#VALUE!	0.0
27	0	0	0						0		27	Str. L = 12.2m		0.0
28	© Mott MacDonald 2015			0	0	0	INF	0			28		#VALUE!	0.0
29	0	0	0						0		29	Str. L = 0m		0.0
30	© Mott MacDonald 2015			0	0	0	INF	0			30	VT RoCD = 0mm/s		0.0
31	0	0	0						0		31	Str. L = 0m		0.0
32	© Mott MacDonald 2015			0	0	0	INF	0			32	VT RoCD = 0mm/s		0.0
33	0	0	0						0		33	Str. L = 0m		0.0
34	© Mott MacDonald 2015			0	0	0	INF	0			34	VT RoCD = 0mm/s		0.0
35	0	0	0						0		35	Str. L = 0m		0.0
36	© Mott MacDonald 2015			0	0	0	INF	0			36	VT RoCD = 0mm/s		0.0
37	0	0	0						0		37	Str. L = 0m		0.0
38	© Mott MacDonald 2015			0	0	0	INF	0			38	VT RoCD = 0mm/s		0.0
39	0	0	0						0		39	Str. L = 0m		0.0
40	© Mott MacDonald 2015			0	0	0	INF	0			40	VT RoCD = 0mm/s		0.0
41	0	0	0						0		41	Str. L = 0m		0.0
42	© Mott MacDonald 2015			0	0	0	INF	0			42	VT RoCD = 0mm/s		0.0
43	0	0	0						0		43	Str. L = 0m		0.0
44	© Mott MacDonald 2015			0	0	0	INF	0			44	VT RoCD = 0mm/s		0.0
45	0	0	0						0		45	Str. L = 0m		0.0
46	© Mott MacDonald 2015			0	0	0	INF	0			46	VT RoCD = 0mm/s		0.0
47	0	0	0						0		47	Str. L = 0m		0.0
48	© Mott MacDonald 2015			0	0	0	INF	0			48	VT RoCD = 0mm/s		0.0
49	0	0	0						0		49	Str. L = 0m		0.0
50	© Mott MacDonald 2015			0	0	0	INF	0			50	VT RoCD = 0mm/s		0.0
51	0	0	0						0		51	Str. L = 0m		0.0
52	© Mott MacDonald 2015			0	0	0	INF	0			52	VT RoCD = 0mm/s		0.0
53	0	0	0						0		53	Str. L = 0m		0.0
54	© Mott MacDonald 2015			0	0	0	INF	0			54	VT RoCD = 0mm/s		0.0
55	0	0	0						0		55	Str. L = 0m		0.0
56	© Mott MacDonald 2015			0	0	0	INF	0			56	VT RoCD = 0mm/s		0.0
57	0	0	0						0		57	Str. L = 0m		0.0
58	© Mott MacDonald 2015			0	0	0	INF	0			58	VT RoCD = 0mm/s		0.0
59	0	0	0						0		59	Str. L = 0m		0.0
60	© Mott MacDonald 2015			0	0	0	INF	0			60	VT RoCD = 0mm/s		0.0
61	0	0	0						0		61	Str. L = 0m		0.0
62	© Mott MacDonald 2015			0	0	0	INF	0			62	VT RoCD = 0mm/s		0.0
63	0	0	0						0		63	Str. L = 0m		0.0
64	© Mott MacDonald 2015			0	0	0	INF	0			64	VT RoCD = 0mm/s		0.0
65	0	0	0						0		65	Str. L = 0m		0.0
66	© Mott MacDonald 2015			0	0	0	INF	0			66	VT RoCD = 0mm/s		0.0
67	0	0	0						0		67	Str. L = 0m		0.0
68	© Mott MacDonald 2015			0	0	0	INF	0			68	VT RoCD = 0mm/s		0.0
69	0	0	0						0		69	Str. L = 0m		0.0
70	© Mott MacDonald 2015			0	0	0	INF	0			70	VT RoCD = 0mm/s		0.0
71	0	0	0						0		71	Str. L = 0m		0.0
72	© Mott MacDonald 2015			0	0	0	INF	0			72	VT RoCD = 0mm/s		0.0
73	0	0	0						0		73	Str. L = 0m		0.0
74	© Mott MacDonald 2015			0	0	0	INF	0			74	VT RoCD = 0mm/s		0.0
75	0	0	0						0		75	Str. L = 0m		0.0
76	© Mott MacDonald 2015			0	0	0	INF	0			76	VT RoCD = 0mm/s		0.0
77	0	0	0						0		77	Str. L = 0m		0.0
78	© Mott MacDonald 2015			0	0	0	INF	0			78	VT RoCD = 0mm/s		0.0
79	0	0	0						0		79	Str. L = 0m		0.0
80	© Mott MacDonald 2015			0	0	0	INF	0			80	VT RoCD = 0mm/s		0.0
81	0	0	0						0		81	Str. L = 0m		0.0
82	© Mott MacDonald 2015			0	0	0	INF	0			82	VT RoCD = 0mm/s		0.0
83	0	0	0						0		83	Str. L = 0m		0.0

Mott MacDonald	Site / Job	398128 - March to Wisbech Transport Corridor		Line	Up Main
Elements version 5.01	Stage	GRIP 3 Design			
	Des. Ref.		Rev 1	Designer M.Urban	Checker M. Zygmunt / Approver C. Mannion
	Calc Ref.		Rev	Designer	Checker / Approver

Gravity (G)	9.80665 m/s/s	Precision	2 dp			Enforce Reg. L=2 x speed?	Yes		Gauge	1432 mm
Start metreage	138318.9 m	Ruleset	NR			Enforce TL=2 x speed?	No		Rail Head Width	70 mm
Speed Units	mph	VT Length	12.2 m	User VT Length	6 m	Enforce cant limit on low R?	Yes		Rail Centres	1502 mm
		Min R	125 m	Negative Cant Limit	80 mm	Enforce max Def on low R?	No		Cant Constant	11.82

No.	Element: Geom Type	V mph	Bearing /Radius ∆deg or m	L m	Metreage Rising m	Rev. Total m	T. Len. if Rev. m	Track Type	Normal Limits: E mm	D mm	RgE mm/s	CG Min 1 in	CG Max 1 in	RgD mm/s	Exceptional Limits: E mm	D mm	RgE mm/s	CG Min 1 in	CG Max 1 in	RgD mm/s	Speed Conversions: kph	m/s	Ind E. Trans m	Calculations: E+D mm	E mm	D mm	∆E mm	∆D mm	RgE mm	Cant Grad 1 in	RgD mm	Ve mph	Curve Diagram	Text for CAD (Take care - don't delete the formulas): No.	Text A	Text B	D score Widget 1199.2
1	Str.	20	0	0	138318.86			CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	1	Str. L = 0m		0.0
2	VT	20		12.2	138318.86			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	49.81	0	INF	36.5		)	2	VT RoCD = 36.5mm/s		0.0
3	Cve.	20	245.767	26.6	138318.86	0		CWR	150	110					180	150					32.2	8.94		49.81	0	49.81						NEG	(	3	R= 245.767m L = 26.6m E = 0mm D = 49.81mm		1324.9
4	VT	20		12.2	138345.46			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	5.58	0	INF	4.09		>	4	VT RoCD = 4.09mm/s		0.0
5	Cve.	20	221	16.11	138345.46	0		CWR	150	110					180	150					32.2	8.94		55.39	0	55.39						NEG	(	5	R= 221m L = 16.11m E = 0mm D = 55.39mm		892.3
6	VT	20		12.2	138361.57			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	20.42	0	INF	14.96		>	6	VT RoCD = 14.96mm/s		0.0
7	Cve.	20	350	48.6	138361.57	0		CWR	150	110					180	150					32.2	8.94		34.97	0	34.97						NEG	(	7	R= 350m L = 48.6m E = 0mm D = 34.97mm		1699.5
8	Trans	20		25	138410.17			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	25				0	41.54	0	INF	14.85		|	8	Trans L = 25m. RoCE = 0mm/s, RoCD = 14.85mm/s		0.0
9	Cve.	20	160	127.6	138435.17	0		CWR	150	110					180	150					32.2	8.94		76.51	0	76.51						NEG	(	9	R= 160m L = 127.646m E = 0mm D = 76.51mm		9766.2
10	VT	20		12.2	138562.81			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	15.85	0	INF	11.61		>	10	VT RoCD = 11.61mm/s		0.0
11	Cve.	20	201.79	56	138562.81	0		CWR	150	110					180	150					32.2	8.94		60.66	0	60.66						NEG	(	11	R= 201.79m L = 56m E = 0mm D = 60.66mm		3397.0
12	VT	20		12.2	138618.81			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	12.2	0	INF	8.94		>	12	VT RoCD = 8.94mm/s		0.0
13	Cve.	20	168	19	138618.81	0		CWR	150	110					180	150					32.2	8.94		72.86	0	72.86						NEG	(	13	R= 168m L = 19m E = 0mm D = 72.86mm		1384.3
14	VT	20		12.2	138637.81			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	7.05	0	INF	5.17		>	14	VT RoCD = 5.17mm/s		0.0
15	Cve.	20	186	39.2	138637.81	0		CWR	150	110					180	150					32.2	8.94		65.81	0	65.81						NEG	(	15	R= 186m L = 39.2m E = 0mm D = 65.81mm		2579.8
16	VT	20		12.2	138677.01			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	5.15	0	INF	3.77		>	16	VT RoCD = 3.77mm/s		0.0
17	Cve.	20	201.79	29.88	138677.01	0		CWR	150	110					180	150					32.2	8.94		60.66	0	60.66						NEG	(	17	R= 201.79m L = 29.879m E = 0mm D = 60.66mm		1812.5
18	VT	20		12.2	138706.89			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	60.66	0	INF	44.45		)	18	VT RoCD = 44.45mm/s		0.0
19	Str.	20		0	138706.89	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	19	Str. L = 0m		0.0
20	VT	20		12.2	138706.89			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	20	VT RoCD = 0mm/s		0.0
21	Str.	20		0	138706.89	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	21	Str. L = 0m		0.0
22	VT	20		12.2	138706.89			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	22	VT RoCD = 0mm/s		0.0
23	Str.	20	0	0	138706.89	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	23	Str. L = 0m		0.0
24	Trans	20		12.98	138706.89			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.98				0	0	0	INF	0		|	24	Trans L = 12.98m. RoCE = 0mm/s, RoCD = 0mm/s		0.0
25	Str.	20		12.2	138719.87	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	25	Str. L = 12.2m		0.0
26	ICOB	20	0	0	138732.07			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	0				0	0	0	INF	0		|	26	#VALUE!		0.0
27	Str.	20		12.2	138732.07	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	27	Str. L = 12.2m		0.0
28	ICOB	20	0	0	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	0				0	0	0	INF	0		|	28	#VALUE!		0.0
29	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	29	Str. L = 0m		0.0
30	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	30	VT RoCD = 0mm/s		0.0
31	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	31	Str. L = 0m		0.0
32	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	32	VT RoCD = 0mm/s		0.0
33	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	33	Str. L = 0m		0.0
34	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	34	VT RoCD = 0mm/s		0.0
35	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	35	Str. L = 0m		0.0
36	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	36	VT RoCD = 0mm/s		0.0
37	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	37	Str. L = 0m		0.0
38	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	38	VT RoCD = 0mm/s		0.0
39	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	39	Str. L = 0m		0.0
40	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	40	VT RoCD = 0mm/s		0.0
41	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	41	Str. L = 0m		0.0
42	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	42	VT RoCD = 0mm/s		0.0
43	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	43	Str. L = 0m		0.0
44	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	44	VT RoCD = 0mm/s		0.0
45	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	45	Str. L = 0m		0.0
46	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	46	VT RoCD = 0mm/s		0.0
47	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	47	Str. L = 0m		0.0
48	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	48	VT RoCD = 0mm/s		0.0
49	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	49	Str. L = 0m		0.0
50	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	50	VT RoCD = 0mm/s		0.0
51	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	51	Str. L = 0m		0.0
52	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	52	VT RoCD = 0mm/s		0.0
53	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	53	Str. L = 0m		0.0
54	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	54	VT RoCD = 0mm/s		0.0
55	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	55	Str. L = 0m		0.0
56	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	56	VT RoCD = 0mm/s		0.0
57	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	57	Str. L = 0m		0.0
58	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	58	VT RoCD = 0mm/s		0.0
59	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	59	Str. L = 0m		0.0
60	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	60	VT RoCD = 0mm/s		0.0
61	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	61	Str. L = 0m		0.0
62	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	62	VT RoCD = 0mm/s		0.0
63	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	63	Str. L = 0m		0.0
64	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	64	VT RoCD = 0mm/s		0.0
65	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	65	Str. L = 0m		0.0
66	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	66	VT RoCD = 0mm/s		0.0
67	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	67	Str. L = 0m		0.0
68	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	68	VT RoCD = 0mm/s		0.0
69	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	69	Str. L = 0m		0.0
70	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	70	VT RoCD = 0mm/s		0.0
71	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	71	Str. L = 0m		0.0
72	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	72	VT RoCD = 0mm/s		0.0
73	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	73	Str. L = 0m		0.0
74	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	74	VT RoCD = 0mm/s		0.0
75	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	75	Str. L = 0m		0.0
76	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	76	VT RoCD = 0mm/s		0.0
77	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	77	Str. L = 0m		0.0
78	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	78	VT RoCD = 0mm/s		0.0
79	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	79	Str. L = 0m		0.0
80	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	80	VT RoCD = 0mm/s		0.0
81	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	81	Str. L = 0m		0.0
82	VT	20		12.2	138744.27			PS PL			35	400	1500	35			55	400	2500	55	32.2	8.94	12.2				0	0	0	INF	0		|	82	VT RoCD = 0mm/s		0.0
83	Str.	20	0	0	138744.27	0		CWR	150	110					180	150					32.2	8.94		0	0	0						0	|	83	Str. L = 0m		0.0

Mott MacDonald	Site / Job	398128 - March to Wisbech Transport Corridor		Line	Down Main
	Stage	GRIP 3 Design			
	Des. Ref.		Rev 1	Designer M. Karpinski	Checker M. Zygmunt / Approver C. Mannion
Elements version 5.01	Calc Ref.		Rev	Designer	Checker / Approver

		Precision	2 dp			Enforce Reg. L=2 x speed?	Yes	Gauge	1432 mm
Gravity (G)	9.80665 m/s/s	Ruleset	NR			Enforce TL=2 x speed?	No	Rail Head Width	70 mm
Start metreage	0 m	VT Length	12.2 m	User VT Length	6 m	Enforce cant limit on low R?	Yes	Rail Centres	1502 mm
Speed Units	mph	Min R	125 m	Negative Cant Limit	80 mm	Enforce max Def on low R?	No	Cant Constant	11.82

No.	Geom Type	V mph	Bearing /Radius Δdeg or m	L m	Element Metreage Rising m	Rev. Total m	T. Len. if Rev. m	Track Type		Normal Limits E mm	D mm	RgE mm/s	CG Min 1 in	CG Max 1 in	RgD mm/s	Exceptional Limits E mm	D mm	RgE mm/s	CG Min 1 in	CG Max 1 in	RgD mm/s	Speed Conversions kph	m/s	Ind E. Trans m
1	Str.	40	0	0	0			CWR		150	110					180	150					64.4	17.88	
2	VT	40		12.2	0				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	12.2
3	Cve.	40	-644.4	18.41	0	0		CWR		150	110					180	150					64.4	17.88	
4	Trans	40		24.54	18.409				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	24.541
5	Str.	40	0	23.63	42.95	0		CWR		150	110					180	150					64.4	17.88	
6	Trans	40		30	66.576				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	30
7	Cve.	40	1400	36.65	96.576	0		CWR		150	110					180	150					64.4	17.88	
8	Trans	40		30	133.23				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	30
9	Str.	40	0	211.8	163.23	0		CWR		150	110					180	150					64.4	17.88	
10	Trans	40		30	375				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	30
11	Cve.	40	1400	36.65	405	0		CWR		150	110					180	150					64.4	17.88	
12	Trans	40		30	441.654				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	30
13	Str.	40	0	23.63	471.654	0		CWR		150	110					180	150					64.4	17.88	
14	Trans	40		24.54	495.284				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	24.541
15	Cve.	40	-644	18.41	519.825	0		CWR		150	110					180	150					64.4	17.88	
16	VT	40		12.2	538.234				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	12.2
17	Str.	40	0	0	538.234	0		CWR		150	110					180	150					64.4	17.88	
18	VT	40		12.2	538.234				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	12.2
19	Str.	40		0	538.234	0		CWR		150	110					180	150					64.4	17.88	
20	VT	40		12.2	538.234				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	12.2
21	Str.	40	0	0	538.234	0		CWR		150	110					180	150					64.4	17.88	
22	Trans	40		35	538.234				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	35
23	Str.	40		0	573.234	0		CWR		150	110					180	150					64.4	17.88	
24	VT	40		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	64.4	17.88	12.2
25	Str.	45	0	0	573.234	0		CWR		150	110					180	150					72.4	20.12	
26	VT	45		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	72.4	20.12	12.2
27	Str.	45		0	573.234	0		CWR		150	110					180	150					72.4	20.12	
28	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
29	Str.	30		0	573.234	0		CWR		150	110					180	150					48.3	13.41	
30	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
31	Str.	30		0	573.234	0		CWR		150	110					180	150					48.3	13.41	
32	ICOB	30		0	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	0
33	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
34	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
35	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
36	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
37	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
38	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
39	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
40	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
41	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
42	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
43	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
44	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
45	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
46	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
47	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
48	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
49	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
50	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
51	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
52	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
53	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
54	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
55	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
56	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
57	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
58	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
59	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
60	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
61	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
62	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
63	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
64	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
65	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
66	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
67	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
68	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
69	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
70	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
71	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
72	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
73	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
74	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
75	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
76	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
77	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
78	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
79	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
80	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
81	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	
82	VT	30		12.2	573.234				PS PL			35	400	1500	35			55	400	2500	55	48.3	13.41	12.2
83	Str.	30	0	0	573.234	0		CWR		150	110					180	150					48.3	13.41	

No.	Calculations E+D mm	E mm	D mm	ΔE mm	ΔD mm	RgE mm	Cant Grad 1 in	RgD mm	Ve mph	Curve Diagram	Text for CAD (Take care - don't delete the formulas) No.	Text A	Text B	D score Widget 289.1
1	0	0	0						0		1	Str. L = 0m		0.0
2	© Mott MacDonald 2015			0	75.99	0	INF	111.37			2	VT RoCD = 111.37mm/s		0.0
3	-75.99	0	-75.99						NEG		3	R= 644.4m L = 18.409m E = 0mm D = 75.99mm		1398.9
4	© Mott MacDonald 2015			0	75.99	0	INF	55.36			4	Trans L = 24.541m. RoCE = 0mm/s, RoCD = 55.36mm/s		0.0
5	0	0	0						0		5	Str. L = 23.626m		0.0
6	© Mott MacDonald 2015			0	34.97	0	INF	20.84			6	Trans L = 30m. RoCE = 0mm/s, RoCD = 20.84mm/s		0.0
7	34.97	0	34.97						NEG		7	R= 1400m L = 36.654m E = 0mm D = 34.97mm		1281.8
8	© Mott MacDonald 2015			0	34.97	0	INF	20.84			8	Trans L = 30m. RoCE = 0mm/s, RoCD = 20.84mm/s		0.0
9	0	0	0						0		9	Str. L = 211.77m		0.0
10	© Mott MacDonald 2015			0	34.97	0	INF	20.84			10	Trans L = 30m. RoCE = 0mm/s, RoCD = 20.84mm/s		0.0
11	34.97	0	34.97						NEG		11	R= 1400m L = 36.654m E = 0mm D = 34.97mm		1281.8
12	© Mott MacDonald 2015			0	34.97	0	INF	20.84			12	Trans L = 30m. RoCE = 0mm/s, RoCD = 20.84mm/s		0.0
13	0	0	0						0		13	Str. L = 23.63m		0.0
14	© Mott MacDonald 2015			0	76.03	0	INF	55.39			14	Trans L = 24.541m. RoCE = 0mm/s, RoCD = 55.39mm/s		0.0
15	-76.03	0	-76.03						NEG		15	R= 644m L = 18.409m E = 0mm D = 76.03mm		1399.6
16	© Mott MacDonald 2015			0	76.03	0	INF	111.43			16	VT RoCD = 111.43mm/s		0.0
17	0	0	0						0		17	Str. L = 0m		0.0
18	© Mott MacDonald 2015			0	0	0	INF	0			18	VT RoCD = 0mm/s		0.0
19	0	0	0						0		19	Str. L = 0m		0.0
20	© Mott MacDonald 2015			0	0	0	INF	0			20	VT RoCD = 0mm/s		0.0
21	0	0	0						0		21	Str. L = 0m		0.0
22	© Mott MacDonald 2015			35	35	17.88	1000	17.88			22	Trans L = 35m. RoCE = 17.88mm/s CG = 1 in 1000, RoCD = 17.88mm/s		0.0
23	0	35	-35						NEG		23	Str. L = 0m		0.0
24	© Mott MacDonald 2015			35	35	51.3	349	51.3			24	VT RoCD = 51.3mm/s		0.0
25	0	0	0						0		25	Str. L = 0m		0.0
26	© Mott MacDonald 2015			0	0	0	INF	0			26	VT RoCD = 0mm/s		0.0
27	0	0	0						0		27	Str. L = 0m		0.0
28	© Mott MacDonald 2015			0	0	0	INF	0			28	VT RoCD = 0mm/s		0.0
29	0	0	0						0		29	Str. L = 0m		0.0
30	© Mott MacDonald 2015			0	0	0	INF	0			30	VT RoCD = 0mm/s		0.0
31	0	0	0						0		31	Str. L = 0m		0.0
32	© Mott MacDonald 2015			0	0	0	INF	0			32	#VALUE!		0.0
33	0	0	0						0		33	Str. L = 0m		0.0
34	© Mott MacDonald 2015			0	0	0	INF	0			34	VT RoCD = 0mm/s		0.0
35	0	0	0						0		35	Str. L = 0m		0.0
36	© Mott MacDonald 2015			0	0	0	INF	0			36	VT RoCD = 0mm/s		0.0
37	0	0	0						0		37	Str. L = 0m		0.0
38	© Mott MacDonald 2015			0	0	0	INF	0			38	VT RoCD = 0mm/s		0.0
39	0	0	0						0		39	Str. L = 0m		0.0
40	© Mott MacDonald 2015			0	0	0	INF	0			40	VT RoCD = 0mm/s		0.0
41	0	0	0						0		41	Str. L = 0m		0.0
42	© Mott MacDonald 2015			0	0	0	INF	0			42	VT RoCD = 0mm/s		0.0
43	0	0	0						0		43	Str. L = 0m		0.0
44	© Mott MacDonald 2015			0	0	0	INF	0			44	VT RoCD = 0mm/s		0.0
45	0	0	0						0		45	Str. L = 0m		0.0
46	© Mott MacDonald 2015			0	0	0	INF	0			46	VT RoCD = 0mm/s		0.0
47	0	0	0						0		47	Str. L = 0m		0.0
48	© Mott MacDonald 2015			0	0	0	INF	0			48	VT RoCD = 0mm/s		0.0
49	0	0	0						0		49	Str. L = 0m		0.0
50	© Mott MacDonald 2015			0	0	0	INF	0			50	VT RoCD = 0mm/s		0.0
51	0	0	0						0		51	Str. L = 0m		0.0
52	© Mott MacDonald 2015			0	0	0	INF	0			52	VT RoCD = 0mm/s		0.0
53	0	0	0						0		53	Str. L = 0m		0.0
54	© Mott MacDonald 2015			0	0	0	INF	0			54	VT RoCD = 0mm/s		0.0
55	0	0	0						0		55	Str. L = 0m		0.0
56	© Mott MacDonald 2015			0	0	0	INF	0			56	VT RoCD = 0mm/s		0.0
57	0	0	0						0		57	Str. L = 0m		0.0
58	© Mott MacDonald 2015			0	0	0	INF	0			58	VT RoCD = 0mm/s		0.0
59	0	0	0						0		59	Str. L = 0m		0.0
60	© Mott MacDonald 2015			0	0	0	INF	0			60	VT RoCD = 0mm/s		0.0
61	0	0	0						0		61	Str. L = 0m		0.0
62	© Mott MacDonald 2015			0	0	0	INF	0			62	VT RoCD = 0mm/s		0.0
63	0	0	0						0		63	Str. L = 0m		0.0
64	© Mott MacDonald 2015			0	0	0	INF	0			64	VT RoCD = 0mm/s		0.0
65	0	0	0						0		65	Str. L = 0m		0.0
66	© Mott MacDonald 2015			0	0	0	INF	0			66	VT RoCD = 0mm/s		0.0
67	0	0	0						0		67	Str. L = 0m		0.0
68	© Mott MacDonald 2015			0	0	0	INF	0			68	VT RoCD = 0mm/s		0.0
69	0	0	0						0		69	Str. L = 0m		0.0
70	© Mott MacDonald 2015			0	0	0	INF	0			70	VT RoCD = 0mm/s		0.0
71	0	0	0						0		71	Str. L = 0m		0.0
72	© Mott MacDonald 2015			0	0	0	INF	0			72	VT RoCD = 0mm/s		0.0
73	0	0	0						0		73	Str. L = 0m		0.0
74	© Mott MacDonald 2015			0	0	0	INF	0			74	VT RoCD = 0mm/s		0.0
75	0	0	0						0		75	Str. L = 0m		0.0
76	© Mott MacDonald 2015			0	0	0	INF	0			76	VT RoCD = 0mm/s		0.0
77	0	0	0						0		77	Str. L = 0m		0.0
78	© Mott MacDonald 2015			0	0	0	INF	0			78	VT RoCD = 0mm/s		0.0
79	0	0	0						0		79	Str. L = 0m		0.0
80	© Mott MacDonald 2015			0	0	0	INF	0			80	VT RoCD = 0mm/s		0.0
81	0	0	0						0		81	Str. L = 0m		0.0
82	© Mott MacDonald 2015			0	0	0	INF	0			82	VT RoCD = 0mm/s		0.0
83	0	0	0						0		83	Str. L = 0m		0.0

F.2 Highways

F.2.1 Highways Design Table

MARCH TO WISBECH - DESIGN TABLE - HIGHWAYS

Revision: A **Date:** 09.01.20

Scheme	Name alignment	Design speed [km/h]	Speed Limit [mph]	Horizontal Alignment				Vertical Alignment						
				Radius [m]	Length of transition [m]	Superelevation	Horizontal Alignment Comments	K Crest	K Sag	SSD [m]	SSD Achieved	Grade max. [%]	Vertical Alignment Comments	Notes on Departures etc.
Scheme 1	ELM ROAD NORTH & SOUTH	60	30	255	60.5	YES			13	84.4	YES			The SSD is <90m, so *one step below desirable minimum.* Side roads joining so a departure is required.
		60	30	360	42.8	YES		14.5		82.6	YES	4.6		
		60	30					17		244	YES			
		60	30						15	130.2	YES			
		60	30						15	76.1	YES			
		60	30					17		206.4	YES			
	LONGHILL ROAD	50	30	360	24.8	YES		10		93.5	YES	2.5		
	ELM ROAD Spur	30	30	35	55.1	YES	No space to insert a transition curve	-	-	-	-	5.0		
	FLAGGRASS HILL ROAD	30	30	90	21.4	YES	No space to insert a transition curve	-	-	-	-	2.5		
	Roundabout ELM, FLAGGRASS HILL ROAD, B1101	-	30	30	-	-		-	-	-	-			
	B1101	100	60	1020	70.0	YES		55		263	YES			A k value of 55 is *one step below desirable minimum* and the SSD of 160m is *one step below desirable minimum* so a departure is required. A side road junction in area of reduced SSD also triggers the need for a departure.
		100	60						32	163	YES			
		100	60					55		161	YES	2.5		
		100	60						26	448	YES			
		100	60						40	168.5	YES			
		100	60						100	285	YES			
		50	30	360	24.8	YES		10		240	YES			
		50	30	127	70.3	YES	No space to insert a transition curve		9	80	YES			
	B1101 Link to Elm Tree Farm	30	30	130	14.8	YES	No space to insert a transition curve		13	653	YES	-2.5		
	B1101 Link	30	30	35	55.1	YES	No space to insert a transition curve	-	-	-	-	6.0		
		30	30	90	21.4	YES	No space to insert a transition curve	-	-	-	-			
Scheme 2	COLDHAM BRIDGE	70	40	360	68.0	YES		13		131.7	YES			At 70kph design speed, a k value of 6.5 is *three steps below desirable minimum.* The SSD is also *three steps below desirable minimum*. This hog curve is approx 100m from a junction and the SSD for 70kph is 120m so the standard requires an SSD to junction of 180m.
		70	40	510	48.0	YES			15	95.2	YES			
		70	40					6.5		55.3	NO	6.0	No space to insert larger curve	
	STATION ROAD LINK	30	30	50	38.5	YES	No space to insert a transition curve	2	5	-	-	5.0		
Scheme 3	HOLLY BANK/CROOKED BANK LINK	50	30	180	49.6	YES		17		192.2	YES	0.8		
		50	30						9	52.2	YES		SSD achieved for DS=50km/h, One Step below	
	HOLLY BANK/CROOKED BANK BRIDGE	50	30	180	49.6	YES	No space to insert a transition curve		3	28.5	NO		Junction	Hog has a k value of 5 which is *two steps below desirable minimum,* and the SSD is also *two steps below desirable minimum* so a departure would be required. However, this is an accommodation bridge for a Byway so this is not likely to be applicable.
		50	30					5		48.5	NO	7.0	No space to insert large curve and no space to insert shallower gradient.	
		50	30						9	52.2	YES			
	BROAD DROVE ROAD	60	30	255	60.5	YES			20	95.2	YES			60kph design speed k 15 is *one step below desirable minimum*, and the SSD is also *one step below desirable minimum*, so a departure is required. A side road within 1.5 SSD would also trigger a departure.
		60	30	360	42.8	YES		17		192.2	YES			
		60	30	510	30.2	YES			20	95.2	YES			
		60	30	20	-	YES	Junction	15		84.1	YES	6.0		
		60	30						20	95.2	YES			
	BROAD DROVE LINK	30	30	65	29.6	YES	No space to insert a transition curve	-	9	56.1	YES	3.0	SSD achieved for DS=50km/h, One Step below	
	BROAD DROVE	50	30	180	49.6	YES	No space to insert a transition curve	-	9	52.3	YES	6.0		Note: Uphill gradient of 3.5% at junction.
Scheme 4	A47 Wisbech Bypass	70	40	720	34.0	YES			20	95.2	YES			A 720m radius for 70kph in the not recommended zone for FOSD. K 20 is *one step below desirable minimum* and the presence of a reduced SSD of *one step below desirable minimum,* means that a departure is required.
		70	40					20		97.1	YES	5.5		
Scheme 5	WEASENHAM LANE	50	30	520	-	NO	Transition curve not necessary		9	55.5	YES	5.4	SSD achieved for DS=50km/h, One Step below	-
		50	30	255	35.0	YES		10		68.6	YES		SSD achieved for DS=50km/h, One Step below	

F.2.2 Transitions & Super elevations

Scheme 1 - Elm Road North & South

transition 0.3 0.6

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	60					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			60.5	60.46	30.23	78.23
Curve (4 step below)		255				

transition 0.3 0.6

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	60					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			42.8	42.83	21.41	92.95
Curve (4 step below)		360				

transition 0.3 0.6

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	60					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			60.5	60.46	30.23	78.23
Curve (4 step below)		255				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	3.65	Edge of carriageway level [mm]
Start superelevation	-5.00%	-182.5
End superelevation	-2.50%	-91.25
Level difference [mm]		91.25
Transition length for 0.5% [m]		18.25
Transition length for 1.0% [m]		9.125

R=255

Right Lane width [m]	3.65	Edge of carriageway level [mm]
Start superelevation	3.50%	127.75
End superelevation	-0.50%	-18.25
Level difference [mm]		146
Transition length for 0.5% [m]		29.2
Transition length for 1.0% [m]		14.6

R=360

Scheme 1 - Flaggrass Hill Road

transition 0.3 0.6

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	30					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			0	21.41	10.71	46.48
Curve (4 step below)		90				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	3.65	Edge of carriageway level [mm]
Start superelevation	-2.50%	-91.25
End superelevation	2.50%	91.25
Level difference [mm]		182.5
Transition length for 0.5% [m]		36.5
Transition length for 1.0% [m]		18.25

R=90

Right Lane width [m]	3.65	Edge of carriageway level [mm]
Start superelevation	-0.50%	-18.25
End superelevation	-2.50%	-91.25
Level difference [mm]		73
Transition length for 0.5% [m]		14.6
Transition length for 1.0% [m]		7.3

R=90

Scheme 1 - B1101

transition

				0.3	0.6	
Approach N		Designed alignment		Calculated values		
Design speed [km/h]	50					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			60.5	70.25	35.13	55.21
Curve (4 step below)		127				

transition

				0.3	0.6	
Approach N		Designed alignment		Calculated values		
Design speed [km/h]	50					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			24.8	24.78	12.39	92.95
Curve (4 step below)		360				

transition

				0.3	0.6	
Approach N		Designed alignment		Calculated values		
Design speed [km/h]	100					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			70	69.98	34.99	156.46
Curve (4 step below)		1020				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	3.65	Edge of carriageway level [mm]	R=360
Start superelevation	-2.50%	-91.25	
End superelevation	2.50%	91.25	
Level difference [mm]		182.5	
Transition length for 0.5% [m]		36.5	
Transition length for 1.0% [m]		18.25	

Right Lane width [m]	3.65	Edge of carriageway level [mm]	R=1020
Start superelevation	-2.50%	-91.25	
End superelevation	3.50%	127.75	
Level difference [mm]		219	
Transition length for 0.5% [m]		43.8	
Transition length for 1.0% [m]		21.9	

Right Lane width [m]	3.65	Edge of carriageway level [mm]	R=127
Start superelevation	-0.10%	-3.65	
End superelevation	-2.50%	-91.25	
Level difference [mm]		87.6	
Transition length for 0.5% [m]		17.52	
Transition length for 1.0% [m]		8.76	

Scheme 2 - Coldham Bridge

transition 0.3 0.6

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	70					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			68	68.01	34.00	92.95
Curve (4 step below)		360				

transition 0.3 0.6

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	70					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			48	48.00	24.00	110.63
Curve (4 step below)		510				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	3.4	Edge of carriageway level [mm]	R=360
Start superelevation	-2.50%	-85	
End superelevation	-5.00%	-170	
Level difference [mm]		85	
Transition length for 0.5% [m]		17	
Transition length for 1.0% [m]		8.5	

Right Lane width [m]	3.4	Edge of carriageway level [mm]	R=510
Start superelevation	-2.50%	-85	
End superelevation	3.50%	119	
Level difference [mm]		204	
Transition length for 0.5% [m]		40.8	
Transition length for 1.0% [m]		20.4	

Scheme 3 - Holly Bank/Crooked Bank Bridge

transition

				0.3	0.6	
Approach N		Designed alignment		Calculated values		
Design speed [km/h]	50					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			49.6	49.57	24.78	65.73
Curve (4 step below)		180				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	2.51	Edge of carriageway level [mm]	R=180
Start superelevation	-2.50%	-62.75	
End superelevation	-5.00%	-125.5	
Level difference [mm]		62.75	
Transition length for 0.5% [m]		12.55	
Transition length for 1.0% [m]		6.275	

Scheme 3 - Holly Bank/Crooked Bank Link

transition 0.3 0.6

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	50					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			49.6	49.57	24.78	65.73
Curve (4 step below)		180				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	2.51	Edge of carriageway level [mm]
Start superelevation	-2.50%	-62.75
End superelevation	-5.00%	-125.5
Level difference [mm]		62.75
Transition length for 0.5% [m]		12.55
Transition length for 1.0% [m]		6.275

R=180

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	2.51	Edge of carriageway level [mm]
Start superelevation	-2.50%	-62.75
End superelevation	5.00%	125.5
Level difference [mm]		188.25
Transition length for 0.5% [m]		37.65
Transition length for 1.0% [m]		18.825

Scheme 3 - Broad Drove Road

transition

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	60			0.3	0.6	
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			60.5	60.46	30.23	78.23
Curve (4 step below)		255				

transition

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	60			0.3	0.6	
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			42.8	42.83	21.41	92.95
Curve (4 step below)		360				

transition

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	60			0.3	0.6	
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			30.2	30.23	15.12	110.63
Curve (4 step below)		510				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	3.65	Edge of carriageway level [mm]	R=255
Start superelevation	-2.50%	-91.25	
End superelevation	-5.00%	-182.5	
Level difference [mm]		91.25	
Transition length for 0.5% [m]		18.25	
Transition length for 1.0% [m]		9.125	

Right Lane width [m]	3.65	Edge of carriageway level [mm]	R=360
Start superelevation	-2.50%	-91.25	
End superelevation	-3.50%	-127.75	
Level difference [mm]		36.5	
Transition length for 0.5% [m]		7.3	
Transition length for 1.0% [m]		3.65	

Right Lane width [m]	3.65	Edge of carriageway level [mm]	R=510
Start superelevation	-2.50%	-91.25	
End superelevation	2.50%	91.25	
Level difference [mm]		182.5	
Transition length for 0.5% [m]		36.5	
Transition length for 1.0% [m]		18.25	

Scheme 4 - A47 Wisbech Bypass

transition 0.3 0.6

Approach N		Designed alignment		Calculated values		
Design speed [km/h]	70					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			34	34.00	17.00	131.45
Curve (4 step below)		720				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	4.65	Edge of carriageway level [mm]
Start superelevation	-2.50%	-116.25
End superelevation	2.50%	116.25
Level difference [mm]		232.5
Transition length for 0.5% [m]		46.5
Transition length for 1.0% [m]		23.25

Right Lane width [m]	4.65	Edge of carriageway level [mm]
Start superelevation	-2.50%	-116.25
End superelevation	-2.50%	-116.25
Level difference [mm]		0
Transition length for 0.5% [m]		0
Transition length for 1.0% [m]		0

Scheme 5 - Weasenham Lane

transition

				0.3	0.6	
Approach N		Designed alignment		Calculated values		
Design speed [km/h]	50					
Element of alignment		Radius [m]	Length [m]	for q=0.3m/s3	for q=0.6m/s3	sqrt(24R)
Straight						
Transition			35	34.99	17.49	78.23
Curve (4 step below)		255				

DMRB TD9/93, 3.7 superelevation

Left Lane width [m]	3.65	Edge of carriageway level [mm]
Start superelevation	-2.50%	-91.25
End superelevation	3.50%	127.75
Level difference [mm]		219
Transition length for 0.5% [m]		43.8
Transition length for 1.0% [m]		21.9

Right Lane width [m]	3.65	Edge of carriageway level [mm]
Start superelevation	-2.50%	-91.25
End superelevation	-3.50%	-127.75
Level difference [mm]		36.5
Transition length for 0.5% [m]		7.3
Transition length for 1.0% [m]		3.65

G. Geotechnical and Geo-Environmental Desk Study

MOTT MACDONALD

March to Wisbech Transport Corridor

Geotechnical and Geo-Environmental Desk Study

17 September 2019

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Geotechnical and Geo-Environmental Desk Study

17 September 2019

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Contents

Executive summary

Mott MacDonald Limited (MM) has been appointed by Cambridgeshire County Council to provide a GRIP stage 3 geotechnical and geo-environmental desk study for the proposed re-opening of the railway line between March station and Wisbech. The report is intended to inform the GRIP 3 pricing exercise and geotechnical recommendations.

The line from March to Wisbech, engineers line reference (ELR) WIG, comprises of a single track railway which was officially commissioned to be temporarily 'Out of Use' in the Network Rail Sectional Appendix from 2000. The reopening of this line aims to support and promote investment and growth within the north of Cambridgeshire and create improved access and transport links throughout the county to Cambridge.

The reopening of this railway line will include the extension works at March Station, design and construction of a new station at Wisbech, closure of level crossings along the route and design and construction of new grade separations. Detailed development proposals for the March to Wisbech Transport Corridor are detailed in the Grip 2 Heavy Rail Feasibility Report.

Ground conditions throughout the site are largely unknown due to the lack of historical investigations available. Published ground conditions combined with borehole information located at Waldersea junction and proposed Wisbech (South of Town Centre) Station indicate that ground conditions are likely to comprise made ground overlying soft silty clay with layers of sand, gravel and peat throughout the site. Limited groundwater information available. Groundwater level unknown at locations of proposed structures and stations.

A summary of the ground related constraints has been produced identifying; medium risk to fluvial flooding, potential soil and groundwater contamination and potential embankment instability. Lightweight embankment options recommended for grade separations to reduce settlements of soft compressible soils. Piled foundations for bridge abutments and station construction likely to be required due to depths of made ground and soft cohesive materials expected on site.

A preliminary quantitative contamination risk assessment has been undertaken for the site, which has indicated a moderate to low risk from soil and groundwater contamination to human health of future site users, construction workers, buried structures and groundwater.

From the review of available information, it is recommended that a ground investigation is undertaken to further determine the risks associated with the site, including:

- Drilling of boreholes to prove thickness of Made Ground and superficial profiles;
- Drilling of boreholes to determine soil parameters for design at proposed station works and grade separations;
- Installation of standpipes including gas and groundwater monitoring for a period of six weeks;
- In-situ geotechnical testing;
- Collection of soil and rock samples for geotechnical and geochemical testing; and
- Collection of soil, leachate and groundwater samples for geo-environmental testing including UKWIR testing at proposed Wisbech station.

1 Introduction

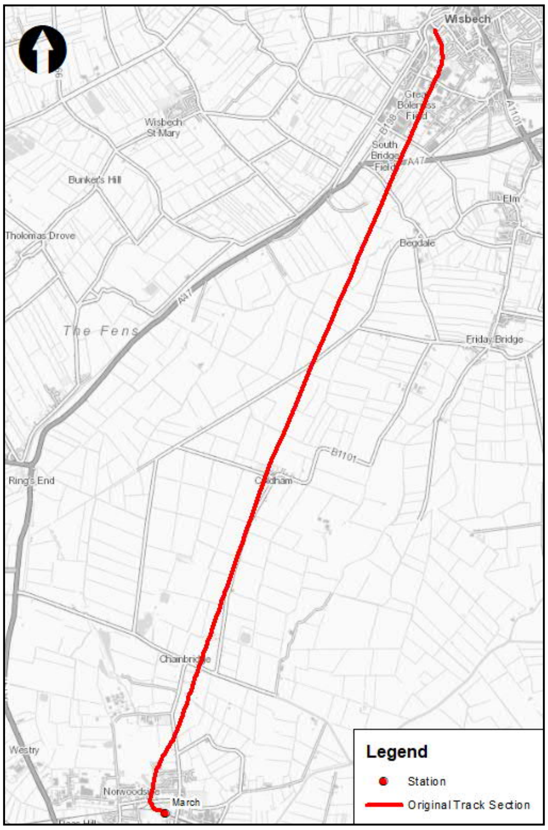
1.1 Background

Mott MacDonald Limited has been appointed by Cambridgeshire County Council to provide a GRIP stage 3 geotechnical and geo-environmental desk study for the proposed re-opening of the railway line between March station and Wisbech. The report is intended to inform the GRIP 3 pricing exercise and geotechnical recommendations.

The line from March to Wisbech, engineers line reference (ELR) WIG, comprises a single track railway which was officially commissioned to be temporarily 'Out of Use' in the Network Rail Sectional Appendix from 2000. The reopening of this line aims to support and promote investment and growth within the north of Cambridgeshire and create improved access and transport links throughout the county to Cambridge.

This desk study covers the seven mile March to Wisbech line from March East Junction at 85 miles 78 chains to the nominal end of the line at 93 miles 49 chains at Wisbech (however the track does not physically exist beyond Weasenham Lane level crossing at 93 miles 15 chains). The location of the site is included in Figure 1.1 with detailed site location plans included within Appendix A.

Figure 1.1: Site Location Plan



Source: Contains OS data © Crown copyright and database right 2019.

1.2 Development Proposals

The reopening of this historical railway line will include the extension works at March Station, design and construction of a new station at Wisbech, closure of level crossings along the route and design and construction of new grade separations. Detailed development proposals for the March to Wisbech Transport Corridor are detailed in the Grip 2 Heavy Rail Feasibility Report [1].

This desk study consists of a geotechnical assessment for the proposed station location and grade separations.

1.3 Scope and objectives

The objectives of this report are to:

- Establish the geological and hydrogeological conditions using existing available information.
- Review and summarise available information for the site including information provided by the client and online sources.
- Establish the site-specific geotechnical hazards and risks which may impact on the proposed development.
- Define geotechnical constraints that can be used to develop feasibility and outline foundation design.
- Develop guidance on ground investigation requirements for the site to identify ground model, groundwater, contamination evidence and inform design of proposed development.

1.4 Methodology

This report has been completed in cognisance of best practice methodology detailed in the following documents:

- BS EN 1997 - 1:2007, 'Eurocode 7 – Geotechnical Design – Part 1: General Rules' [2]
- BS EN 1997 - 2:2007, 'Eurocode 7 – Geotechnical Design – Part 2: Ground Investigation and Testing' [3]
- BS10175:2011(+A1:2017), 'Investigation of Potentially Contaminated Sites' [4]
- CLR 11, 'Model Procedures for the Management of Land Contamination' (2004) [5]
- Construction and Industry Research and Information Associated (2001) Contaminated Land Risk Assessment – A Guide to Good Practice CIRIA Report C552 [6]

1.5 Sources of Information

1.5.1 Information provided by Network Rail

The Earthworks Inspection 5 Chain Records were provided by Network Rail for the earthworks along the existing WIG line [7].

1.5.2 Available Online Sources

The following online sources of information have been used to compile this report:

- National Library of Scotland Online Historical Maps [8].
- British Geological Survey (BGS) GeoIndex Online Viewer [9].
- British Geological Survey (BGS) Geology of Britain Viewer [10].
- Coal Authority Interactive Map Viewer [11].

- British Geological Survey (BGS) Hydrological Map of England and Wales [12].
- Department of Environment, Food and Rural Affairs Magic Online Viewer [13].
- Flood Risk Interactive Map [14].
- UK Radon Interactive Map Viewer [15].

1.6 Limitations

At the time of writing, development options have not been finalised for the works and hence any conclusions and recommendations of this report will need to be reviewed and revised as necessary as the design develops.

An Envirocheck report for the site has not been purchased, however a review of online data has been completed to provide up-to-date information for the site.

Mott MacDonald Ltd is not insured for, and therefore will not undertake, surveys to identify asbestos or provide guidance on the treatment of asbestos. Should the presence of asbestos be suspected during development, Mott MacDonald Ltd would recommend the appointment of a specialist contractor to address the issue and would not provide advice on any risk or remedial measures required.

Earthworks assessment has been based on site walkover reports and NR inspection records however a full site walkover has not been completed.

2 Site Details

2.1 Site Location

The site is in Cambridgeshire approximately 13.4 miles east of Peterborough. The railway line connects March to Wisbech.

The site location is shown within Figures A1.1-1.8, Site Location Plan included in Appendix A.

General site details are presented in Table 2.1.

Table 2.1: General Site Details

Aspect	Detail
Engineers Line Reference (ELR)	WIG
Mileage	Start – 85 miles (m) 75 Chains (Ch)
	Finish – 93 miles (m) 49 Chains (Ch)
National Grid Reference (NGR)	Start – 541818, 297903
	Finish – 545768, 309387

2.2 Site Details

A summary of the site is given in Table 2.2.

Table 2.2: Site Summary

Aspect	Detail
Site Description	The site is located within north Cambridgeshire with the railway line extending in a northeast direction between March to Wisbech. This railway line originally opened as a two-track railway with a permissible track speed of 25mph, but lower restrictions are in places over level crossings. The up-line travels north-east towards Wisbech (high mileage) and the down line travels southwest towards March (low mileage). An intermediate station was originally located in Coldham (89m 20Ch), however this was closed in 1966.
Bridges	The railway crosses numerous drains and rivers within underline bridges at four locations: • 87m 31Ch – Chain Bridge (Twenty Foot River) (ID 2314) • 90m 22Ch – Mulberry Drain (ID 2315) • 90m 61Ch – Waldersey Drain (ID 2317) – Visual inspection from Network Rail Inspection reports indicate that there was no evidence of deterioration to this structure at the time of inspection in 2008 [7]. • 92m 9Ch – Redmoor Drain (ID 2319) The railway is crossed by a road bridge at location: • 86m 10Ch – Road bridge carrying Norwood Road over the railway line (ID 1823) Visual observations of all structures are included in the March to Wisbech Grip 2 report [1].
Level Crossings	There are 21 level crossings throughout the scheme all of which are detailed in the March to Wisbech Grip 2 Report [1].
Topography	The site is relatively flat and railway is at grade, however there are some sections of railway founded on steep embankments (1 (V) : 1 (H) Slope) as identified on Network Rail Earthworks Inspection Reports [7].

Aspect	Detail
Surrounding Areas	The railway alignment travels northeast from March through undeveloped farm land passing through the hamlet of Coldham.
Designated Areas	Surrounding areas between Redmoor Crossing and A47 Level crossings are designated as priority habitats for traditional orchids.

2.3 Site Reconnaissance

A visual inspection of the site was undertaken by Mott MacDonald staff on the 21st and 22nd April 2015. Full details of this site reconnaissance are included in the March to Wisbech Grip 2 Report [1].

2.4 Site History

The history of the site and proposed structures has been assessed based on a review of historical maps available from the National Library of Scotland [8] and included in Table 2.3.

Table 2.3: Site History

Aspect	Details
Stations	
March Station	Historical mapping from 1885 shows March station in its current location and footprint.
Proposed Wisbech Town (South of Town Centre)	Historical mapping from 1885 to present shows railways sidings and unidentified buildings associated with the railways within this location. Between 1888 – 1968 a Goods Shed is illustrated 50m north of the site boundary. Between 1968 – 1990 a warehouse, tanks and depot are noted west of the site. To the east of the railway, heavy industry is noted on mapping including concrete works, cabinet factories and works.
Proposed Parkway (South of A47)	Historical mapping from 1885 to present shows farm land with a drain located through the centre of the site. Between 1937 – 1949 Redmoor Mill is illustrated 50m south of the site boundary.
Proposed Grade Separations	
Scheme 1: Elm Road, Sheldruch and Chain Bridge (86m 50Ch – 87m 40Ch)	Historical mapping from 1885 to present shows farm land with Hundred Drove drain crossing the centre of the alignment.
Scheme 2: Station Road – Coldham (89m 10Ch)	Historical mapping from 1885 to present shows farm land in the location of the proposed alignment. Peartree Hill Farm is shown west of the proposed start of realignment from 1885 to present.
Scheme 2: Waldersey (90m 20Ch)	Historical mapping from 1885 to present shows farm land in the location of the proposed alignment. The proposed alignment will also cross Waldersea Drove Sidings shown on mapping from 1902 – 1977.
Scheme 3: Holly Bank / Crooked Bank Bridge (91m 35Ch)	Historical mapping from 1885 to present shows farm land and drains.
Scheme 3: Redmoor Crossing (92m 10Ch)	Historical mapping from 1885 to present shows farm land and drains.

Aspect	Details
Scheme 4: A47 Wisbech Bypass (92m 30Ch)	Historical mapping from 1885 to present shows farm land and drains. The A47 appears on mapping from 1981 in its current location.
Scheme 5: Weasenham Lane (92m 45Ch)	Historical mapping from 1885 to 1968 shows farm land and allotments. From 1885 to 1959 Virginia Waters Fish pond is located to the north of the proposed alignment. After 1959 a large section of the pond has been infilled until 1968 when the pond is completed infilled. This area starts to become developed from 1968 including factories, metal container factories and warehouses.

2.5 Unexploded Ordnance

The online Regional Unexploded Bomb (UXB) risk maps indicated that the route, stations and structures are all at low risk. However, a UXO find has been highlighted on the map approximately 850m northwest of the proposed Wisbech Town (South of Town Centre) Station. The UXB risk map has been included in Appendix B.1.

A Pre-Desk Study Assessment for the Wisbech (South of Town Centre) Station site is included in Appendix B.2. This Pre-Desk Study Assessment has found that there are no available records that indicate the site was bombed or any evidence of military operations.

3 Ground Conditions

3.1 Published Geology

3.1.1 Made Ground

Made ground has been identified between 86m 15ch to 86m 22ch from British Geological Society (BGS) mapping potentially associated with railway sidings from the Great Northern & Great Eastern Joint Railway line branching off from this location, however as the entire line is founded on an embankment, made ground can be assumed to underlie the original alignment.

3.1.2 Superficial Geology

BGS mapping indicated that superficials beneath the site comprise of March Gravels Member, which extends from March Station to 86m 45ch, Oadby member, between 86m 45ch and 87m 10ch and Tidal Flat Deposits from 87m 10ch to 93m 49ch [9] [10].

March Gravels Member deposit comprises sandy flint gravel and clayey silty sand. The Oadby Member is a Diamicton Glacial Till with strata consisting of brown to grey clay with lenses of sand and gravel. Tidal flat deposits including mud flat and sand flat deposits consisting of consolidated soft silty clay with layers of sand, gravel and peat [9] [10].

3.1.3 Bedrock Geology

BGS mapping indicates that the bedrock geology underlying the site comprises of Ampthill Clay Formation. The Ampthill Clay formation comprises mudstones with silty limestone and cementstone [9] [10].

3.1.4 Structural Geology

There are no linear features located within the vicinity of the site [9] [10].

3.2 Mining

This site is not located within a coal mining reporting area and reviewing available information it can be concluded that there are no mining works located within or near to the site [11].

3.3 Historical Ground Information

The British Geological Survey (BGS) database of historical exploratory holes has been reviewed as part of the desk study. The data has been reviewed in term of its relevance to the proposed scheme and included within Appendix C.

3.3.1 Stations

3.3.1.1 March Station

There is one borehole located south of Norwood Road bridge completed in 1883 indicating approximately 3.4m of cohesive made ground overlying Kimmeridge clay. Oxford clay has been identified 21m below ground level (mbgl) terminating in this material at 86mbgl. The location of this borehole is included in Figure A2.1 in Appendix A and the borehole scan has been included in Appendix C.

3.3.1.2 Wisbech Town (South of Town Centre)

Ground conditions beneath the proposed Wisbech Town (South of Town Centre) Station has been estimated based on boreholes located approximately 50m west of the proposed site. The locations of these boreholes are included in Figure A2.8 in Appendix A and the borehole scans have been included in Appendix C.

Boreholes in this area all terminated within Raised Tidal Flat Deposits comprising very soft to soft silts and clays at a depth of 6.1mbgl.

Groundwater was not encountered within the boreholes recorded in this area, but groundwater monitoring information was available approximately 360m west of the proposed station location. Monitoring information indicates that groundwater ranges between 0.60 – 2.10mbgl. Groundwater monitoring records have been included in Appendix C.

3.3.1.3 Proposed Parkway (South of A47)

There are no historical boreholes completed within 500m of this scheme and hence ground conditions can be assumed to be in line with BGS mapping indicating superficials will likely comprise Tidal Flat Deposits including soft silty clay with layers of sand, gravel and peat [9] [10].

Trial pit information from 500m north of the site indicates layers of clay, peat and silt up to 3.00mbgl.

3.3.2 Existing Bridges

3.3.2.1 86m 10Ch – Road bridge carrying Norwood Road over the railway line (ID 1823)

There is one borehole located south of Norwood Road bridge completed in 1883 indicating approximately 3.4m of cohesive made ground overlying Kimmeridge clay. Oxford clay has been identified 21 mbgl terminating in this material at 86mbgl. The location of this borehole is included in Figure A2.1 in Appendix A and the borehole scan has been included in Appendix C.

3.3.2.2 87m 31Ch – Chain Bridge (Twenty Foot River) (ID 2314)

There is no historical GI within the immediate vicinity of the proposed alignment for Scheme 1. BGS mapping indicates superficials to comprise of the Oadby Member. The Oadby Member is a glacial till from the Diamicton period with strata consisting of brown to grey clay with lenses of sand and gravel. Exploratory hole logs from 500m west of the section observed laminated layers of silty clay varying in strength. Rock was not encountered in this investigation indicating that rockhead is greater than 20mbgl at this location.

3.3.2.3 90m 22Ch – Mulbary Drain (ID 2315) & 90m 61Ch – Waldersey Drain (ID 2317)

Historical boreholes within the vicinity of Mulbary Drain are included within Appendix C. Ground conditions within this section indicate topsoil overlying a 1.2m thick layer of soft peat. Tidal Flat deposits of very soft to soft organic silty clays up to 6mbgl overlie medium dense to dense sands and gravels. Tidal deposits improve with depths with firm becoming stiff silty clays identified from 17mbgl. Rockhead was encountered at 26.75mbgl comprising of hard limestone.

3.3.2.4 92m 9Ch – Redmoor Drain (ID 2319)

There are no historical boreholes completed in the vicinity of this scheme and hence ground conditions can be assumed to be in line with BGS mapping indicating superficials will likely comprise Tidal Flat Deposits including soft silty clay with layers of sand, gravel and peat [9] [10].

Ground conditions would be expected to be similar to those observed around the Scheme 2 Waldersey.

3.3.3 Proposed Grade Separations

3.3.3.1 Scheme 1

Elm Road, Sheldruch and Chain Bridge (86m 50Ch – 87m 40Ch)

There is no historical GI within the immediate vicinity of the proposed alignment for Scheme 1. BGS mapping indicates superficials to comprise of the Oadby Member. The Oadby Member is a glacial till from the Diamicton period with strata consisting of brown to grey clay with lenses of sand and gravel. Exploratory hole logs from 500m west of the section observed laminated layers of silty clay varying in strength. Rock was not encountered in this investigation indicating that rockhead is greater than 20mbgl at this location.

3.3.3.2 Scheme 2

Station Road – Coldham (89m 10Ch)

There are no historical boreholes completed in the vicinity of this area and hence ground conditions can be assumed to be in line with BGS mapping indicating superficials will likely comprise Tidal Flat Deposits including soft silty clay with layers of sand, gravel and peat [9] [10].

Waldersey (90m 20Ch)

Historical boreholes within the vicinity of the proposed new crossing at Waldersey are included within Appendix C. Ground conditions within this section indicate topsoil overlying a 1.2m thick layer of soft peat. Tidal Flat deposits of very soft to soft organic silty clays up to 6mbgl overlie medium dense to dense sands and gravels. Tidal deposits improve with depths with firm becoming stiff silty clays identified from 17mbgl. Rockhead was encountered at 26.75mbgl comprising hard limestone.

3.3.3.3 Scheme 3

Holly Bank / Crooked Bank Bridge (91m 35Ch) & Redmoor Crossing (92m 10Ch)

There are no historical boreholes completed in the vicinity of this scheme and hence ground conditions can be assumed to be in line with BGS mapping indicating superficials will likely comprise Tidal Flat Deposits including soft silty clay with layers of sand, gravel and peat [9] [10].

Ground conditions would be expected to be similar to those observed around the Scheme 2 Waldersey.

3.3.3.4 Scheme 4

A47 Wisbech Bypass (92m 30Ch)

There are no historical boreholes completed within 500m of this scheme and hence ground conditions can be assumed to be in line with BGS mapping indicating superficials will likely comprise Tidal Flat Deposits including soft silty clay with layers of sand, gravel and peat [9] [10].

Trial pit information from 500m north of the site indicates layers of clay, peat and silt up to 3.00mbgl.

3.3.3.5 Scheme 5

Weasenham Lane (92m 45Ch)

There are no historical boreholes completed within the vicinity of this scheme and hence ground conditions can be assumed to be in line with BGS mapping indicating superficials will likely comprise Tidal Flat Deposits including soft silty clay with layers of sand, gravel and peat [9] [10].

Ground conditions are likely to be similar to those anticipated at the proposed Wisbech (South of Town Centre) Station. Boreholes in this area all terminated within Raised Tidal Flat Deposits comprising very soft to soft silts and clays at a depth of 6.1mbgl [9] [10].

3.4 Network Rail Embankment Inspection Reports

Network Rail provided inspection records for earthworks along this section of track [7]. An earthwork is defined as a cutting, embankment or natural slope up to 100m long equal to or greater than 3m in height, or if less, whose failure could pose unacceptable risk to the safe operation or performance of the railway infrastructure.

Earthworks are given an Earthwork Hazard Category (EHC) ranging from A to E, where A is statistically least likely to fail and E is statistically most likely to fail.

Sections identified to be at average risk to track throughout the entire scheme have been summarised below in Table 3.1. There are a number of earthworks categorised ‘Grade / No Earthwork’ which have been identified as having an average risk to track safety without slope hazard review due to the height of slope >3m. Stability of the embankments should be assessed and confirmed at the next GRIP stage including full track walkover survey to confirm current earthworks conditions.

An inspection of the route in 2015 by Mott MacDonald staff, detailed in the March to Wisbech Transport Corridor Grip 2 Report [1], observed visual evidence of potential earthworks instability between track section 89m 50Ch and 90m 80Ch. Inspection details for all earthworks within the sections are summarised in Table D.1 included in Appendix D.

Table 3.1: Earthwork Inspection Details

Network Rail Earthworks Inspection Details

Track Section	Line	Inspection Date	Earthworks Category	EHC	Comments
86m 6.55Ch – 86m 11.55Ch	Up	11/05/16	Approach Embankment	B	• Reinforced slope at high mileage of overbridge is indicated to be in poor condition. • Marshy/ponding identified beyond toe of approach embankment. • This embankment has a maximum height of 5.5m with a slope angle of 35 degrees (approximately 1 in 1.43 slope). • Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. • Inspector feels overall EHC could be lowered to A due to low risk to track safety.
87m 36.55Ch – 87m 41.55Ch	Down	01/08/19	Soil Embankment	A	• Drainage issues resulting in average risk to track safety.

Network Rail Earthworks Inspection Details

Track Section	Line	Inspection Date	Earthworks Category	EHC	Comments
					• This embankment has a maximum height of 3.0m with a slope angle of 30 degrees (approximately 1 in 1.73 slope). • Marshy ground identified at or imediately beyond embankment toe. • Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. • Occasional rabbit burrowing observed.
90m 31.55Ch – 90m 36.55Ch	Up	13/03/15	Soil Embankment	B	• This embankment has a maximum height of 2.0m with a slope angle of 28 degrees (approximately 1 in 1.88 slope). • Marshy ground at or immediately beyond slope toe. • Concrete retaining wall identified between 90m 35.36Ch – 90m 35.59Ch. • Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. • Occasional rabbit burrows identified.
90m 36.55 – 90m 41.55	Up	10/01/19	Grade / No Embankment	N/A	• Average risk identified for rotational and translational slips. • Average risk identified for earthflow, washout and burrowing. • Average risk identified for vegetation, scour and drainage issues.
90m 41.55Ch – 90m 46.55Ch	Up	13/02/15	Soil Embankment	A	• Average risk to track safety due to identified risk of earthflow and burrowing. • Inspector comments from 2015 stated that no significant issues were identified in the inspection. • This embankment has a maximum height of 2.0m with a slope angle of 28 degrees (approximately 1 in 1.88 slope). • Marshy ground identified at or immediately beyond slope toe. • Occasional rabbit burrows identified.
91m 26.55Ch – 91m 31.55Ch	Up	10/01/19	Grade / No Earthwork	N/A	• Average risk identified for rotational and translational slips. • Average risk identified for earthflow, washout, burrowing, detrimental vegetation, scour and drainage issues.
91m 31.55Ch – 91m 36.55Ch	Up	10/01/19	Grade / No Earthwork	N/A	• Average risk identified for rotational and translational slips. • Average risk identified for earthflow, washout, burrowing, detrimental vegetation, scour and drainage issues.
92m 11.55Ch – 92m 16.55Ch	Down	04/02/11	Grade / No Earthwork	N/A	• Average risk to track safety due to identified risk of detrimental vegetation.
92m 16.55Ch – 92m 21.55Ch	Down	04/02/11	Grade / No Earthwork	N/A	• Average risk to track safety due to identified risk of detrimental vegetation.
92m 21.55Ch – 92m 26.55Ch	Down	04/02/11	Grade / No Earthwork	N/A	• Average risk to track safety due to identified risk of detrimental vegetation.
93m 21.55Ch – 93m 26.55Ch	Up	14/02/11	Grade / No Earthwork	N/A	• Average risk to track safety due to identified risk of washout.

Network Rail Earthworks Inspection Details

Track Section	Line	Inspection Date	Earthworks Category	EHC	Comments
93m 26.55Ch – 93m 31.55Ch	Up	14/02/11	Grade / No Earthwork	N/A	• Average risk to track safety due to identified risk of washout and scour.

4 Environmental Setting

4.1 Hydrology, Hydrogeology and Flooding

4.1.1 Hydrology

A review of Ordnance Survey mapping and aerial imagery has indicated a number of water features within the proposed works as summarised below:

- Drains culverted below the railway at 15 locations; 87m 10Ch, 87m 55Ch, 88m 0Ch, 88m 25Ch, 89m 20Ch, 89m 52Ch, 89m 72Ch, 90m 10Ch, 90m 30Ch, 91m 10Ch, 91m 60Ch, 92m 45Ch, 92m 55Ch and 93m 25Ch.
- The railway crosses Twenty Foot River at 87m 30Ch.
- The railway crosses Mulbary Drain at 90m 22Ch.
- The railway crosses Waldersey Main Drain at 90m 61Ch.
- The railway crosses Redmoor Drain at 92m 9Ch.

Culverts were assessed in the original site walkover and detailed within the Grip 2 Feasibility report [1].

4.1.2 Hydrogeology

The BGS Hydrogeological map of England and Wales records the bedrock as a concealed aquifer with limited local potential. Limited yields of uncertain quality and risk of saline contamination in coastal materials [12].

March Gravels Member, which extends from March Station to 86m 45ch is designated a Secondary A Superficial aquifer. A Secondary A aquifer is a permeable stratum capable of supporting water supplies at a local level and forming an important source of base flow to rivers. Oadby member, between 86m 45ch and 87m 10ch is designated as an Undifferentiated Secondary aquifer supporting water supplies at a local level and forming an important source of base flow to rivers. Tidal Flat Deposits have been designated as an unproductive aquifer [13].

4.1.3 Flooding

Flood Risk Mapping [14] available for England indicated that the majority of the site is at a medium risk for flooding from rivers and sea. A medium risk of flooding from rivers and seas means that each year this area has a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%). The route is at a medium risk at locations;

- 87m 30Ch – 87m 35Ch
- 87m 60Ch – 88m 15Ch
- 88m 25Ch – 88m 55Ch
- 88m 70Ch – 89m 17Ch
- 89m 30Ch – 93m 36Ch

Proposed structures and stations located within the above mileages will also be at a medium risk for flooding from rivers and seas including all highway schemes and both proposed locations for Wisbech Station.

The majority of track is located on embankment with drains identified at the toe of the slopes and hence surface water drainage is not anticipated to be a risk to this development [14].

4.2 Nitrate

Between 85m 75Ch and 89m 10Ch has been designated as a Nitrate Vulnerable Zone defined as being at risk from agricultural nitrate pollution [13].

4.3 Radon

The site is in a lower probability radon area with less than 1% of homes above the action level [15].

5 Qualitative Contaminated Land Risk Assessment

The primary regulatory regime, under which contaminated land in the UK is managed, is Part II A of the Environmental Protection Act (EPA), 1990, although numerous other subsidiary Regulations are also relevant. This report adopts a strategy for the assessment of potential land contamination based on current guidance documents related to Part II A of the EPA. Particular reference is made to CIRIA Report C552 [6] and to the Model Procedures for the Management of Land Contamination, CLR 11 [5].

Following the procedures in CLR 11, a key element of the Preliminary Risk Assessment is the development of a conceptual model which may be refined or revised as more information and understanding is obtained through the risk assessment process. The conceptual model is described in terms of the contaminant Sources, transport Pathways and possible Receptors that may be present, and the potential 'Pollutant Linkages' between them, as defined in the relevant legislation and guidance. These activities are described in CIRIA C552 as "hazard identification".

A key element of an environmental risk assessment is the development of a conceptual model which is done by undertaking a Source –Pathway – Receptor analysis of the Site:

- Sources (S) are potential or known contaminant sources e.g. a former land use;
- Pathways (P) are environmental systems thorough which a contaminant could migrate e.g. air, groundwater;
- Receptors (R) are sensitive environmental receptors that could be adversely affected by a contaminant. E.g., Site occupiers, groundwater resources.

Where a source, relevant pathway and receptor are present, a pollutant linkage is considered to exist whereby there is a circumstance through which environmental harm could occur and a potential environmental liability is considered to exist.

The conceptual model for the site is presented in Table 5.3. A qualitative risk assessment has been undertaken as described in Appendix E.

5.1 Development of Conceptual Model: Hazard Identification

For the proposed development site, the following sources, pathways and receptors have been identified.

It is assumed that a robust environmental management plan will be adopted during the construction works and as a result, no contamination will occur as a result of leaks and spills during construction.

Similarly, it is assumed that no contaminated material will be brought onto the site for use in the proposed development and all imported topsoil will be compliant with BS3882:2015 [16].

Table 5.1 presents the potential contaminant sources, pathways and receptors that have been identified.

Table 5.1: Sources, Pathways and Receptors

Sources, Pathways and Receptors	Details
Sources	**Overall Scheme** S1: Made ground associated with historical development. S2: Ground gas associated with made ground deposits. S3: Operation of the existing railway. **Area Specific** **Proposed Wisbech (South of Town Centre) Station** **Off-Site** S4: Former potentially contaminative land uses including warehouse, tanks and depots located 50m north. **Proposed Parkway (South of A47) Station** **Off-Site** S4: Former potentially contaminative land uses including Redmoor Mill 50m south. **Scheme 2: Waldersey Crossing** **On Site** S5: Former potentially contaminative land uses including historical Waldersea Drove Railway Sidings. **Scheme 5: Weasenham Lane** **On-Site** S6: Potentially infilled land associated with Virginia Waters Fish Pond. **Off-Site** S4: Former potentially contaminative land uses including factories and warehouses.
Pathways	P1: Human uptake pathways: – P1a: Soil and dust ingestion. – P1b: Dermal contact. – P1c: Inhalation of dust. – P1d: Inhalation of vapours. P2: Direct contact with contaminated or corrosive soils. P3: Inhalation and/or accumulation of ground gas. P4: Contaminant leachate. P5: Vertical / horizontal contaminant migration in groundwater or via drains.
Receptors	R1: Future site users R2: Construction & maintenance workers R3: Buried structures and services R4: The water environment

Table 5.2 presents potential contaminants of concern associated with the potential sources identified. It should be noted that this list may not be exhaustive.

Table 5.2: Potential Contaminants of Concern

Source	Contaminants of Concern
S1: Made ground associated with existing site development. S2: Ground gas associated with made ground deposits. S6: Potentially infilled land associated with Virginia Waters Fish Pond.	Metals, metalloids and their compounds, inorganics including asbestos, organics including TPH and PAH, ground gas (CO_2, CH_4, CO, H_2S).
S3: Operation of the existing railway. S5: Former potentially contaminative land uses including historical Waldersea Drove Railway Sidings.	Hydrocarbons: diesel, lubricating oils and paraffin, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), solvents, ethylene glycol, creosote, herbicides, ferrous residues, metal fines, ash and fill, sulphates [17]

Source	Contaminants of Concern
S4: Former potentially contaminative land uses including warehouse, tanks, depots, factories and mills.	Aluminium, antimony, arsenic, bismuth, boron, cadmium, chromium, copper, lead, magnesium, manganese, mercury, molybdenum, nickel, niobium, platinum, silver, tantalum, tin, titanium, tungsten, vanadium, zinc, charcoal, anthracite, boric oxide, chlorides, chrome oxides, fluorides, sulphides, sulphates, sulphides, sulphuric acid, hydrochloric acid, alkalis, organic solvents, mineral acids, halogenated solvents, non-halogenated solvents and fuels [18].

5.2 Preliminary Contaminated Land Risk Assessment

A qualitative contaminated land risk assessment for the site has been undertaken following the guidance presented in CLR11 [5] and CIRIA C552 [6]. The risk assessment presented in Table 7 is based on the pollutant linkages presented in the CSM.

Table 5.3: Preliminary Contaminated Land Risk Assessment

Source	Pathway	Receptor	Risk Rating	Comments
On-Site Overall Scheme S1: Made ground associated with historical development. S3: Operation of the existing railway. Area Specific Scheme 5: Weasenham Lane S4: Former potentially contaminative land uses including factories and warehouses. S6: Potentially infilled land associated with Virginia Waters Fish Pond.	P1: Human uptake pathways: – P1a: Soil and dust ingestion. – P1b: Dermal contact. – P1c: Inhalation of dust. – P1d: Inhalation of vapours	R1: Future site users	Probability: Low Likelihood Consequence: Minor Risk Category: Very Low Risk	• Following development, the stations and car parks will be completely covered in hardstanding making exposure to contaminants unlikely, however, further investigation required to confirm nature of contaminants and risk level.
		R2: Construction & maintenance workers	Probability: Likely Consequence: Mild Risk Category: Moderate Risk	• Potential short-term exposure to contaminants during construction works may occur, e.g. dust generation, dermal contact. • Further investigation required to confirm nature of contaminants present.
	P2: Direct contact with contaminated or corrosive soils	R3: Buried structures and services	Probability: Likely Consequence: Minor Risk Category: Low Risk	• Potential risk to buried structures and services if corrosive contaminants encountered on site. • Further investigation required to confirm nature of contaminants present.
	P4: Contaminant leachate. P5: Vertical / horizontal contaminant migration in groundwater or via drains.	R4: The water environment	Probability: Likely Consequence: Mild Risk Category: Moderate Risk	• Potential for contaminants in made ground or from point sources to leach/migrate to groundwater and drain network. • Further investigation required to determine impacted groundwater.
S1: Made ground associated with existing site development. S2: Ground gas associated with made ground deposits.	P3: Inhalation and/or accumulation of ground gas.	R1: Future site users R2: Construction & maintenance workers	Probability: Likely Consequence: Medium Risk Category: Moderate Risk	• Potential for ground gas generation associated with suspected made ground underlying the proposed station building footprint. • Further investigation required to determine if gas protection is required.
Off-Site Proposed Wisbech (South of Town Centre) Station S4: Former potentially contaminative land uses including warehouse, tanks and depots located 50m north. Proposed Parkway (South of A47) Station S4: Former potentially contaminative land uses including Redmoor Mill 50m south.	P4: Contaminant leachate. P5: Vertical / horizontal contaminant migration in groundwater or via drains.	R4: The water environment and services	Probability: Likely Consequence: Medium Risk Category: Moderate Risk	• Risk of contamination spreading through drain network from sources located around the site.

6 Geotechnical Risks

The anticipated ground conditions beneath the site are presented in Section 3. Based on the ground model and proposed development, the geotechnical hazards associated are presented in Table 6.1.

Table 6.1: Geotechnical Hazards

Aspect	Geotechnical Considerations
Unknown Ground Conditions	• Preliminary ground models based on historical ground investigations located off alignment/published bgs mapping. Information on strata, boundaries or consistency could be different to those observed. Information not available to determine suitable ground model or parameters for design.
Poor Ground Conditions	• Ground conditions underlying proposed structures and stations is limited and where available indicates thick layers of soft cohesive deposits and peat. Bedrock identified at Waldersey junction at approximately 26.5mbgl.
Unknown Groundwater Profile	• Limited groundwater information available. Groundwater level unknown at locations of proposed structures and stations.
Embankment Instability	• Visual observations from Mott MacDonald site walkover indicates potentially unstable embankments from track section 89m 50Ch and 90m 80Ch. • Stability of the embankments should be assessed and confirmed at the next GRIP stage including full track walkover survey to confirm current earthworks conditions.
Medium River and Coastal Flood Risk	• Flood mapping indicates areas of the site to be at risk from rivers and coastal flooding.
Remedial Works	• Potentially unstable embankments may require regrading with additional drainage at toe of slope.
Foundation Options	• Ground conditions are not known and may vary across the site. • Bedrock properties (including strength and weathering profile) are not known and may vary across the site. • Excavations may be required within potentially unstable made ground. Consideration should be given to the design of appropriate temporary works and earthworks. • Should shallow groundwater be encountered, excavations may require to be dewatered. • Lightweight embankment options recommended to reduce settlements of soft compressible soils. • Piled foundations likely to be required due to depths of made ground and soft cohesive materials expected on site.

7 Conclusions and Recommendations

This section contains an overview of the key findings and conclusions of this report. However, no reliance should be placed on any part of this summary without referring to the relevant sections in the report.

7.1 Risk Register

Presents a ground risk register for the site. It contains a summary of the risks associated with the ground conditions identified in this report whilst considering the proposed works.

Table 7.1: Ground Risk Register

ID	Hazard	Potential Control Measures
GE01	Ground conditions within the site may vary from those identified in the surrounding area.	Undertake a ground investigation to determine a suitable ground model for the site.
GE02	Variable ground strengths, profiles and consistencies throughout site.	Undertake in-situ and laboratory testing to inform ground model and parameters for design.
GE03	Unknown groundwater profile throughout the site.	Include groundwater monitoring within the ground investigation to determine groundwater profile.
GE04	Site at medium risk from fluvial flooding.	Ensure adequate protection included within design for fluvial flooding.
GE05	Contamination risk to sensitive receptors including human health and groundwater. (Preliminary assessment indicates moderate to low risk)	Ground investigation to include collection of soil and groundwater samples for chemical analysis. Undertake a Quantitative Risk Assessment.
GE06	Potential for ground gas due to thick deposits of made ground.	Ground gas monitoring recommended within investigation.

7.2 Ground Investigation Recommendations

Based on the above assessment, it is recommended that a detailed ground investigation is undertaken at the site in order to confirm the ground conditions for the development. The ground investigation should be carried out in accordance with BS 5930:2015 [19] and BS10175:2011 [4].

The ground investigation scope may include, but is not limited to, the following tasks, depending on the development proposals:

- Cable Percussive Boreholes to investigate;
  - Superficial ground conditions and obtain soil samples for geo-environmental and geotechnical laboratory testing.
- Hand dug inspection pits to investigate;
  - Existing bridge abutments and conditions.
- In-situ testing including Standard Penetration Tests (SPTs) to identify soil bearing strength and compressibility.
- Combined gas and groundwater monitoring installations with response zones targeted to characterise the ground gas and groundwater regimes beneath the site.
- Gas and groundwater level monitoring including carbon dioxide, oxygen, carbon monoxide, hydrogen sulphide and methane to assist with design of basement. Six visits at weekly

intervals are recommended, with at least one visit during low and falling atmospheric pressure.

- In-situ and laboratory geotechnical testing of soil.
- Chemical analysis of representative soil and groundwater samples to allow assessment of the risk posed to sensitive receptors including Waste Acceptance Criteria (WAC) testing for soil classification for potential off-site disposal and UKWIR testing for new pipework.

A detailed ground investigation will be designed at the next Grip stage.

8 References

[1] Mott MacDonald, “March to Wisbech Transport Corridor Grip 2 Heavy Rail Feasibility Report Rev B,” August 2019.

[2] BS EN 1997-1:2007, “Eurocode 7 - Geotechnical Design Part 1: General Rules,” 2004.

[3] BS EN 1997-2:2007, “Eurocode 7 - Geotechnical Design Part 2: Ground Investigation and Testing,” 2007.

[4] BS 10175:2011+A2:2017, “Investigation of Potentially Contaminated Sites – Code of Practice,” 2017.

[5] Environmental Agency, “Model Procedures for the Management of Land Contamination, Contaminated Land Report 11,” 2004.

[6] Construction and Industry Research and Information Association (CIRIA) C552, “Contaminated Land Risk Assessment - A Guide to Good Practice,” 2001.

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[8] National Library of Scotland, “Georeferenced Maps,” 2019. [Online]. Available: https://maps.nls.uk/geo/explore/side-by-side/#zoom=16&lat=52.5627&lon=0.0924&layers=1&right=BingHyb.

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[13] Department of Environment, Food and Rural Affairs, “MAGIC Online Viewer,” 2019. [Online]. Available: https://magic.defra.gov.uk/MagicMap.aspx.

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[16] BS 3882:2015, “Specification for Topsoil,” 2015.

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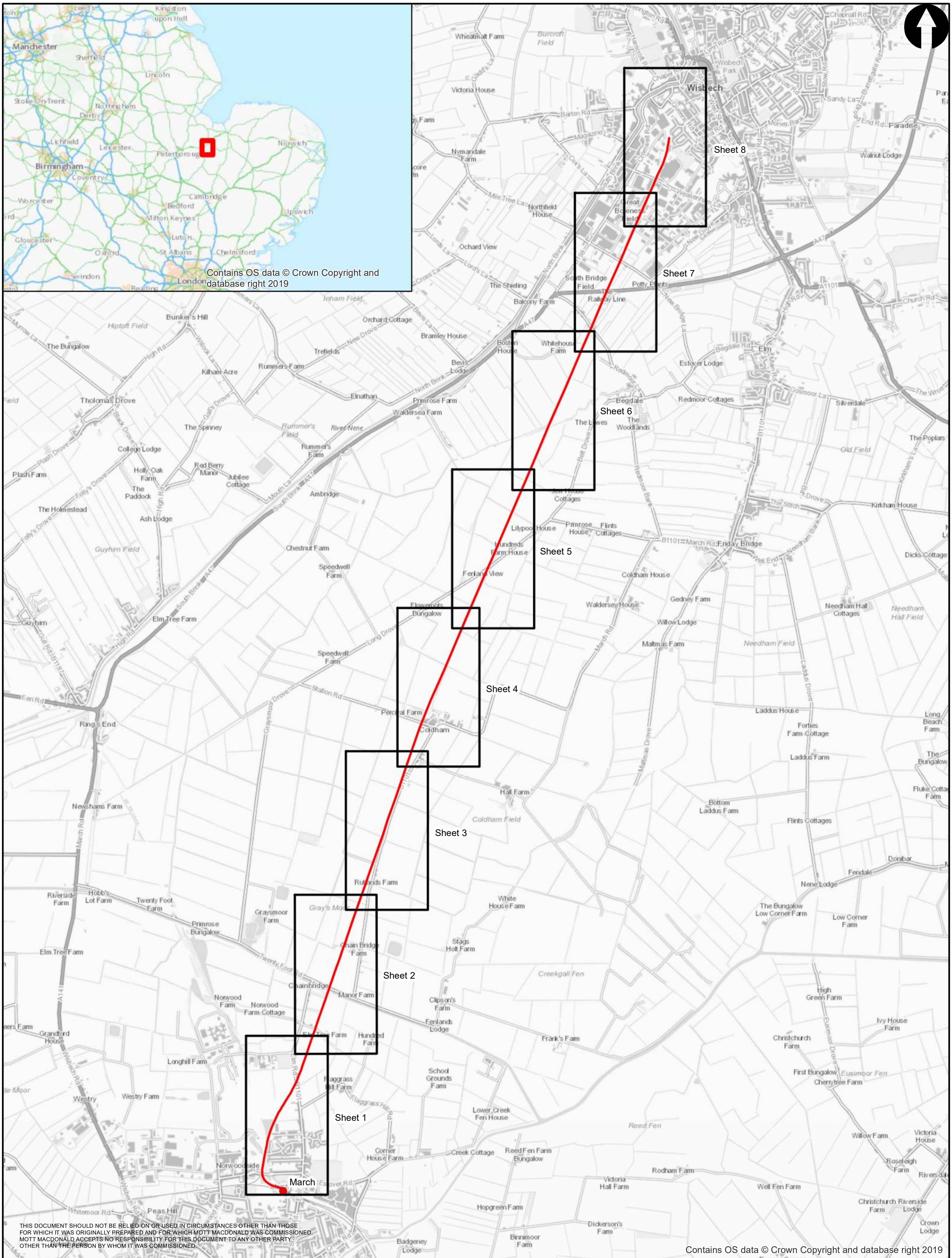
[18] Department of the Environment , “Industry Profile: Metal Manufacturing, Refining and Finishing Works,” 1996.

[19] BS 5930:2015, “The Code of Practice for Site Investigations,” 2015.

Appendices

A. Drawings

A.1 Site Location Plans



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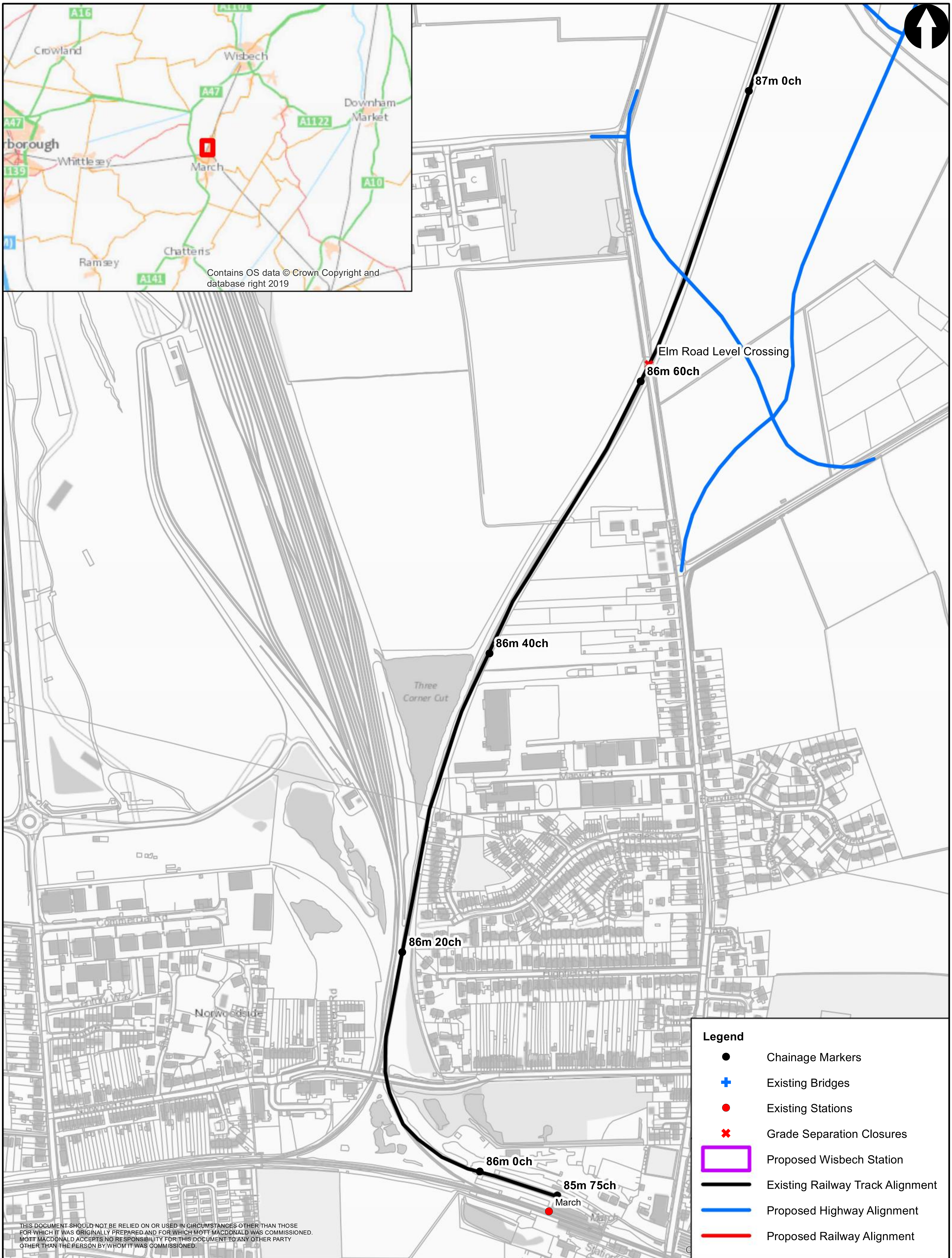

Title

March to Wisbech Transport Corridor
Site Location Plan
Figure A1.1

MOTT MACDONALD

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United Kingdom

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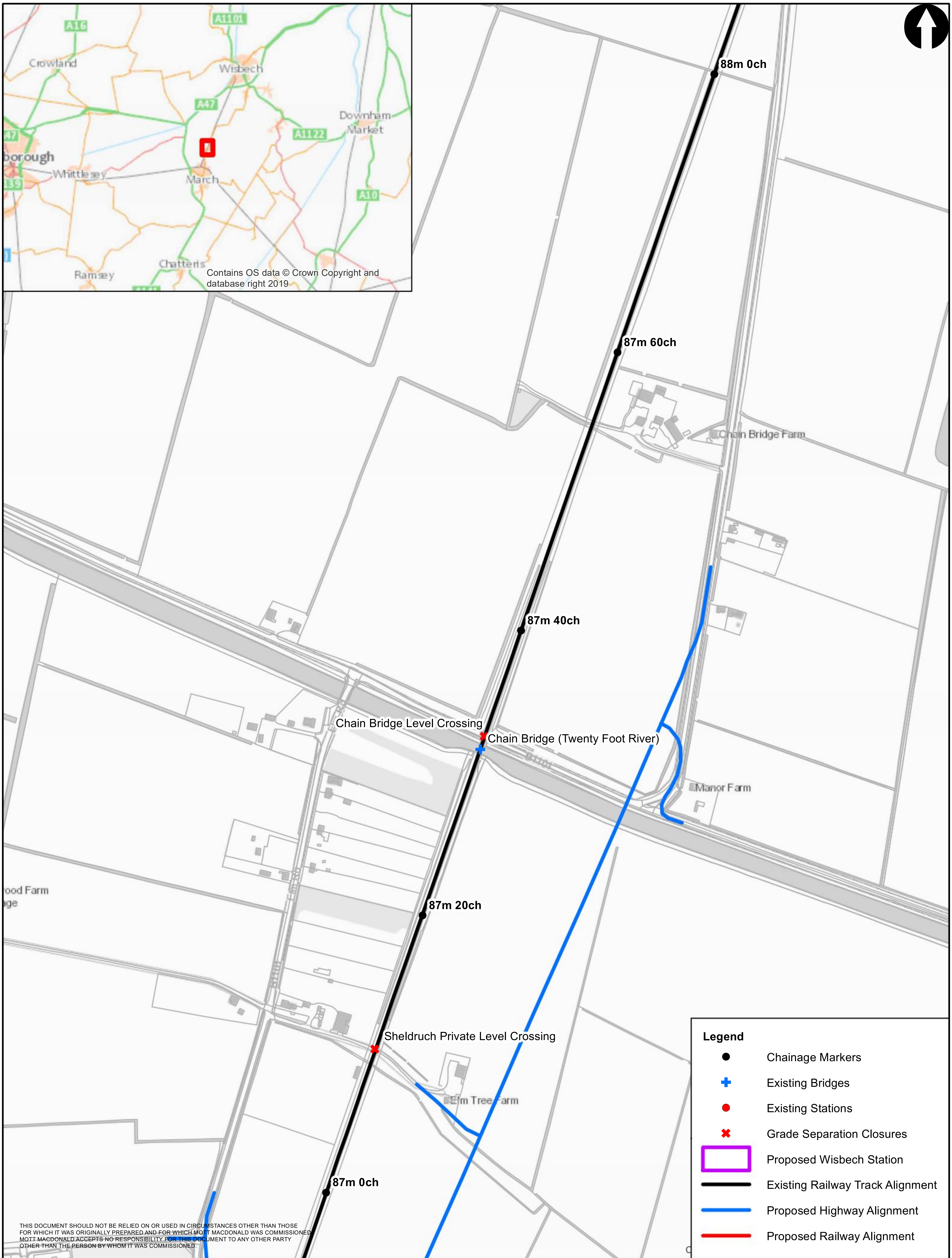

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Figure A1.2

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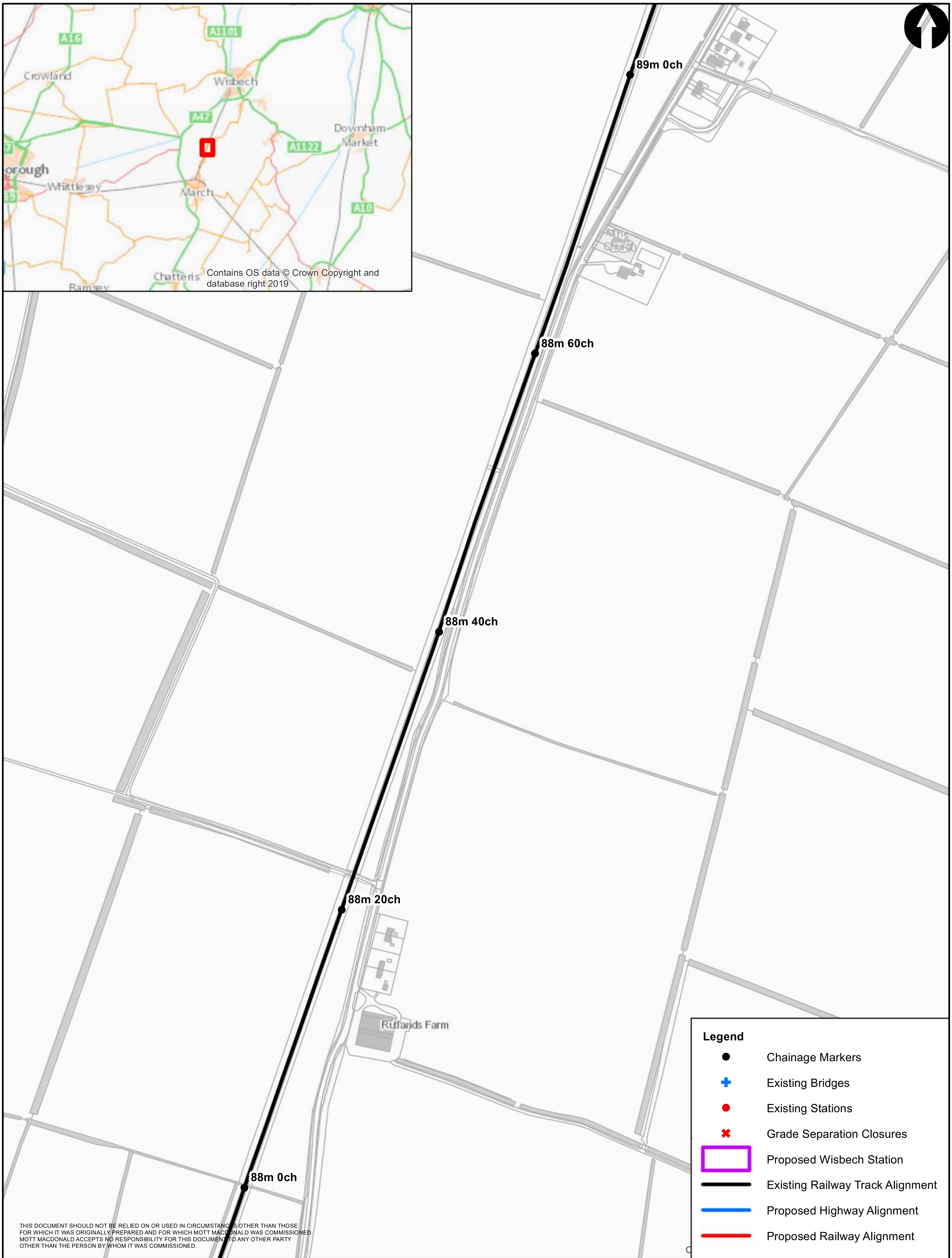

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March to Wisbech Transport Corridor
Site Location Plan
Figure A1.3

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United Kingdom

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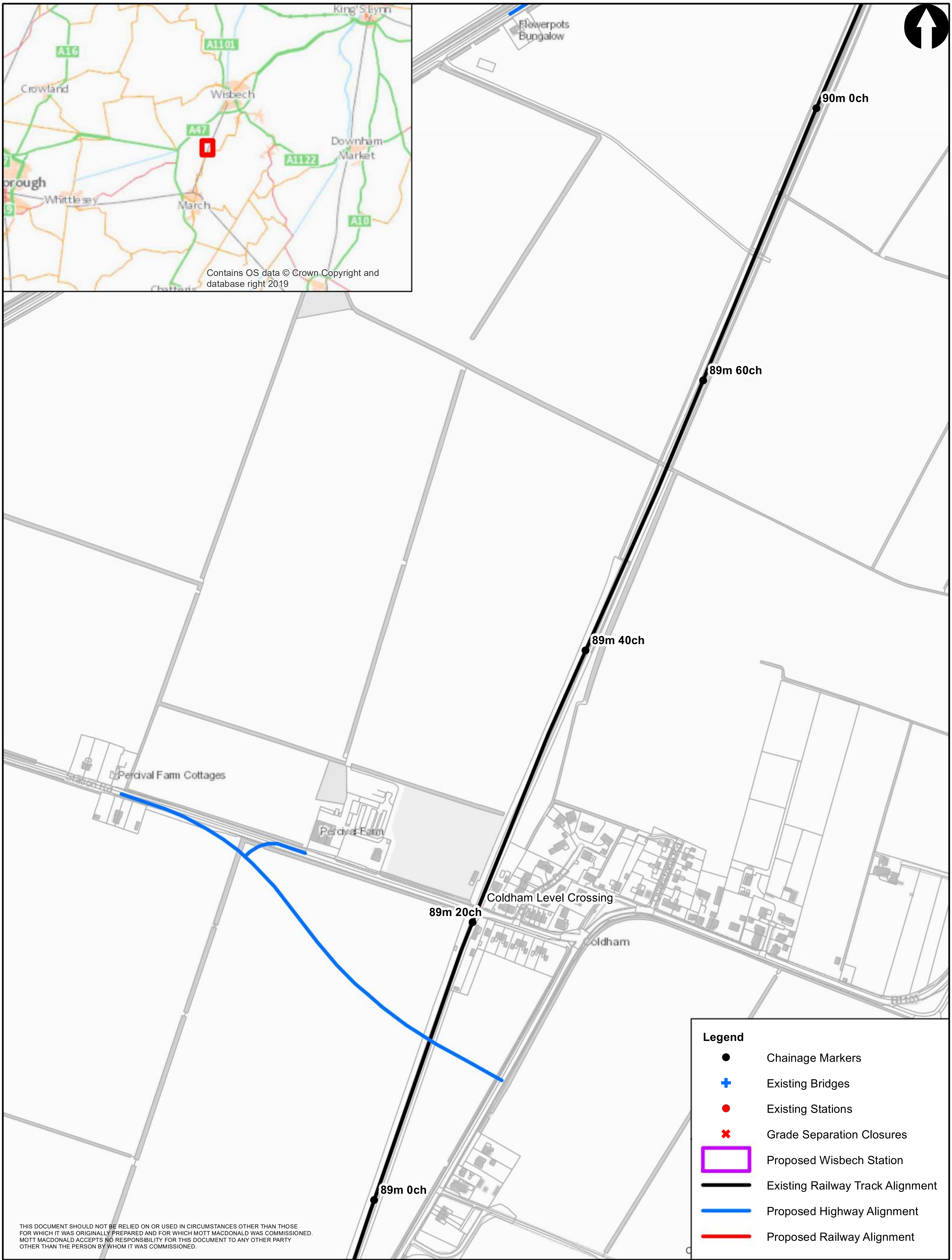

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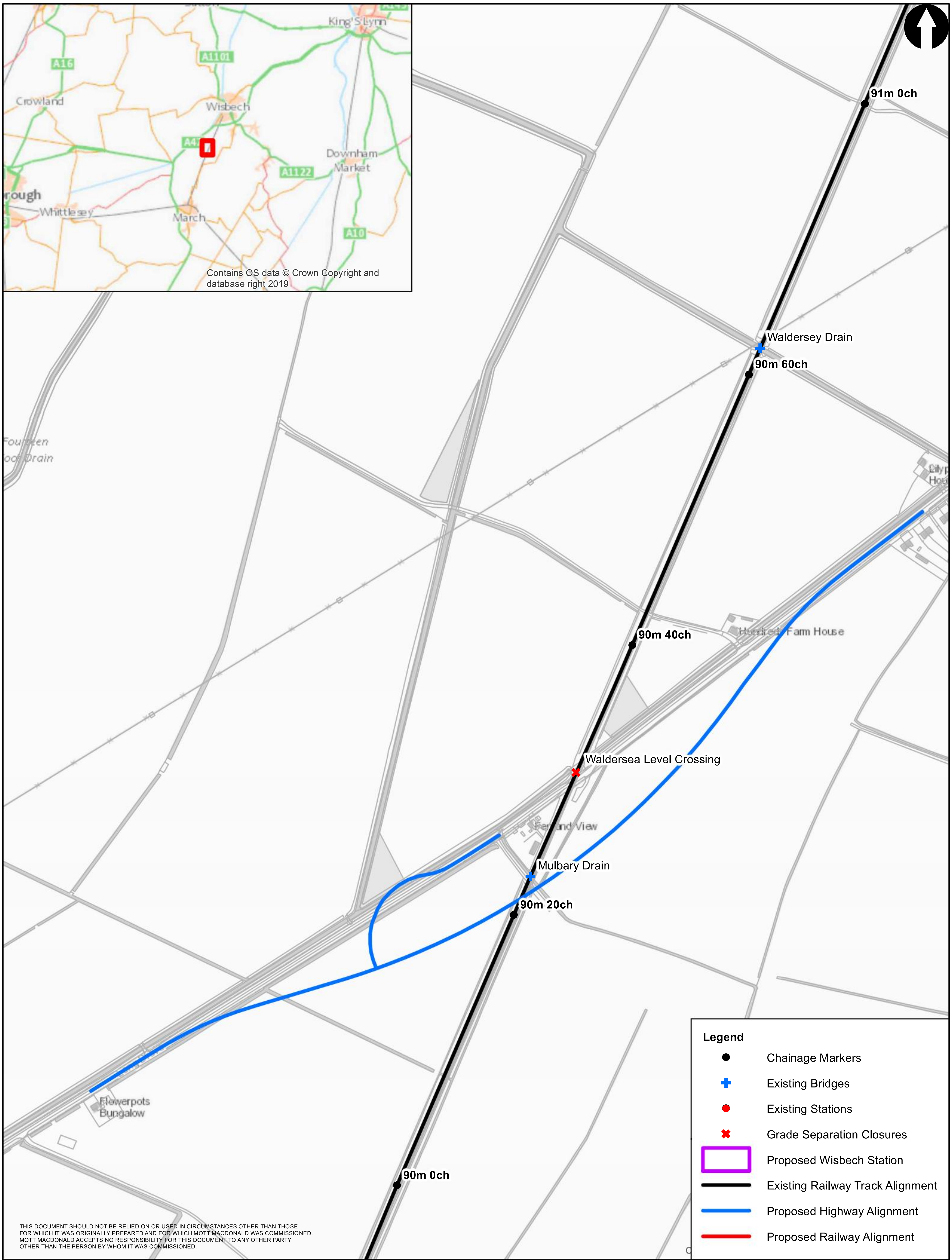

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Site Location Plan
Figure A1.5

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Derwent House
150 Arundel Gate
Sheffield S1 2JY
United Kingdom

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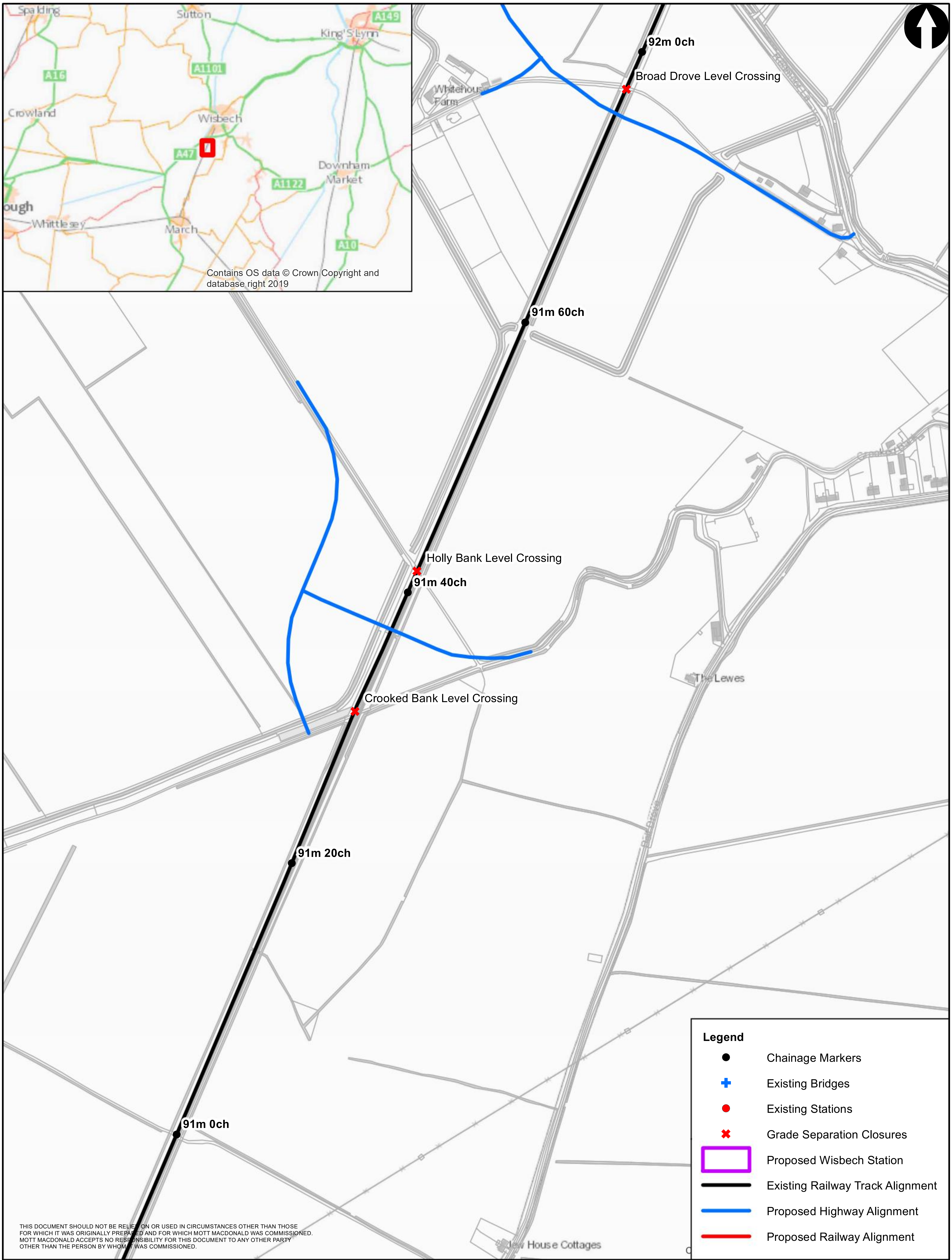

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March to Wisbech Transport Corridor Site Location Plan Figure A1.6	MOTT MACDONALD	Mott MacDonald 4th Floor Derwent House 150 Arundel Gate Sheffield S1 2JY United Kingdom

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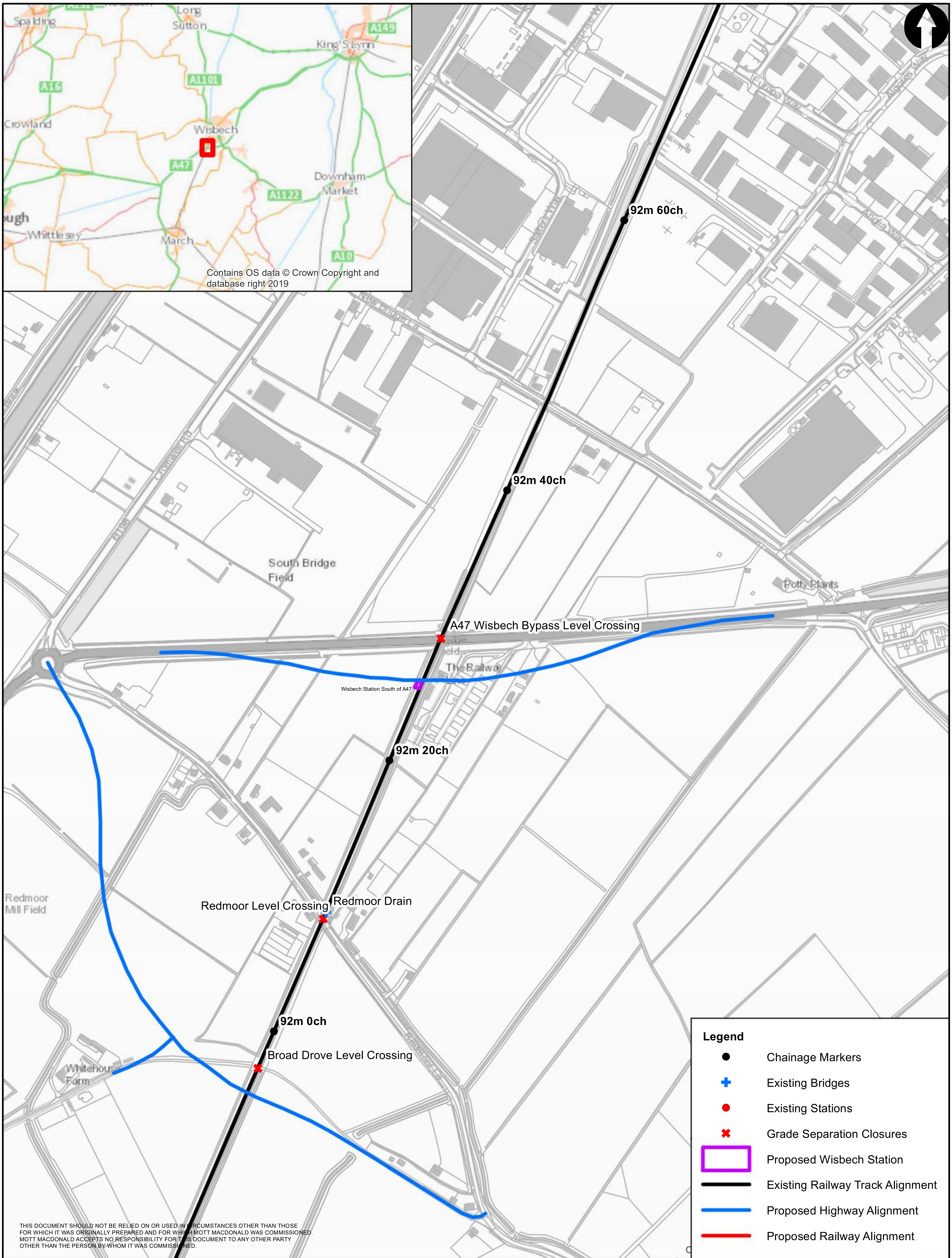

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March to Wisbech Transport Corridor
Site Location Plan
Figure A1.7

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Derwent House
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United Kingdom

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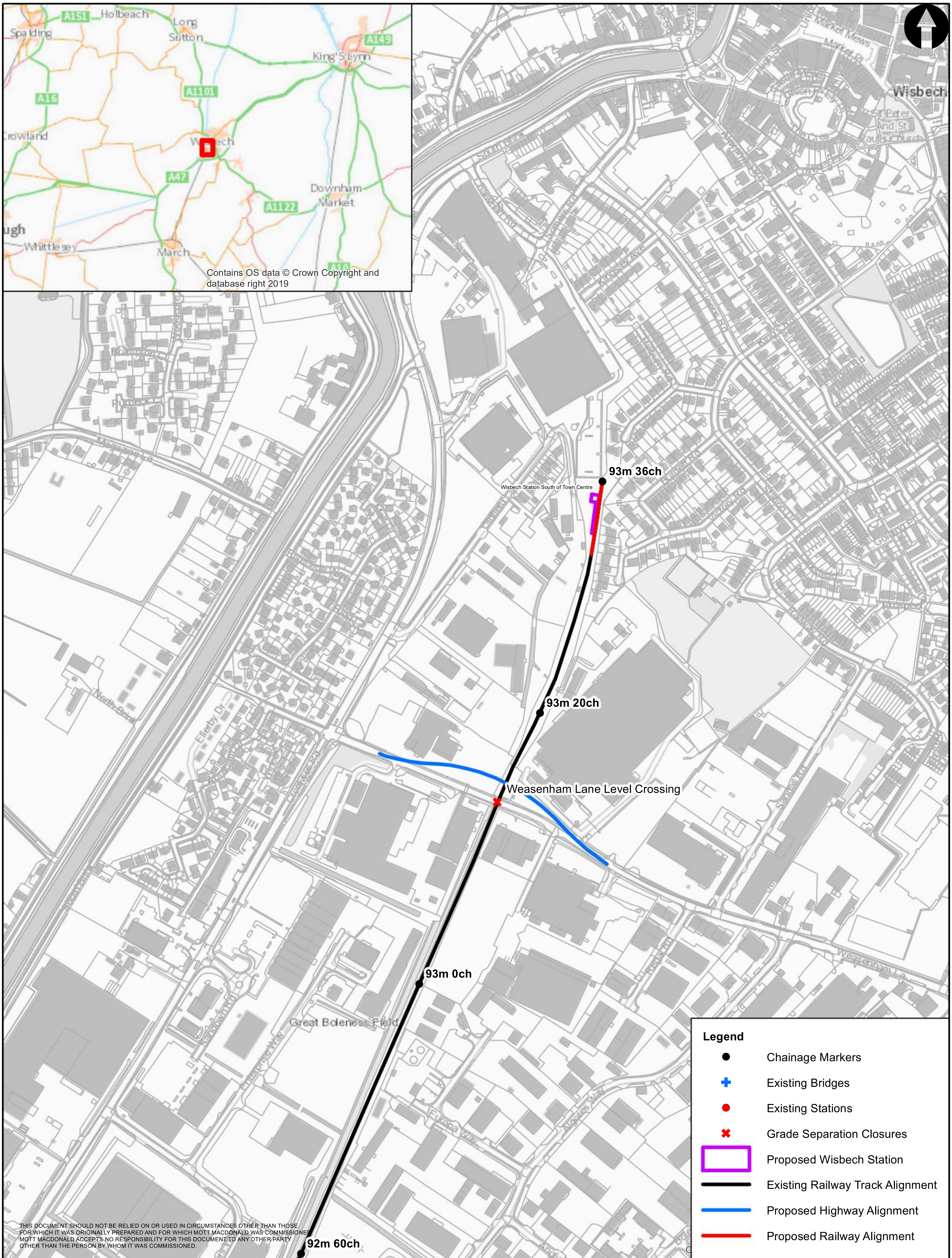

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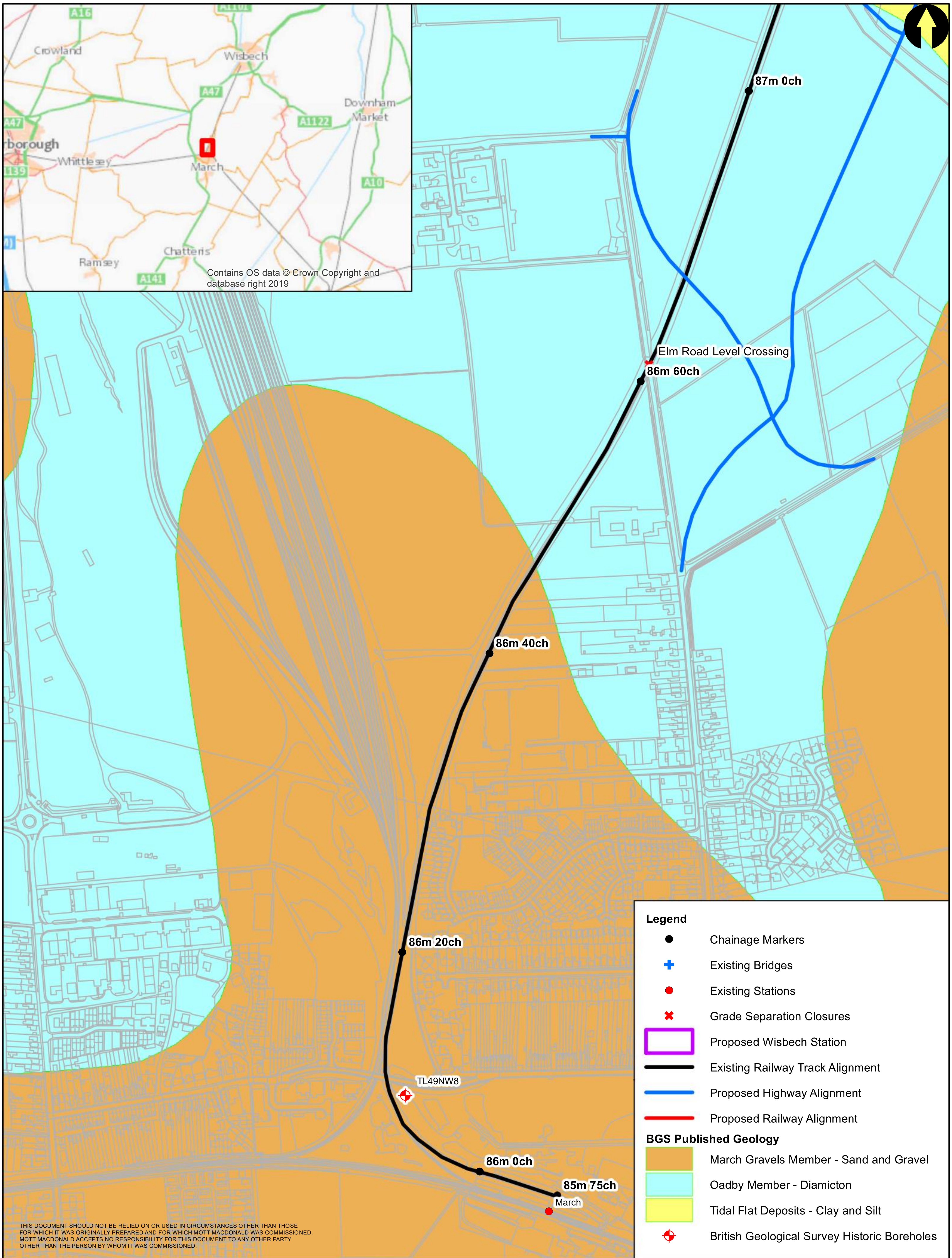
A.2 Geology and Borehole Location Plans



Title
March to Wisbech Transport Corridor
Superficial Geology and Borehole Locations
Figure A2.1

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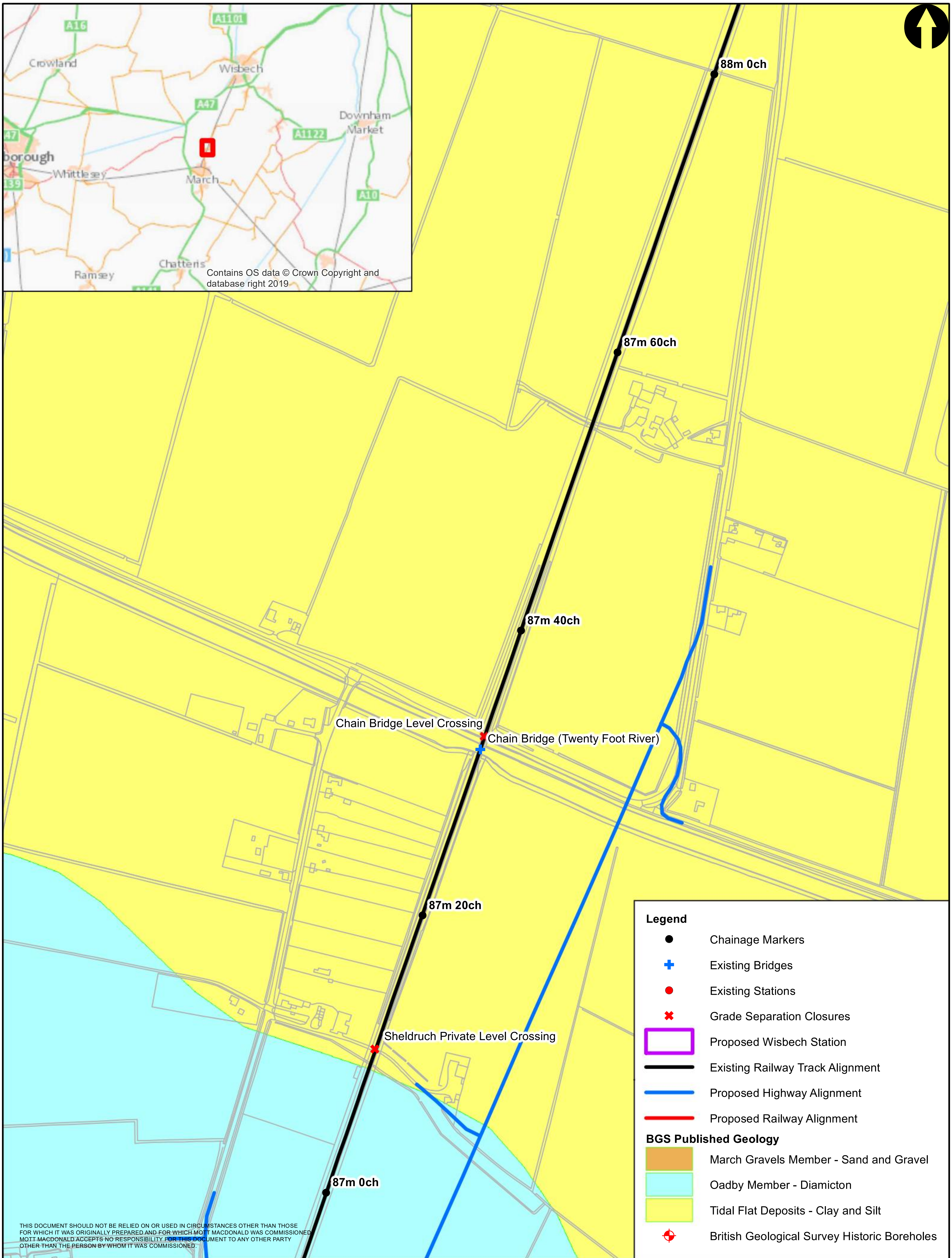

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March to Wisbech Transport Corridor
Superficial Geology and Borehole Locations
Figure A2.2

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United Kingdom

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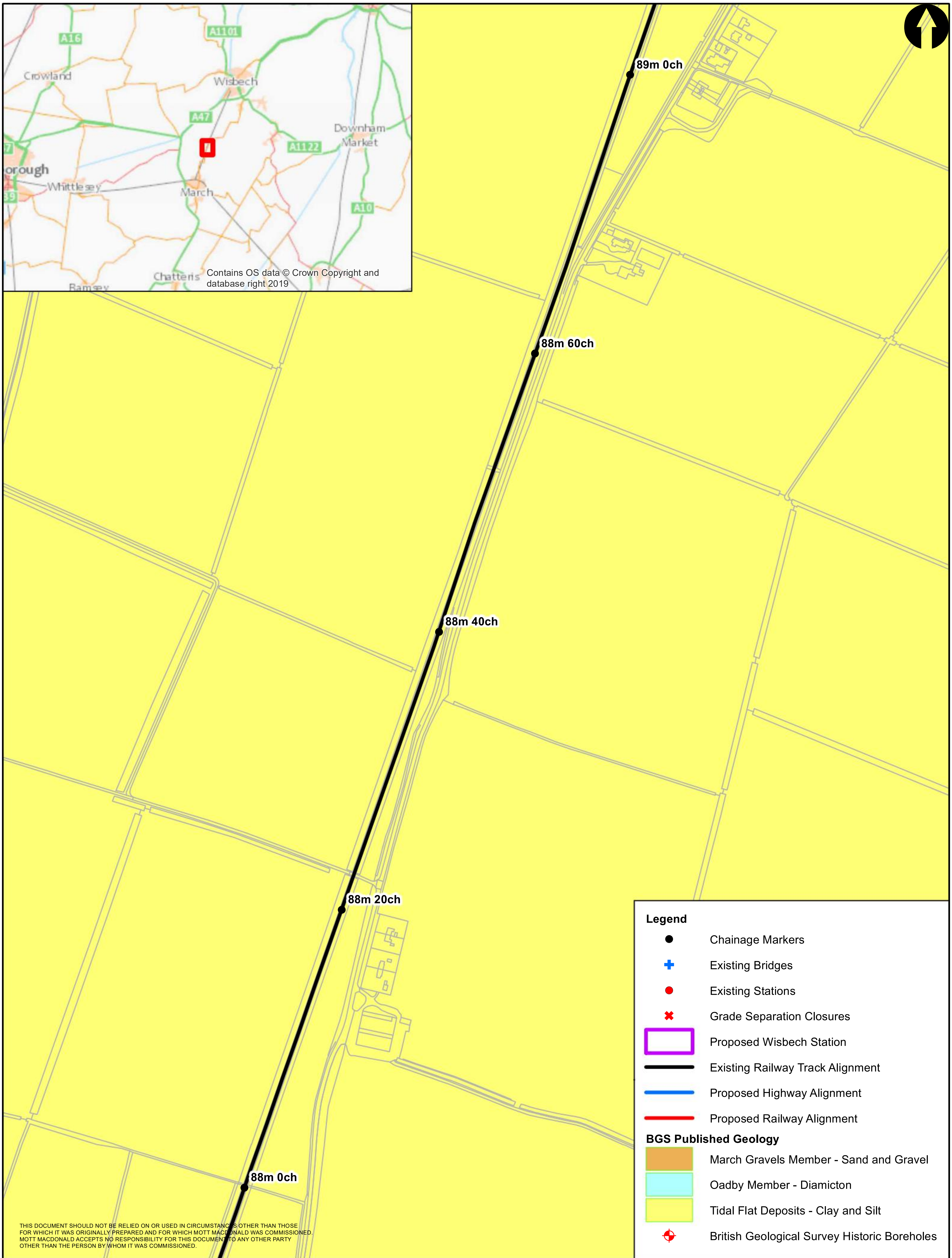

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March to Wisbech Transport Corridor
Superficial Geology and Borehole Locations
Figure A2.3

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150 Arundel Gate
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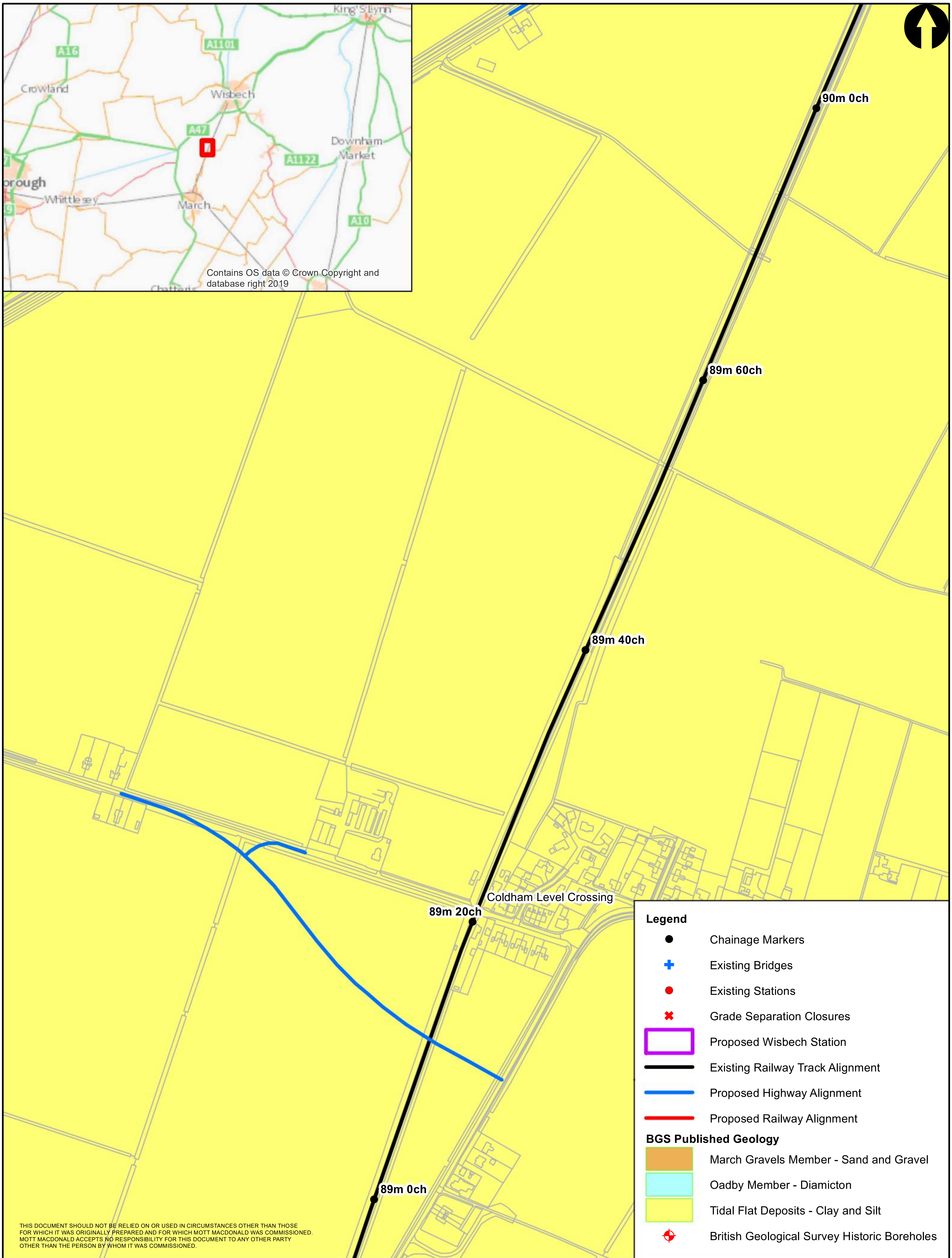

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March to Wisbech Transport Corridor
Superficial Geology and Borehole Locations
Figure A2.4

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Date	Drawn	Chkd	Appvd	Scale	Drawing	Rev	Status
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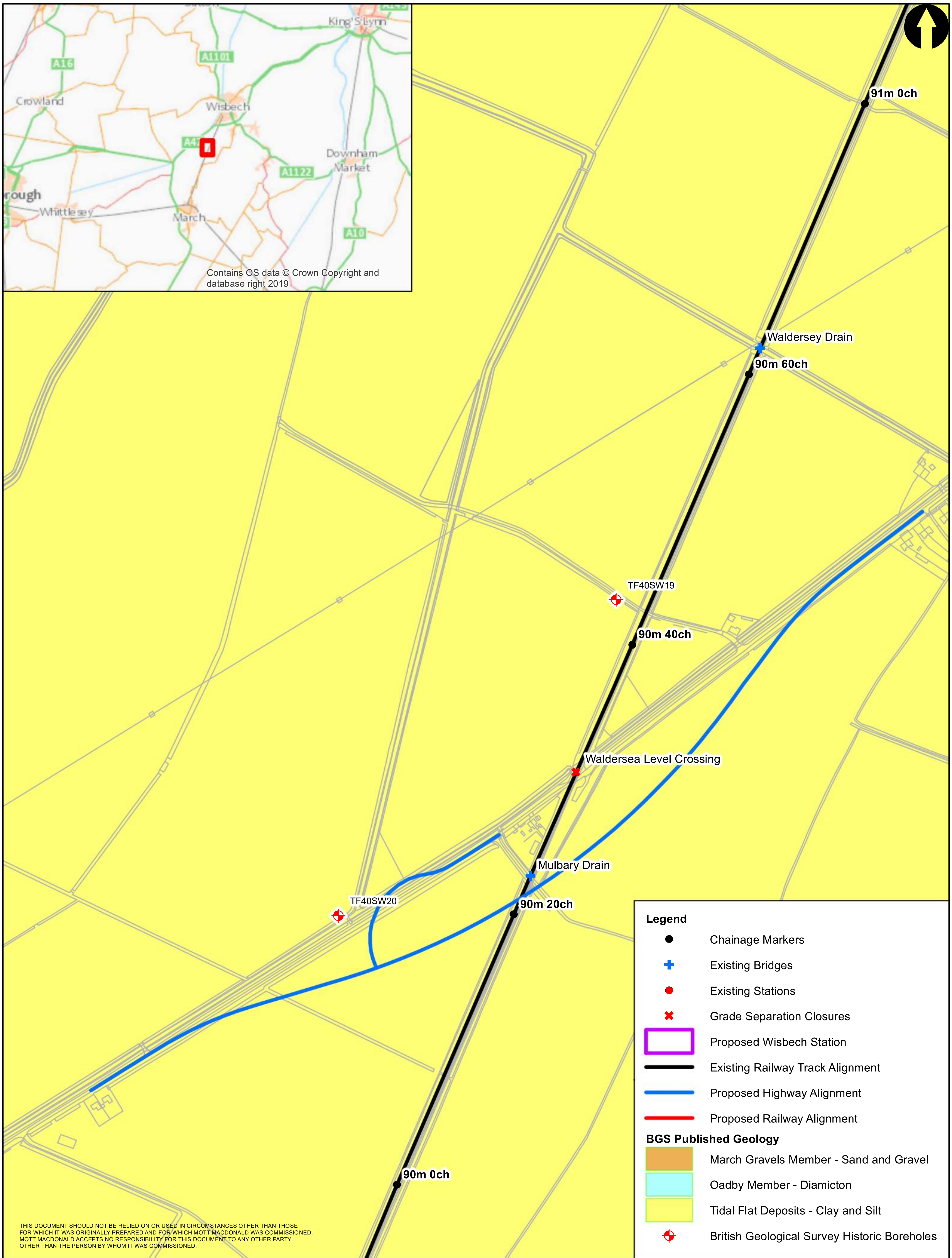
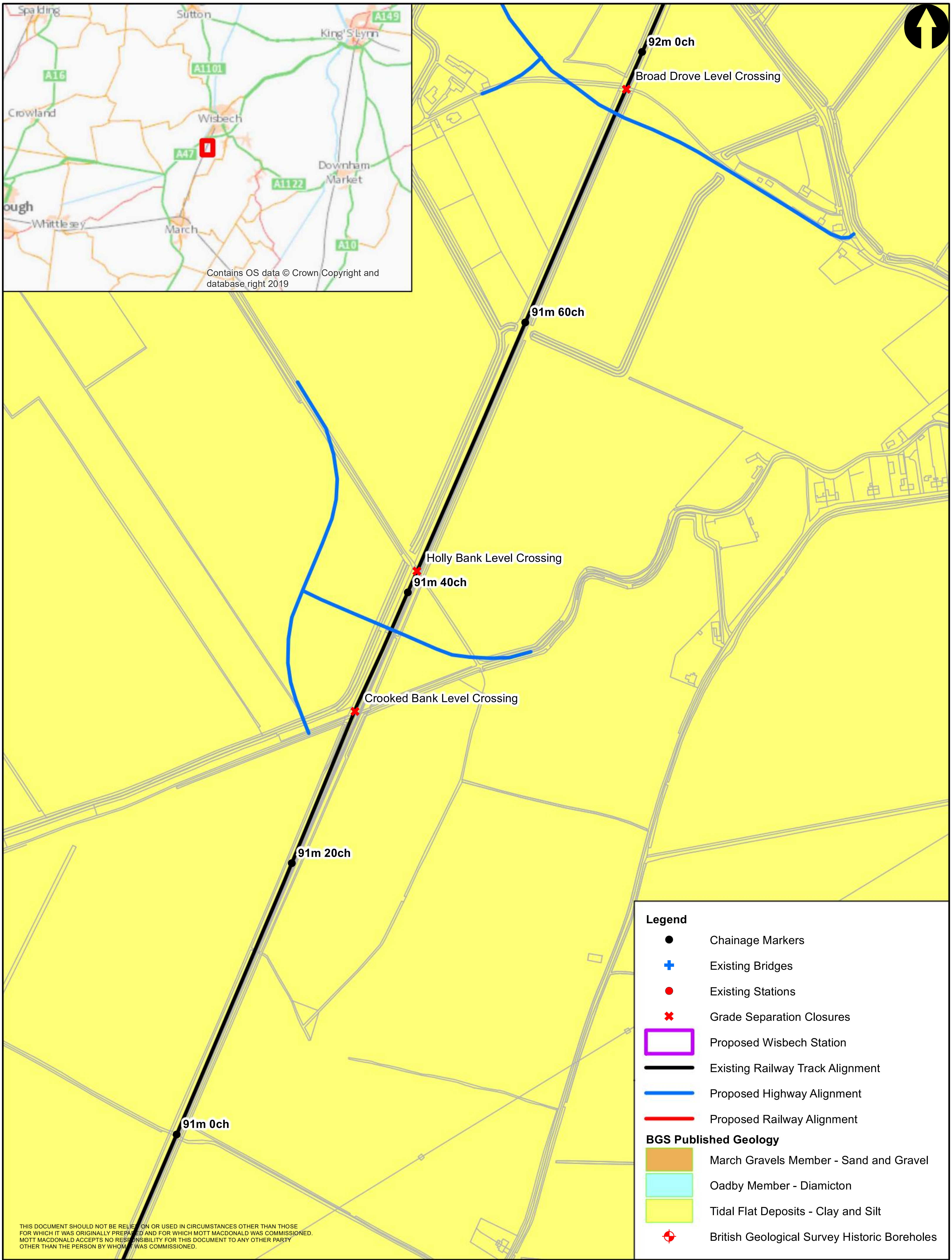


Title

March to Wisbech Transport Corridor
Superficial Geology and Borehole Locations
Figure A2.5

Mott MacDonald
4th Floor
Derwent House
150 Arundel Gate
Sheffield S1 2JY
United Kingdom

Date	Drawn	Chkd	Appvd	Scale	Drawing	Rev	Status
17/09/2019	AC	CH	AW	1:4,500	Figure A2.5	01	PRE

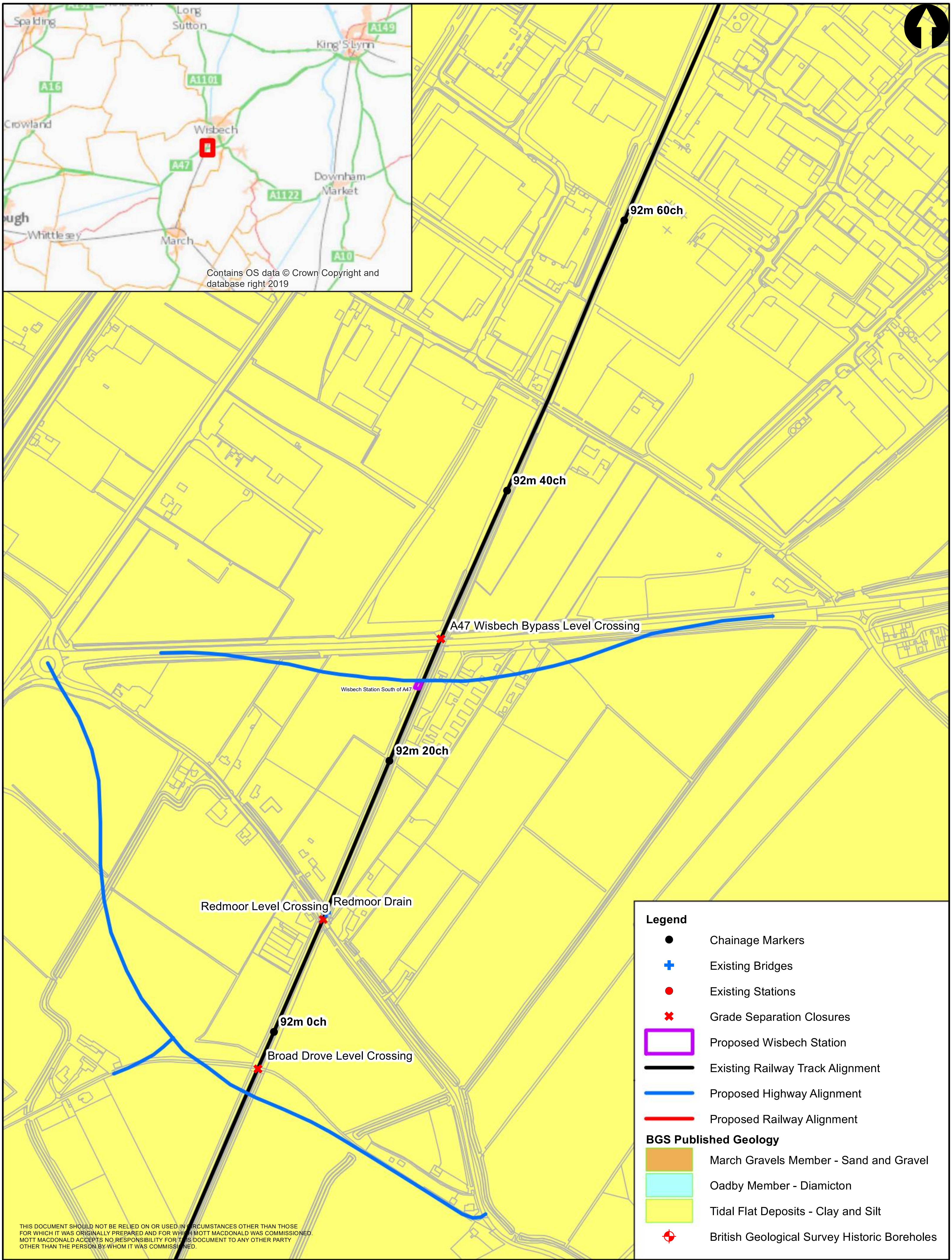


Title

March to Wisbech Transport Corridor
Superficial Geology and Borehole Locations
Figure A2.6

MOTT MACDONALD
Mott MacDonald
4th Floor
Derwent House
150 Arundel Gate
Sheffield S1 2JY
United Kingdom

Date	Drawn	Chkd	Appvd	Scale	Drawing	Rev	Status
17/09/2019	AC	CH	AW	1:4,500	Figure A2.6	01	PRE



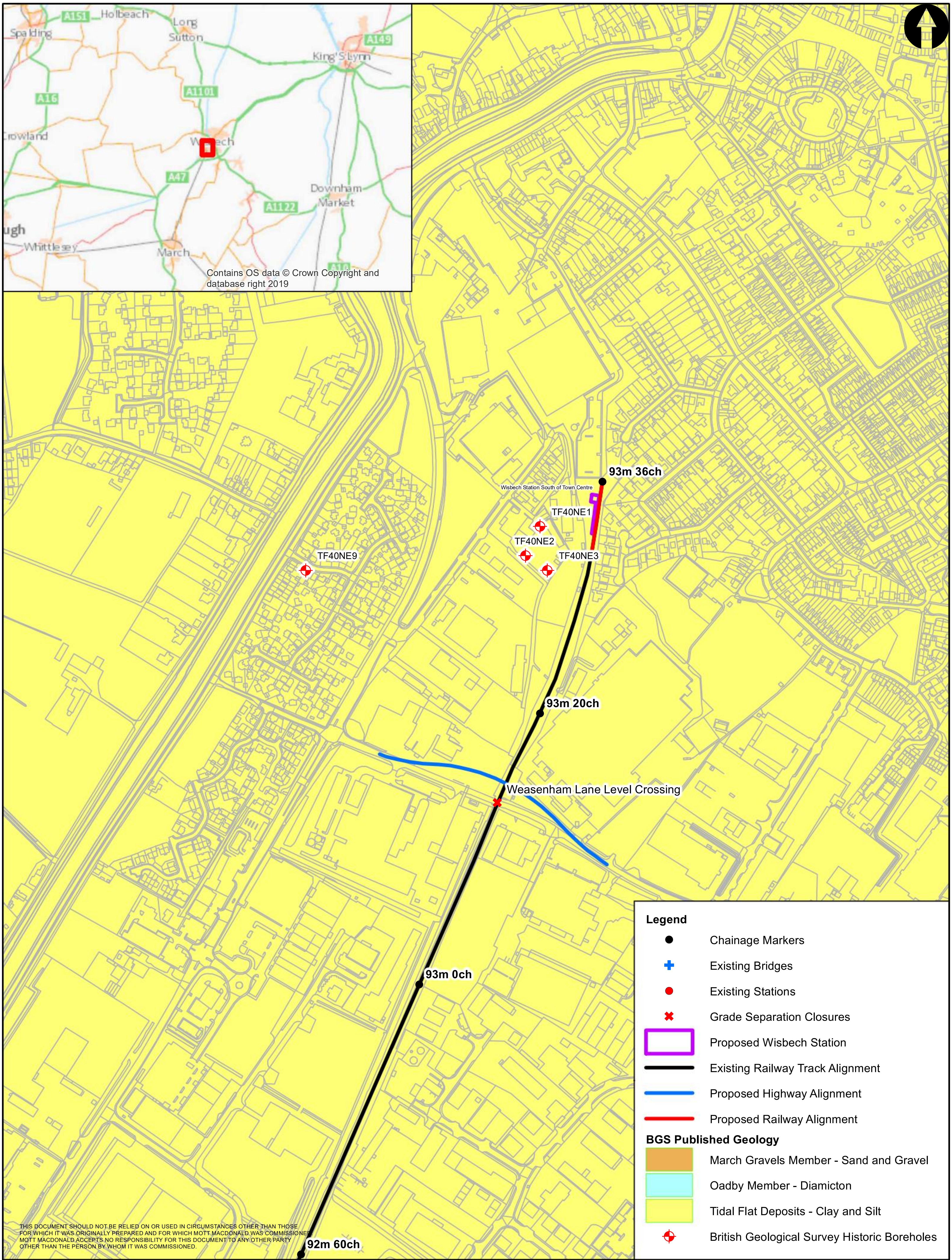
Title

March to Wisbech Transport Corridor
Superficial Geology and Borehole Locations
Figure A2.7

MOTT MACDONALD

Mott MacDonald
4th Floor
Derwent House
150 Arundel Gate
Sheffield S1 2JY
United Kingdom

Date	Drawn	Chkd	Appvd	Scale	Drawing	Rev	Status
17/09/2019	AC	CH	AW	1:4,500	Figure A2.7	01	PRE



Title

March to Wisbech Transport Corridor
Superficial Geology and Borehole Locations
Figure A2.8

MOTT MACDONALD

Mott MacDonald
4th Floor
Derwent House
150 Arundel Gate
Sheffield S1 2JY
United Kingdom

Date	Drawn	Chkd	Appvd	Scale	Drawing	Rev	Status
17/09/2019	AC	CH	AW	1:4,500	Figure A2.8	01	PRE

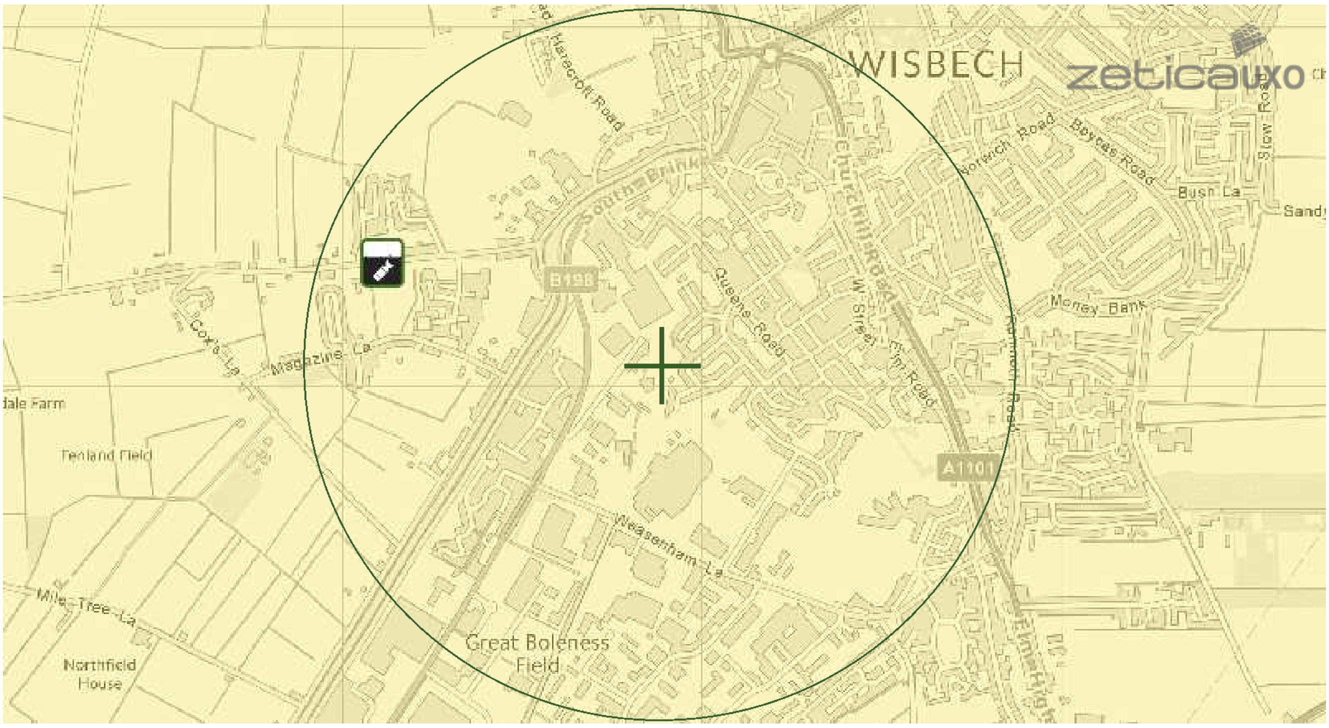
B. Unexploded Ordnance

B.1 UXB Risk Map – Wisbech (South of Town Centre) Station

UNEXPLODED BOMB RISK MAP

SITE LOCATION

Map Centre: 545894,309063



LEGEND

High: Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.

Moderate: Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.

Low: Areas indicated as having 15 bombs per 1000acre or less.

miltary **industry** **UXO find**

transport **dock** **Luftwaffe targets**

utilities **other**

How to use your Unexploded Bomb (UXB) risk map?

The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment* is necessary.

What do I do if my site is in a moderate or high risk area?

Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

If my site is in a low risk area, do I need to do anything?

If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our **pre-desk study assessments (PDSA)**

If I have any questions, who do I contact?

tel: **+44 (0) 1993 886682**

email: **uxo@zetica.com**

web: **www.zeticauxo.com**

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website: **(https://zeticauxo.com/downloads-and-resources/risk-maps/)**

It is important to note that this map is not a UXO risk assessment and should not be reported as such when reproduced.

*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.

B.2 Pre-Desk Study Assessment - Wisbech (South of Town Centre) Station

zeticaUXO

Pre-Desk Study Assessment

Site:	Land off Victory Road, Wisbech, Cambridgeshire
Client:	Mott MacDonald
Contact:	Ayla Cooper
Date:	14th August 2019
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a railway line on the Site. ■ Military Headquarters and recruitment centres.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a railway line on the Site. ■ Military camps and training areas. ■ Anti-Aircraft (AA) and anti-invasion defences.

WWII Bombing Decoys (within 5km of Site)	None.
WWII Bombing	During WWII the Site was located in the Municipal Borough (MB) of Wisbech, which officially recorded 55No. High Explosive (HE) bombs with a bombing density of 11.9 bombs per 405 hectares (ha). No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	A detailed desk study, whilst always prudent, is not considered essential in this instance.
This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary. It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.	

C. Borehole Records

C.1 Stations

C.1.1 March Station

159/2

159/2

TL 49 NW/8

NGR. 4161 9804

March.

Ordnance Map 159, new ser. (Cambridgeshire 12 S.W., 16 N.W.).
Geologic Map 65.
Railway Station 1883.

Boring, communicated by J. S. WINBOLT, who also showed me specimens (described in brackets). Fossils determined by G. SHARMAN.

	Thickness. Feet.	Depth. Feet.
Made ground (clay with stones, etc.)	11	11
Ballast (shelly gravel)	1	12
[Kimeridge] Clay (fragments of *Ammonites biplex?* and of *A. cordatus?* at 15 feet), septaria at 65 to 66	58	70
[Oxford] Clay, light-grey rather darker in parts, with septaria at or near top, at 84 to 85½, at 93½ to 95, at 143 to 144½, at 148½ to 150, at 155 to 157, at 167½ to 172, at 174½ to 176. *Gryphæa dilata* at 70 to 76, at 250 to 265 and at 274. *Avicula inæquivalvis* at about 128. Some stone, with bits of shell, between 145 and 160. Piece of wood at 249	214	284

March gravels (glacial clays)

Ampthill Clay or West Walton Beds or Oxford Clay

MS
21/6/77

There is some doubt as to the determination of the Ammonites, and unfortunately the specimens have not been kept. *A. biplex* is an Upper Kimeridge species, whilst *A. cordatus* is a Corallian one, though it occurs rarely in the Kimeridge Clay of Yorkshire, associated with *A. biplex*.

H.B. Woodward (Jur. Rks. Brit. v. (1895) 334) refers to a slightly different record of the same boring at the Gt. Eastern Rly Stn [illegible] "one of the [illegible], reached at a depth of 68 ft [illegible] 6 ft thick [illegible 68'–74' [illegible]] This may be a Corallian rock bed."

The opinion in WS Memoir, in H B Woodward (loc. cit.) & Sheet 65 (OS) (loc. infra cit.) [illegible] Kim. clay ([illegible], Skertchly, Expl. Sheet 65, p 8); but with Oxford Clay reached in brick pits ca 40' deep [? [illegible]]

[W. Whitaker in Expl. Sheet 65 O.S., 1893, p. 6 [illegible] Kimeridge [illegible] of the formation and "belongs" [illegible] "summit of Corallian & Oxford Clay". [illegible] "the [illegible] of Corallian Clay, but is interesting as showing the absence of Corallian [illegible] rock-beds. The equivalent of the Corallian probably [illegible] in the clay classed as Kimeridge" in the bore record. [illegible] Skertchly's [illegible] "classed as Kimeridge clay because [illegible] of that age, but Oxford Clay (? Corallian) fossils are also found".

→ E. Neaverson (Proc. Geol. Assoc. 1925, pp 36, 37) [illegible] Kim. Clay [illegible] March [illegible] Kimeridge [illegible] Drift

No information available at March Station
Station Master – staff have no knowledge of bore
Write to District Engineer Cambridge
[illegible]
22.6.47.

Site received from District Engineer, LNER Cambridge and marked on 6" CAMBS 12 SW/W [illegible] 6.11.47.

Visited. No trace. Disused. OD + 11. 289.60 A&R.

Water Supply of
Cambs., Hunts.
& Rutland.
Page 81
copied from Expl. Sheet 65 (O.S.) p. 154, 1893

C.1.2 Wisbech Town (South of Town Centre) Station

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

Name of Shaft or Bore given by Geological Survey:

Name and Number given by owner: Wisbech P.O. Eng. Depot Oldfield Lane B.H. 1

For whom made

Town or Village Wisbech County Cambs.

Exact site (Attach a tracing from a map, or a sketch-map, if possible.)

Purpose for which made trial

Ground Level at shaft/bore relative to O.D. 9·4 ft. If not ground level give O.D. of beginning of shaft/bore

Made by Soil Mechanics Ltd. Date of sinking ? 1961

Information from Date received

Examined by

(For Survey use only)

6-inch Map Registered No. TF/40NE/1

Nat. Grid Reference 4582 0901

1" N.S. Map No.	1" O.S. Map No.	Confidential or not
159		

SPECIMEN NUMBERS AND ADDITIONAL NOTES

(For Survey use only) Geological Classification	Description of Strata	Thickness Ft	Thickness In.	Depth M, Ft	Depth In.
	Top soil	1	0	(0·30) 1	0
	Soft brown silty clay, grey brown towards base	5	6	(1·98) 6	6
	Soft dark grey organic silty clay; light grey towards base	2	0	(2·59) 8	6
	Very soft brown clayey silt	1	6	(3·05) 10	0

D598293/1 P3815 4m 11/61 XL

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

(For Survey use only)
6-inch Map Registered No. TF/40NE/2

Name of Shaft or Bore given by Geological Survey:

Name and Number given by owner: Wisbech P.O. Eng. Depot Oldfield Lane B.H. 2

Nat. Grid Reference 4580. 0897

For whom made

Town or Village Wisbech County Cambs.

Exact site (Attach a tracing from a map, or a sketch-map, if possible.)

1" N.S. Map No.	1" O.S. Map No.	Confidential or not
159		

Purpose for which made trial

Ground Level at ~~shaft~~ bore relative to O.D. 8·3 ft   If not ground level give O.D. of beginning of shaft bore

Made by Soil Mechanics Ltd.   Date of sinking ? 1961

Information from   Date received

Examined by

SPECIMEN NUMBERS AND ADDITIONAL NOTES

(For Survey use only) Geological Classification	Description of Strata	Thickness Ft	Thickness In.	Depth (M) Ft	Depth In.
	Topsoil	1	0	(0·30) 1	0
	Soft brown silty clay, grey brown towards base	3	8	(1·42) 4	8
	Soft dark grey organic silty clay; light grey towards base	3	7	(2·51) 8	3
	Very soft grey brown clayey silt	11	9	(6·10) 20	0

D598293/1 F585 4m 11/61 XL

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

(For Survey use only)
6-inch Map Registered No. TF/40NE/3

Name of Shaft or Bore given by Geological Survey:

Name and Number given by owner: Wisbech P.O. Eng. Depot Oldfield Lane B.H. 3

Nat. Grid Reference 4583. 0895

For whom made

Town or Village Wisbech County Cambs

Exact site (Attach a tracing from a map, or a sketch-map, if possible.)

1" N.S. Map No.	1" O.S. Map No.	Confidential or not
159		

Purpose for which made Trial

Ground Level at shaft/bore relative to O.D. 8·5 ft If not ground level give O.D. of beginning of shaft/bore

Made by Soil Mechanics Ltd. Date of sinking

Information from Date received

Examined by

SPECIMEN NUMBERS AND ADDITIONAL NOTES

(For Survey use only) GEOLOGICAL CLASSIFICATION	DESCRIPTION OF STRATA	THICKNESS FT	THICKNESS IN.	DEPTH M FT	DEPTH IN.
	Topsoil	1	0	(0.30) 1	0
	Soft brown silty clay; grey-brown towards base	5	10	(2.13) 6	10
	Soft dark grey organic silty clay; light grey towards base	1	2	(2.44) 8	0
	Very soft grey-brown clayey silt	2	0	(3.05) 10	0

D598293/1 P3685 4m 11/61 XL

59/47 - 51

TM 40 NE Nos 6-9

BH No 159/47 filed under TF 40 NW/8 NGR 4466 0904

INLAND WATER SURVEY

RECORDS OF WELL-MEASUREMENTS

TF40NE/6-9 *

SCHOOL : Wisbech G. Sch.

SIX-INCH FIELD-SLIP : Cambs. 7 N.E./W.

Well No.	Location of Site and notes on character of water, etc.	Height of Surface above O.D.	Total Depth of Well	Depths to Water Mar. 1937	Oct. 1937	Mar. 1938	Oct. 1938	Mar. 1939	Oct. 1939
(5) 47	Bramley House, Cox's Lane, Wisbech. 1932. Always contains water (26)	10·8'	10'1"	1'11"	5'4"	2'10"			
		O.D+7.	Cistern.						
		Visited 28.9.60 G.O.W.							
(6) 48(6)	Girling's Works, Elm Road, Wisbech (91)	20·7'	6'6"	3'10"	5'0"				
		O.D+14. Sealed by concrete floor. Now Cambridgeshire Motors Ltd. Visited 28.9.60 G.O.W.							
(7) 49(7)	Allotments, Prospect Place, Wisbech (92)	20·7'	9'0"	1'8"	6'0"				
		not known O.D+15.	Presumed filled in Visited 28.9.60 G.O.W.						
(8) 50(8)	Milner Road, Wisbech (98)	20·7'	7'6"	3'0"	6'0"	filled in	Next to 19, Milner Rd		O.D+15 Visited 28.9.60 G.O.W.
(9) 51(9)	South Brink, Gardiner Bros (68)	17·3'	14'0"	2'0"	7'0"				
		O.D+15 Presumed filled in. Unable to find in middle of orchard Visited 28.9.60 G.O.W.							

D 31452-1 1000 D/d 8506 2/37 R P

NGR
6 - 4662 0904
7 - 4639 0892
8 - 4642 0886
9 - 4556 0895

No geologues
MS 21/6/77

C.2 Structures

C.2.1 Scheme 2 – Waldersey

RECORD OF BOREHOLE 1 DIA. OF BORING: 0'8" TO 0'0"

GREAT OUSE — GUYHIRN

REF. NO. 596.
GROUND LEVEL 1.29 FT. O. D.

BORING: STARTED 24/3/65. FINISHED 29/3/65.

SAMPLE OR TEST DEPTH	TYPE
5'6"	V1
6'6"	D1
10'0"	V2
11'6"	D2
15'0"	V3
16'6"	D3
20'0"	V4
21'6"	D4
25'0" - 26'6"	U(4)1
26'9"	D5
32'0" - 33'6"	U(4)2
33'9"	D6
37'0" - 38'6"	U(4)3
38'9"	D7
42'0" - 43'6"	U(4)4
43'9"	D8
51'0" - 52'6"	U(4)5
52'9"	D9
61'0" - 62'6"	U(4)6
62'9"	D10
69'0" - 70'6"	U(4)7
70'9"	D11
88'6"	D12

CHANGE OF STRATA DEPTH	O.D. LEVEL	DESCRIPTION
1'6"	-0.21	LOOSE DARK BROWN TOPSOIL.
30'6"	-29.21	VERY SOFT GREY CALCAREOUS SILTY CLAY CONTAINING ORGANIC MATTER.
68'0"	-66.71	STIFF BECOMING VERY STIFF GREY BROWN AND GREY CALCAREOUS SILTY CLAY CONTAINING FINE AND MEDIUM ROUNDED AND SUB-ANGULAR CHALK GRAVEL.
87'9"	-86.46	VERY STIFF DARK GREY LAMINATED CALCAREOUS SILTY CLAY CONTAINING SHELL FRAGMENTS.
88'6"	-87.21	HARD LIGHT GREY LIMESTONE.

REMARKS SCALE 1" REPRESENTS 10'.
NO FREE GROUNDWATER ENCOUNTERED. CASING USED TO 89'0" BELOW GROUND LEVEL.

KEY D—DISTURBED SAMPLE; B—BULK do. do.; W—WATER do.
S( )—STANDARD PENETRATION TEST; C( )—CONE do. do.; No. OF BLOWS FOR 12in. PENETRATION IN BRACKETS
U(4)—4 in. dia. UNDISTURBED SAMPLE; V = IN-SITU VANE TEST.

WHATLINGS (FOUNDATIONS) LTD., 2410 LONDON ROAD, GLASGOW. E.2

RECORD OF BOREHOLE 2

DIA. OF BORING: 0'6" TO 55'0"

GREAT OUSE — GUYHIRN

REF. NO. 596.
GROUND LEVEL 1.21 FT. O. D.

BORING: STARTED 8/4/65. FINISHED 10/4/65.

SAMPLE OR TEST		CHANGE OF STRATA			
DEPTH	TYPE	LEGEND	DEPTH	O.D. LEVEL	DESCRIPTION
2'6"	D1		3'0"	-1.79	LOOSE DARK BROWN TOPSOIL.
6'6"	D2		7'0"	-5.79	SOFT DARK BROWN PEAT.
9'0"	D3				VERY SOFT TO SOFT GREY SILTY CLAY CONTAINING ORGANIC MATTER.
9'0"	V1				
14'0"	D4 V2				
19'0"	D5 V3				
	D6		20'0"	-18.79	
21'0" - 22'0"	S(28)				MEDIUM DENSE TO DENSE LIGHT BROWN MEDIUM AND COARSE SAND AND FINE AND MEDIUM GRAVEL CONTAINING SHELL FRAGMENTS.
	D7				
26'0" - 27'0"	S(32)				
30'9"	D8				
	D9				
33'0" - 34'0"	S(36)		35'6"	-34.29	
36'0" - 37'6"	U(4)2				FIRM BECOMING STIFF LIGHT BROWN AND GREY LAMINATED CALCAREOUS SILTY CLAY.
37'9"	D10				
41'0" - 42'6"	U(4)3				
42'9"	D11				
47'0" - 48'6"	U(4)4				
48'9"	D12				
53'0" - 54'6"	U(4)5				
54'9"	D13		55'0"	-53.79	

REMARKS SCALE 1" REPRESENTS 10'.
GROUNDWATER ENTERED THE BOREHOLE AT 20'0" BELOW GROUND LEVEL AND FELL OVERNIGHT FROM 20'0" TO 22'0" WITH THE HOLE AT 31'0" CASED TO 31'0". THE HOLE WAS DRY ON COMPLETION. CASING USED TO 50'0" BELOW GROUND LEVEL.

KEY D—DISTURBED SAMPLE
B—BULK do. do.
W—WATER do.
S( )—STANDARD PENETRATION TEST
C( )—CONE do. do.
No. OF BLOWS FOR 12in. PENETRATION IN BRACKETS
U(4)—4 in. dia. UNDISTURBED SAMPLE
V - IN-SITU VANE TEST.

WHATLINGS (FOUNDATIONS) LTD., 2410 LONDON ROAD, GLASGOW, E.2

D. Network Rail Earthwork Assessment Record Summary

Table D.1: Earthwork Inspection Details

Network Rail Earthworks Inspection Details						Mott MacDonald Visual Inspection Details
Track Section	Line	Inspection Date	Earthworks Category	Earthworks Hazard Category (EHC)	Comments	
89m 46.2Ch – 89m 51.5Ch	Up	28/02/19	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 40 degrees (approximately 1 in 1.19 slope). Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	Level crossing sign leaning towards right hand embankment slope when looking towards high mileage.
89m 56.5Ch – 89m 61.5Ch	Up	28/02/19	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 35 degrees (approximately 1 in 1.43 slope). Marshy areas identified on slope face. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	
89m 66.5Ch – 89m 71.5Ch	Down	22/12/08	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 20 degrees (approximately 1 in 2.75 slope). Marshy ground identified at or immediately beyond slope toe. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	Visible dip in vertical alignment of the track over approx. 40m. Both rails are dipped but appears worst on the right hand rail (when facing higher mileage). Ballast levels within the sleeper beds and on the ballast shoulder are low on the right hand side (when facing higher mileage) which may indicate the ballast is migrating down the embankment slope.
89m 71.5Ch – 89m 76.5Ch	Down	28/02/19	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 25 degrees (approximately 1 in 2.15 slope). Marshy areas identified on slope face. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	Visible horizontal misalignment over approx. 30 metres
89m 76.5Ch – 90m 1.55Ch	Down	28/02/19	Soil Embankment	A	Culvert located at 89m 77.2Ch requiring repairs. This embankment has a maximum height of 2.0m with a slope angle of 20 degrees (approximately 1 in 2.75 slope). Marshy areas have been identified on the slope.	

Network Rail Earthworks Inspection Details						Mott MacDonald Visual Inspection Details
Track Section	Line	Inspection Date	Earthworks Category	Earthworks Hazard Category (EHC)	Comments	
					Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional to frequent rabbit borrows identified.	
90m 1.55Ch – 90m 6.55Ch	Down	22/12/08	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 20 degrees (approximately 1 in 2.75 slope). Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional to frequent rabbit borrows identified.	
90m 6.55Ch – 90m 11.55Ch	Down	28/02/19	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 20 degrees (approximately 1 in 2.75 slope). Marshy areas indicated on face of slope and at or immediately beyond slope toe. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	Unidentified sign leaning towards right hand embankment slope (looking to higher mileage)
90m 11.55Ch – 90m 16.55Ch	Down	22/12/08	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 15 degrees (approximately 1 in 3.73 slope). Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	Further evidence of ballast migrating down the right hand slope of the embankment (towards higher mileage)
90m 16.55Ch – 90m 21.55Ch	Down	22/12/08	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 20 degrees (approximately 1 in 2.75 slope). Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	
90m 21.55Ch – 90m 26.55Ch	Down	22/12/08	Soil Embankment	A	This embankment has a maximum height of 2.5m with a slope angle of 20 degrees (approximately 1 in 2.75 slope). Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	Visible dip in track adjacent to the Wisbech side of underbridge/2315 (Mulberry drain). Sleepers where noted to be ‘handing’ off the rails in this area of approximately 10m and no ballast was supporting the sleepers.

Network Rail Earthworks Inspection Details						Mott MacDonald Visual Inspection Details
Track Section	Line	Inspection Date	Earthworks Category	Earthworks Hazard Category (EHC)	Comments	
90m 21.55Ch – 90m 26.55Ch	Up	15/02/11	Soil Embankment	A	This embankment has a maximum height of 4.0m with a slope angle of 45 degrees (approximately 1 in 1 slope). Marshy ground at or immediately beyond slope toe with groundwater issues present at toe. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Soil Slope Hazard Index category has been defined as marginal.	Visible dip in track adjacent to the Wisbech side of underbridge/2315 (Mulberry drain). Sleepers where noted to be 'handing' off the rails in this area of approximately 10m and no ballast was supporting the sleepers.
90m 31.55Ch – 90m 36.55Ch	Up	13/03/15	Soil Embankment	B	This embankment has a maximum height of 2.0m with a slope angle of 28 degrees (approximately 1 in 1.88 slope). Marshy ground at or immediately beyond slope toe. Concrete retaining wall identified between 90m 35.36Ch – 90m 35.59Ch. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	
90m 36.55 – 90m 41.55	Up	10/01/19	Grade / No Embankment	N/A	Average risk identified for rotational and translational slips. Average risk identified for earthflow, washout and burrowing. Average risk identified for vegetation, scour and drainage issues.	
90m 41.55Ch – 90m 46.55Ch	Down	02/08/19	Soil Embankment	A	This embankment has a maximum height of 2.5m with a slope angle of 25 degrees (approximately 1 in 2.15 slope). Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements.	
90m 41.55Ch – 90m 46.55Ch	Up	13/03/15	Soil Embankment	A	Average risk identified for burrowing and earthflow. This embankment has a maximum height of 2.0m with a slope angle of 28 degrees (approximately 1 in 1.88 slope). Marshy ground at or immediately beyond slope toe. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	

Network Rail Earthworks Inspection Details						Mott MacDonald Visual Inspection Details
Track Section	Line	Inspection Date	Earthworks Category	Earthworks Hazard Category (EHC)	Comments	
90m 46.55Ch – 90m 51.55Ch	Down	05/12/08	Soil Embankment	A	This embankment has a maximum height of 2.5m with a slope angle of 30 degrees (approximately 1 in 1.73 slope). Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	
90m 46.55Ch – 90m 51.55Ch	Up	13/03/15	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 28 degrees (approximately 1 in 1.88 slope). Marshy ground at or immediately beyond slope toe. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows identified.	
90m 51.55Ch – 90m 56.55Ch	Down	27/02/19	Soil Embankment	A	This embankment has a maximum height of 2.0m with a slope angle of 40 degrees (approximately 1 in 1.19 slope). Marshy areas identified on slope face and at or immediately beyond slope toe. Brick retaining wall identified at 90m 55Ch – 90m 55.23Ch. Movement indicator information identifies a uniform toe and uniform crest with no significant indication of track movements. Occasional rabbit borrows and Fox / Badger identified.	

E. Contaminated Land Risk Assessment Methodology

E.1 Regulatory Context

The primary legislative regime under which historic contaminated land is managed in the UK is Part IIA of the Environmental Protection Act (EPA), 1990. The framework for the assessment of potential land contamination adopted in this report is based on current guidance documents regarding the implementation of Part IIA of the EPA and the assessment of potentially contaminated land, with particular reference to:

- Department of the Environment Food and Rural Affairs (DEFRA) (2012) "Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance", April 2012 [20]
- Environment Agency (2009) "Human Health Toxicological Assessment of Contaminants in Soil", Science Report – SC050021/SR2 [21]
- British Standard (BS) 10175:2011 "Investigation of Potentially Contaminated Sites" [4]
- Environment Agency (2013) "Groundwater Protection Policy and Practice, GP3" [22]
- Department for Communities and Local Government (2012) "National Planning Policy Framework" [23]

Part IIA principally deals with sites where individual historic contamination linkages present a "Significant Possibility of Significant Harm" (SPOSH) or a Significant Possibility of Significant Pollution to Controlled Waters (SPOSPCOW) representing an unacceptable level of contamination risk for each linkage. The Part IIA clean-up is the minimum which can be done on a cost basis to make and keep the site in a "just safe" condition for an existing use.

Elimination of liability under Part IIA is not always achievable largely because of the inherent risk basis of the statutory regime, the technical difficulty in establishing levels of contamination that are likely to represent SPOSH, and the variable distribution of contamination at many sites. Statutory guidance on Part IIA DEFRA, 2012 [27] recognises that sites require prioritisation by Local Authorities under the statutory Part IIA site inspection programme to ensure that only those sites likely to present the greatest risks are identified. However, it should be recognised that considerable investigation is often required to establish whether sites are likely to meet the definition of contaminated land under Part IIA. Such investigation may be beyond the scope of project budgets for nominally "low risk sites" necessitating judgement on an acceptable level of investigation. Since the designation of Contaminated Land is the responsibility of the Local Authority, it is advised that consensus is sought on any recommendations regarding the significance of contaminated land risks and remedial measures through consultation with the Regulator(s).

Section 161 of the Water Resources Act 1991 states that the Environment Agency can recover clean-up costs on person(s) who caused or knowingly permitted the entry or presence of any poisonous, noxious or polluting matter or any solid waste into controlled waters. Contamination and environmental considerations are studied by developing a conceptual model of the site that describes the environmental features of the site together with the expected interaction of potential contamination sources and the wider environment.

E.2 Planning Context

The National Planning Policy Framework [23] includes the following policies in relation to contaminated land:

Policy 109: "The planning system should contribute to and enhance the natural and local environment by:

- Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and
- Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate"

Policy 120: "To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner."

Policy 121: "Planning policies and decisions should also ensure that:

- The site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;
- After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and
- Adequate site investigation information, prepared by a competent person, is presented."

The glossary states the following relation to "site investigation information:

- Site investigation information: Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures [such as BS10175 (2011) Code of Practice for the Investigation of Potentially Contaminated Sites]. The minimum information that should be provided by an applicant is the report of a desk study and site reconnaissance."

E.3 Qualitative Contaminated Land Risk Assessment

E.3.1 General

The methodology for the Phase II assessment of potential land contamination adopted in this report is based on current guidance documents, in particular CIRIA Report C552 [6].

E.3.2 Classification of Risk

The potential consequences of contamination risks occurring at this site are classified in accordance with the following table, which is adapted from the CIRIA C552 [6] guidance.

Table E.1: Classification of Consequence

Classification	Definition of Consequence
Severe	Short-term (acute) risks to human health. Short-term risk of pollution of sensitive water resource or ecosystem. Catastrophic damage to crops/ buildings/ property/ infrastructure, including off-site soils.
Medium	Medium/long-term (chronic) risks to human health. Medium/long-term risk of pollution of sensitive water resource or ecosystem. Significant damage to crops/ buildings/ property /infrastructure (on or off-site). Contamination of off-site soils.
Mild	Easily preventable, permanent health effects on humans. Pollution of non-sensitive water resources. Localised damage to crops/buildings/property/infrastructure (on or off-site).
Minor	Easily preventable, non-permanent health effects on humans, or no effects. Minor, low-level and localised contamination of on-site soils. Easily repairable damage to crops/buildings/property/infrastructure.

The probability of contamination risks occurring at this site will be classified in accordance with the table below which is also adapted from the CIRIA guidance. Note that for each category, it is assumed that a pollution linkage exists. Where a pollution linkage does not exist, the likelihood is zero, as is the risk.

Table E.2: Classification of Probability

Classification	Definition of Probability
High Likelihood	Circumstances are such that an event appears very likely in the short-term or almost inevitable in the long-term; or there is already evidence that such an event has occurred.
Likely	Circumstances are such that such an event is not inevitable but is possible in the short-term and is likely over the long-term.
Low	Likelihood Circumstances are such that it is by no means certain that an event would occur even over a longer period, and it is less likely in the short-term.
Unlikely	Circumstances are such that it is improbable that an event would occur even in the very long-term.

For each possible pollution linkage (source-pathway-receptor) identified, the potential risk can be evaluated, based on the following principle:

Contamination risk = Probability of event occurring x Consequence of event occurring

This relationship can be represented graphically as a matrix seen in the table below, which is adapted from the CIRIA guidance.

Table E.3: Overall Contamination Risk Matrix

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Low Risk
	Likely	High Risk	Moderate Risk	Moderate Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate Risk	Low Risk	Very Low Risk
	Unlikely	Low Risk	Low Risk	Very Low Risk	Very Low Risk

The definitions of the risk categories identified in the above matrix are given in the table below, together with the investigatory and remedial actions that are likely to be necessary in each case. The risk categories apply to each pollutant linkage, not just to each hazard or receptor.

Table E.4: Definition of Risk Categories and Likely Actions Required

Risk Category	Definition and Likely Actions Required
Very High	Severe harm to a defined receptor is very likely or has already occurred. The risk is likely to result in a substantial liability. Urgent investigation (if not already undertaken) is likely to be required. Urgent remediation is likely to be required.
High	Harm to a defined receptor is likely. The risk, if realised, may result in a substantial liability. Urgent investigation (if not already undertaken) is likely to be required. Remediation is likely to be required in the long term, possibly sooner.
Moderate	Harm to a defined receptor is possible, but severe harm is unlikely. Investigation is likely to be required to clarify the level of potential liability and risk. Some remediation may be required in the longer term.
Low	Harm to a defined receptor is possible but is likely to be mild at worst. Liabilities could theoretically arise but are unlikely. Further investigation is not required at this stage. Remediation is unlikely to be required.
Very Low	Harm to a defined receptor is unlikely and would be minor at worst. No liabilities are likely to arise. Further investigation is not required at this stage. Remediation is very unlikely to be required.

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H. Lineside Boundary Risk Assessment and Access Strategy

March to Wisbech Corridor

Lineside Boundary Risk Assessment and Access Strategy

28 February 2020

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March to Wisbech Corridor

Lineside Boundary Risk Assessment and Access Strategy

28 February 2020

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Contents

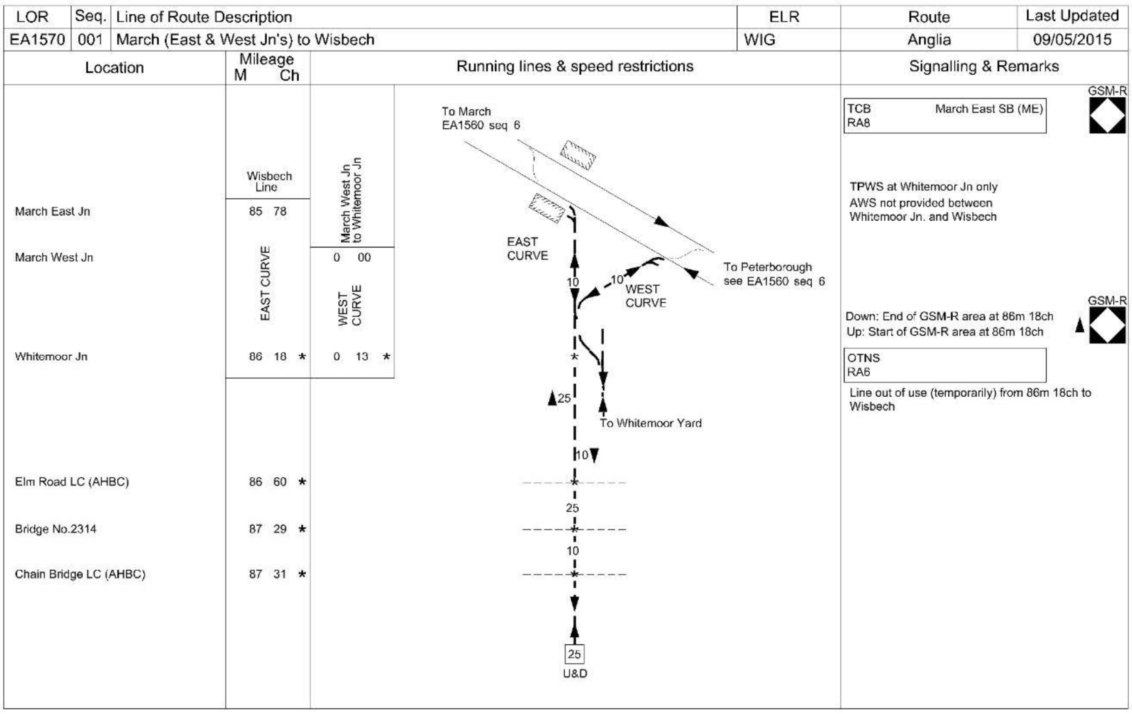
1 Introduction

1.1 Project Overview

The primary objectives of this project are to investigate the feasibility and cost of re-opening the railway line between March Station and Wisbech to heavy rail services.

1.2 Route Information

The line concerned is approximately seven miles long and was closed to regular traffic in 2000. The line is formally considered to be out of use but still appears in the Network Rail sectional appendix.



LOR	Seq.	Line of Route Description	ELR	Route	Last Updated
EA1570	002	March (East & West Jn's) to Wisbech	WIG	Anglia	02/02/2013

Location	Mileage M Ch	Running lines & speed restrictions	Signalling & Remarks
		25	OTNS March East SB (ME) RA6
			Line out of use (temporarily)
Coldham LC (TMO)	89 21		
Waldersea LC (TMO)	90 29		
Redmoor LC (AOCL)	92 09	A20 A20	
Wisbech Bypass LC (AOCL)	92 26	A20 A20	
		25	
Weasenham Lane LC (TMO)	93 15 *	10	
		Wisbech Yard	
Wisbech	93 60		
End of line			

1.3 Purpose of this report

The purpose of this report is to determine the appropriate boundary construction along the length of the proposed route, to mitigate against the perceived risk of trespass. The report will also cover the proposed access point strategy.

2 Approach

NR/L2/OTK/5100/02 states that when selecting a boundary class, if the existing measure class is controlling the threat from adjacent land use then a like-for-like renewal is recommended. If this is not the case a higher specification shall be chosen. As the track is not in use and has not been for some time, parts of the track do not have an existing fence and in most places, it is damage/non-functional. It is therefore difficult to judge what class of fence is required based on these recommendations.

NR/L2/TRK/5100, which was superseded by this standard, provided guidance on what class of fence is required based on the likelihood and consequence rankings of trespass. This information is not replicated in the latest standard however no updated or contradictory advice is available. Standard NR/L2/TRK/5100 will therefore be used, where appropriate, to determine the boundary class required.

There is no guidance as to the frequency or location of which access points should be provided. Prior to input from Network Rail a strategy has been outlined in Section 3.4 which aims to provide suitable access to all proposed lineside assets.

3 Classifications

3.1 Barrier Classification

The fencing classifications used throughout this assessment follow the criteria set out in the Network Rail Track Standard ‘Management of Fencing and Other Boundary Measures’ (NR/L2/TRK/5100).

The classes of fencing used are defined as follows:

Class I barrier

Barrier of types including vertical bar, expanded metal, brick and mortar walls, concrete panel and decorative iron railings

Class II barrier

Barrier of types including welded mesh, chain link, close-boarded timber and brick and mortar walls

Class III barrier

Post and wire (including stock netting where appropriate), post and rail (timber or equivalent), dry stone walls and natural features (including ditches, hedges and watercourses)

Table 5 within the track standard NR/L2/TRK/5100 specifies these fencing classes further in terms of potential barrier construction.

3.2 Lineside Barriers

Classes I and II are both types of lineside barrier. A lineside barrier is defined as:

Lineside Barrier

A physical, man-made, barrier to deter unauthorised access on to the lineside, which shall be continuous, clearly identifiable and of sturdy construction, including but not limited to;

- Walls – Constructed from, but not limited to, brick, stone and concrete panels to meet the relevant minimum height specifications according to risk assessment and can be fitted with topping to create an additional deterrent;
- Welded mesh – Fences as specified in British Standard BS1722-10:1999;
- Expanded metal – Open mesh steel panel fences as specified in British Standard BS1722-14:2001;
- Vertical bar – Steel palisade fences as described in British Standard BS1722-12:1999 (note: vertical ribs should face away from Network Rail property), decorative fencing as specified in British Standard BS1722-9:2000;
- Chain link – As described in British Standards BS1722-1:1999 and BS1722-10:1999;
- Timber – As described in British Standards BS1722-5:1999 and BS1722-7:1999; and
- Post and wire – As described in British Standard BS1722-2:2000 with the number of wire strands dependent on risk assessment. British Standard BS1722-8:1997 provides specification for continuous bar fences for farm animal containment.

3.3 Natural Barriers

A Class III barrier, although could be a basic man-made / lineside barrier, is often formed by natural features.

3.4 Access Points

3.4.1 Construction

NR/L2/TRK/5100 states that access gates should be of a similar standard to the adjacent barriers. Suitable locks such as security padlocks are expected to be fitted to the gates. Warning notices should be present on the barrier to deter trespassers, alongside lineside operational safety signage. For electrified lines, NR/RT/E/S/2113 requires that access points display signage warning of the risk of electric shock from overhead wires on the left hand side of the entrance, facing incoming vehicles and pedestrians. This signage is required to conform to BS 5378, and RTE 6001, RTE 6012 or RTE 6013 as appropriate. Supplementary signage advising lineside workers on how to reduce the risk of electric shock may also be provided on the access point as deemed necessary.

3.4.2 Locations

All of the existing level crossings will be closed as part of the scheme however 8no. of these crossings will be converted into access points. In these locations (and 50m either side of the access) the assumed likelihood of trespass will be greater due to the provision of an accessible route to the access gate.

In the absence of any guidance for positioning and frequency of lineside access points, along with the feasibility of each location, the following criteria has been used to identify the most suitable locations to position these access points:

- Track equipment such as points, that could lead to a single point of failure of the line, within 300m of an access point.
- Structures such as Underbridges and Overbridges, which are frequently inspected and may require larger equipment to do so, within 500m of an access point.
- Smaller assets such as signals/culverts within 1000m of an access point, however within 500m where possible.

Appendix B contains the access points review findings.

Where these level crossings are not being converted into access points there will, in some cases, still be a road access up to the rail corridor. In these locations the assumed likelihood of trespass will again be greater.

3.5 Third Party Barriers

NR/L2/TRK/5100 states that, in some circumstances, Network Rail may rely on third party barriers and take responsibility for lineside security if this barrier is breached. There are multiple areas along the route that are bound by domestic close boarded timber fences. With the information available through the desk study, it is assumed these fences will not be relied upon by Network Rail and so a second fence, owned and maintained by Network Rail, will be specified at these locations.

3.6 Height

The minimum height of newly installed, man-made barriers shall be 1350mm.

3.7 Cycle Route

There is a proposed cycle route parallel to the rail corridor which is positioned within the assumed Network Rail boundary for a portion of the route. In this location 2no. fences will be provided to the same side of the rail; one separating the rail from the cycle path, and a second demarcating the edge of the Network Rail boundary.

4 Methodology

4.1 Determination of Fencing Requirements

Using the results from the survey the required fencing requirements were determined using Table 4 in NR/L2/TRK/5100. This was done through determination of a risk category for unauthorised access and consequence assessment.

4.1.1 Containment Condition

The condition of the fencing along the route was assessed and given the following ratings from 'Management of Fencing and Other Boundary Measures' (NR/L2/TRK/5100), as shown in Table 4.1 below.

Table 4.1: Condition Rating and Priority

Rating		Condition
Good	0	Fit for current use, no work required
Poor	2	Fit for current use, but maintenance required
Very Poor	4	Inadequate condition, maintenance or renewal proposal or enhancement proposal required

Source: Table 3 in NR/L2/TRK/5100

From the available information the condition of the existing fence is difficult to determine. Since the railway has been out of operation for some time it is assumed the majority of the fence is in a very poor condition. Any fence maintained by a third party is assumed to be good or poor.

4.1.2 Risk category

The Network Rail Standard 'Management of Fencing and Other Boundary Measures' (NR/L2/TRK/5100) also defines the risk categories for both the likelihood of unauthorised access (Table 4.2) and the consequence of unauthorised access (Table 4.3).

Table 4.2: Risk categories for likelihood of unauthorised access

Risk		Likelihood of Unauthorised Access
V. High	4	Recorded evidence of trespass or vandalism within last 12 months
High	3	Significant potential for child trespass or vandalism via neglected land. Park/play areas, schools, shopping area, roads/footpaths; areas used to graze livestock
Medium	2	Back gardens, or industrial areas or recreation/leisure land e.g. country parks
Low	1	Non-grazing agricultural land, remote land, woodland or disused railway

Source: Table 1 in NR/L2/TRK/5100

Note that agricultural land can fall into risk categories 1 or 3 dependent on whether the land usage is arable or livestock. While the current usage of most agricultural land is readily apparent, where there has been any uncertainty the land has been assumed to be used for grazing as this is the worst-case assumption.

Table 4.3: Risk categories for consequence of unauthorised access

Risk		Consequence of Unauthorised Access
V. High	4	Third / fourth rail electrified, or Track Category 1A
High	3	Track Category 1 or 2
Medium	2	Track Category 3 or 4
Low	1	Track Category 5 or 6

Source: Table 2 in NR/L2/TRK/5100

Track Category Designation

Based on the limited number of services running on the line the track category is assumed to be category 4 or higher. As such the risk category for consequence of unauthorised access is considered to be class 2 – medium risk. This assumption is to be verified by Network Rail using Figure 1 in NR/L2/TRK/001/MOD06 by the Principle Maintenance Support Engineer (Track), based upon line speed and annual tonnage.

4.1.3 Required Barrier Class

In order to allow assessment the adequacy of the existing barrier, consideration was given to the likelihood and consequence risk categories as described above, comparing the values using Table 4 in NR/L2/TRK/5100 (included below as Table 4.4Table 4.4: Barrier classes for renewal for reference).

Table 4.4: Barrier classes for renewal

		Consequence			
		4	3	2	1
Likelihood	4	I	II	II	III
	3	II	II	II	III
	2	II	II	III	III
	1	III	III	III	III

Source: Table 4 in NR/L2/TRK/5100

Where the existing fence class was lower than the minimum stated in the table above that section of fence was determined to be inadequate, and therefore is recommended to be replaced.

If the existing barrier class is adequately deterring unauthorised access but the condition of the fencing suggests that work is needed, a like-for-like renewal may be carried out.

Where fencing that meets the requirements of Table 4.4 does not appear to be deterring unauthorised access to the railway, an upgraded fencing solution has been proposed. The barrier types outlined in Section 3 can be aligned with the barrier classes to aid with the specification of suitable barriers in various locations. This is shown in Table 4.5 below.

Table 4.5: Barrier classes for renewal

Class	Barrier type	Aesthetic option	Extra Security option
III	Dry stone wall Watercourse* Hedge* Ditch* Post and rail	Wooden posts	Stock netting Stock netting

Class	Barrier type	Aesthetic option	Extra Security option
	Post and wire **		
II	Chain link Mesh 1 ***	Powdercoated, or Brick and mortar wall Close board timber	Topping Topping Topping
I	Brick and mortar wall Mesh 2 Vertical bar 1 and 2	Powdercoated, or Concrete panel Iron railings	Topping or special measure Topping or special measure Topping or special measure

*Ditches, hedges and watercourses may be unsuitable at certain times of the year and installation of a ‘physical’ Class III barrier should be considered before enhancing due to trespass

**Stock netting may be used as standard

***Stock fencing may be used to prevent livestock incursion

Source: Table 5 in NR/L2/TRK/5100

4.1.4 Containment Priority

As the project will effectively be re-opening the line, it is assumed that all fencing must be installed as part of these works. Therefore, priority is not assigned to the different sections of fence, which is more suitable to maintenance works and a staged approach.

5 Conclusions

A desk study review of the existing fencing and fencing requirements has been undertaken. The review is split into the eastern and western boundary fences. Where a Class 3 fence is required, a post and wire fence is recommended to match the existing fence along the majority of the route. Where a Class 2 fence is required, a chain link fence is proposed. These fences shall be in accordance with BS 1722, and shall be a minimum of 1.35m high.

Appendix A provides the full breakdown of the fencing requirements, which are summarised in Table 6.

Table 6 Fencing Requirements

Construction type	Western Boundary (m)	Eastern Boundary (m)	Total
Post and Wire	8,410	8,970	**17,380**
Chain Link	4,520	3,070	**7,590**
Existing (to be retained)	250	290	**540**
Total	*13,180*	*12,330*	***23,560***

Source: Mott MacDonald

8 no. of the level crossings that are to be closed are to be converted into access points for Network Rail maintenance purposes. The review of the lineside access point options is available in Appendix B, and the level crossings to be converted to access points are listed below:

- Sheldrach Level Crossing (140.21km)
- Twenty Foot Road/River Level Crossing (140.67km)
- Station Road (Coldham) Level Crossing (143.65km)
- Crelins Level Crossing (144.62km)
- Long Drove/Waldersea Level Crossing (145.45km)
- Crooked Bank Road Level Crossing (147.09km)
- Redmoor Lane Level Crossing (148.23km)
- Newbridge Lane Level Crossing (149.00km)

A. Lineside Boundary Assessment

Fence Assessment - Western Boundary											
Mileage From	Mileage To	Containment Type	Containment Class Existing	Condition	Total Length (m)	Neighbouring Land	Comments	Likelihood	Consequence	Required Containment Class	Required Containment Type
Existing rail sidings - not in scope											
138.900	139.150	Unclear (Dense Vegetation)	3	4	250	Woodland/Pond	No additional fence shown due to large pond between proposed line and sidings area	1	2	3	Post and Wire
139.150	139.550	Post and Wire	3	4	400	Agricultural		1	2	3	Post and Wire
139.550	139.650	Post and wire	3	4	100	Elm Road level crossing	Level crossing to be removed however road access may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
139.650	139.690	Post and Wire	3	4	40	Livestock	Horse noted in field	3	2	2	Chainlink
139.690	139.790	Post and Wire	3	4	100	Elm Road Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
139.790	140.160	Post and Wire	3	4	370	Livestock	Horse noted in field	3	2	2	Chainlink
140.160	140.260	Post and wire	3	4	100	Sherald Occ. Level crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
140.260	140.550	Post and Wire	3	4	290	Back Gardens		2	2	3	Post and Wire
140.550	140.620	Post and Wire	3	4	70	Agricultural		1	2	3	Post and Wire
140.620	140.720	Post and wire	3	4	100	Chain Bridge Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
140.720	143.470	Post and Wire	3	4	2750	Agricultural		1	2	3	Post and Wire
143.420	143.520	Post and Wire	3	4	100	Coldham Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink

Mileage From	Mileage To	Containment Type	Containment Class Existing	Condition	Total Length (m)	Neighbouring Land	Comments	Likelihood	Consequence	Required Containment Class	Required Containment Type
143.520	143.600	Post and Wire	3	4	80	Agricultural	Due to limited distance between change in fence type it is proposed to provide class 2 in this area instead of class 3	1	2	2	Chainlink
143.600	143.700	Post and Wire	3	4	100	Coldham Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
143.700	143.800	Post and Wire	3	4	100	Football pitch		3	2	2	Chainlink
143.800	144.310	Post and Wire	3	4	510	Agricultural		1	2	3	Post and Wire
144.310	144.570	Unclear (Dense Vegetation)	3	4	260	Agricultural		1	2	3	Post and Wire
144.570	144.670	Unclear (Dense Vegetation)	3	4	100	Crelins Acc. Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
144.670	145.000	Unclear (Dense Vegetation)	3	4	330	Agricultural		1	2	3	Post and Wire
145.000	145.240	Post and Wire	3	4	240	Agricultural		1	2	3	Post and Wire
145.240	145.340	Post and Wire	3	4	100	Neads Level Crossing	Level crossing to be removed however road access may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
145.340	145.400	Post and Wire	3	4	60	Back Gardens	Due to limited distance between change in fence type it is proposed to provide class 2 in this area instead of class 3	2	2	2	Chainlink
145.400	145.450	Unclear (Dense Vegetation)	3	4	50	Long Drove/Waldersea Road	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
145.450	146.980	Post and Wire	3	4	1530	Agricultural	Two fences in this location, one seperating rail and cycle path and one for the NR boundary alongside the drainage ditch.	1	2	3	Post and Wire
145.450	147.050	Post and Wire	3	4	1600	Proposed Cycle path	Two fences in this location, one seperating rail and cycle path and one for the NR boundary alongside the drainage ditch.	3	2	2	Chainlink
147.030	147.150	Post and Wire	3	4	120	Crooked Bank Road	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink

Mileage From	Mileage To	Containment Type	Containment Class Existing	Condition	Total Length (m)	Neighbouring Land	Comments	Likelihood	Consequence	Required Containment Class	Required Containment Type
147.150	147.250	Post and Wire	3	4	100	Holly Bank Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
147.250	147.640	Post and Wire	3	4	390	Agricultural		1	2	3	Post and Wire
147.640	147.690	Post and Wire	3	4	50	Livestock	Livestock potentially visible from satellite images	3	2	2	Chainlink
147.690	147.770	Unclear (Dense Vegetation)	3	4	80	Livestock	Livestock potentially visible from satellite images	3	2	2	Chainlink
147.770	147.920	Unclear (Dense Vegetation)	3	4	150	Agricultural		1	2	3	Post and Wire
147.920	148.020	Unclear (Dense Vegetation)	3	4	100	Broad Drove Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
148.020	148.120	Unclear (Dense Vegetation)	3	4	100	Livestock	Horse noted in field	3	2	2	Chainlink
148.120	148.180	Post and Wire	3	4	60	Back Gardens	Due to limited distance between change in fence type it is proposed to provide class 2 in this area instead of class 3	2	2	2	Chainlink
148.180	148.280	Post and Wire	3	4	100	Redmoor Lane Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
148.280	148.380	Post and Wire	3	4	100	Back Gardens		2	2	3	Post and Wire
148.380	148.530	Post and Wire	3	4	150	Woodland		1	2	3	Post and Wire
148.530	148.630	Post and Wire	3	4	100	A47 Wisbech Bypass Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
148.630	148.690	Post and Wire	3	4	60	A47 Bypass Level Crossing	Level crossing to be removed however road access may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
148.690	148.950	Unclear (Dense Vegetation)	3	4	260	Industrial		2	2	3	Post and Wire

Mileage From	Mileage To	Containment Type	Containment Class Existing	Condition	Total Length (m)	Neighbouring Land	Comments	Likelihood	Consequence	Required Containment Class	Required Containment Type
148.950	149.050	Unclear (Dense Vegetation)	3	4	100	Newbridge Lane Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
149.050	149.890	Unclear (Dense Vegetation)	3	4	840	Industrial		2	2	3	Post and Wire
149.890	149.910	Unclear (dense vegetation)	3	4	20	Weasenham Lane Level Crossing	Level crossing to be removed however road access may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
149.910	150.010	Unclear (Dense Vegetation)	3	4	100	Weasenham Lane Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
150.010	150.080	Unclear (Dense Vegetation)	3	4	70	Industrial	Due to limited distance between change in fence type it is proposed to provide class 2 in this area instead of class 3	2	2	2	Chainlink
150.080	150.410	Unclear (Dense Vegetation)	3	4	330	Car park	Proposed	3	2	2	Chainlink

Fence Assessment - Eastern Boundary											
Mileage From	Mileage To	Containment Type	Containment Class Existing	Condition	Total Length (m)	Neighbouring Land	Comments	Likelihood	Consequence	Required Containment Class	Required Containment Type
138.360	138.550	Chainlink	2	0	190	Woodland	Chailink only surrounds NR boundary - new fence will be required around proposed car park	1	2	3	Post and Wire
March Station Proposed Car Park					250	Car Park	Estimated fence length required around proposed car park	3	2	2	Chainlink
138.550	138.650	Chainlink	2	0	100	Norwood Road Overbridge		3	2	2	Chainlink
138.650	138.880	Unclear (dense vegetation)	3	4	230	Back Gardens		2	2	3	Post and Wire
138.880	138.970	Timber panel garden fences	2	2	90	Back Gardens	Third Party Barriers	2	2	3	Post and Wire
138.970	139.110	Unclear (dense vegetation)	3	4	140	Industrial		2	2	3	Post and Wire
139.110	139.250	Post and wire	3	4	140	Back Gardens		2	2	3	Post and Wire
139.250	139.550	Post and wire	3	4	300	Agricultural land		1	2	3	Post and Wire
139.550	139.650	Post and wire	3	4	100	Elm Road level crossing	Level crossing to be removed however road access may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
139.650	139.690	Post and wire	3	4	40	Agricultural land	Due to limited distance between change in fence type it is proposed to provide class 2 in this area instead of class 3	1	2	2	Chainlink
139.690	139.790	Post and Wire	3	4	100	Elm Road Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
139.790	140.620	Post and wire	3	4	830	Agricultural land		1	2	3	Post and Wire

Mileage From	Mileage To	Containment Type	Containment Class Existing	Condition	Total Length (m)	Neighbouring Land	Comments	Likelihood	Consequence	Required Containment Class	Required Containment Type
140.620	140.720	Post and wire	3	4	100	Chain Bridge Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
140.720	141.630	Post and wire	3	4	910	Agricultural land		1	2	3	Post and Wire
141.630	142.990	Post and wire	3	4	1360	Road	Verge widens into disused area of land	3	2	2	Chainlink
142.990	143.470	Post and wire	3	4	480	Agricultural land		1	2	3	Post and Wire
143.420	143.520	Post and Wire	3	4	100	Coldham Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
143.520	143.600	Timber panel garden fences	2	2	80	Back Gardens	Third Party Barriers. Due to limited distance between change in fence type it is proposed to provide class 2 in this area instead of class 3	2	2	2	Chainlink
143.600	143.700	Timber panel garden fences	2	2	100	Coldham Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
143.700	143.760	Timber panel garden fences	2	2	60	Back Gardens	Third Party Barriers	2	2	3	Post and Wire
143.760	145.400	Post and wire	3	4	1640	Agricultural land		1	2	3	Post and Wire
145.420	145.520	Unclear (Dense Vegetation)	3	4	100	Long Drove/Waldersea Road	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
145.520	147.150	Post and wire	3	4	1630	Agricultural land		1	2	3	Post and Wire
147.150	147.250	Post and Wire	3	4	100	Holly Bank Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
147.250	147.920	Post and wire	3	4	670	Agricultural land		1	2	3	Post and Wire

Mileage From	Mileage To	Containment Type	Containment Class Existing	Condition	Total Length (m)	Neighbouring Land	Comments	Likelihood	Consequence	Required Containment Class	Required Containment Type
147.920	148.020	Post and wire	3	4	100	Broad Drove Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
148.020	148.180	Post and wire	3	4	160	Agricultural land		1	2	3	Post and Wire
148.180	148.280	Post and Wire	3	4	100	Redmoor Lane Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
148.280	148.470	Timber panel fences	2	2	190	Woodland	Third Party Barriers	1	2	3	Post and Wire
148.470	148.530	Timber panel garden fences	2	2	60	Back Gardens	Third Party Barriers Caravan site, some garfitti on LOC cabinet	4	2	2	Chainlink
148.530	148.630	Timber panel garden fences	3	4	100	A47 Wisbech Bypass Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
148.630	148.690	Timber panel garden fences	3	4	60	A47 Bypass Level Crossing	Level crossing to be removed however road access may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
148.690	148.950	Unclear (dense vegetation)	3	4	260	Industrial		2	2	3	Post and Wire
148.950	149.050	Unclear (Dense Vegetation)	3	4	100	Newbridge Lane Level Crossing	Level crossing to be converted to access point. Access road may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
149.050	149.890	Unclear (dense vegetation)	3	4	840	Industrial		2	2	3	Post and Wire
149.890	149.910	Unclear (dense vegetation)	3	4	20	Weasenham Lane Level Crossing	Level crossing to be removed however road access may provide access to lineside for trespass (+50m either direction)	3	2	2	Chainlink
149.910	150.010	Unclear (Dense Vegetation)	3	4	100	Weasenham Lane Overbridge	Proposed (+50m either direction)	3	2	2	Chainlink
150.010	150.220	Unclear (dense vegetation)	3	4	210	Industrial		2	2	3	Post and Wire
150.220	150.410	Unclear (dense vegetation)	3	4	190	Back Gardens		2	2	3	Post and Wire

B. Access Points Review

Ref	Name	Feature	What3Words (Approx.)	Project Chainage (km)	Existing access point (on trac)	Suitability of location under proposed design	Recommendation	Proposed access point	Distance from nearest proposed access point (m)	Additional Comments
1	ME302	Signal		138.23	No	The proposed signal is within the station footprint	It is not proposed to provide an access point at this location.	No	170	
2	ME301	Signal		138.37	No	The proposed signal is within the station footprint	It is not proposed to provide an access point at this location.	No	30	
3	**March Station**	**Station**	**Finally.Screening.Sharper**	**138.40**	**Yes**	**End of platform ramp will provide pedestrian access point. Additional vehicle access point will be provided from the car park.**	**It is proposed to retain this access point.**	**Yes**	0	
4	ME36	Signal		138.43	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	29	
5	ME305	Signal		138.51	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	114	
6	ME303	Signal		138.52	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	123	
7	Norwood Road Overbridge	Overbridge	Sublime.Adhesive.Filled	138.61	No	Access stairs could be provided from the overbridge to the trackside. Additional work would be required to the highway to allow suitable space for vehicle acces/parking.	It is not proposed to provide an access point from any of the overbridges on the scheme.	No	50	
8	**Whitemoor Junction**	**Sidings**	**Paramedic.Lake.Handle**	**138.66**	**Yes**	**It is unclear exactly where this access point is however no work in this area would prevent the access to be retained in use.**	**It is proposed to retain this access point.**	**Yes**	0	**TBC exact location of access point during site visit**
9	ME53	Signal		138.72	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	64	
10	ME304	Signal		138.90	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	240	
11	Clarkes Acc	Level Crossing	Stress.Kilowatt.Wording	139.36	No	There is no access to this location from the public highway, access is only via a privately owned farm from a dirt track.	It is not recommended to convert this level crossing into an access point.	No	700	Level crossing will be removed so does not create an issue
12	ME306	Signal		139.47	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	740	Signal is within the maximum preferred distance from an access point
13	Existing Culvert	Culvert	Ribs.Indicates.Throats	139.60	No	This structure is directly adjacent to the Elm Road level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	610	Access to underbridge will require walking further than the preferred maximum however for the additional length (c.110m) it is not proposed to provide an additional access point for this isolated case.
14	Elm Road	Level Crossing	Dried.Lunching.Alarming	139.60	Yes	It is expected the currently proposed road re-alignment will be amended at this location to serve the existing properties. This would likely sever the access road to this level crossing from both sides. Therefore to create an access route to this level crossing would introduce additional works for the scheme.	Due to the close proximity, and the greater suitability of the Sheldrach crossing it is proposed to remove this authorised access point.	No	610	Level crossing will be removed so does not create an issue
15	New Overbridge (Elm Road)	Overbridge	Princely.Tender.Crush	139.74	No	Access stairs could be provided from the overbridge to the trackside. Additional work would be required to the highway to allow suitable space for vehicle acces/parking.	It is not proposed to provide an access point from any of the overbridges on the scheme.	No	470	
16	Existing Culvert	Culvert	Scrub.Coverings.Slacker	140.19	No	This structure is directly adjacent to the Sheldrach level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	20	
17	**Sherald Occ (Sheldrach)**	**Level Crossing**	**Cute.Kitchens.Buying**	**140.21**	**No**	**The access road to this level crossing is from the west of the rail corridor. A new access road will be provided to Elm tree farm from the east. There is farm/agricultural land to both sides of the level crossing.**	**It is recommended to use this level crossing location as an access point, once the level crossing is removed. This will replace the access at Elm Road. Access is to be achieved from the east where the occupational road can be used.**	**Yes**	0	
18	Existing Underbridge (Chain Bridge)	Underbridge	Backyards.Crazy.Replaying	140.64	No	This structure is directly adjacent to the Twenty Foot Road/River level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this underbridge.	No	30	
19	**Twenty Foot Road/River (Chain Bridge)**	**Level Crossing**	**Materials.Copper.Dined**	**140.67**	**Yes**	**Access to the eastern side will be truncated due to the installation of a new river crossing bridge as part of the highway realignment. Access to the western side will be possible. Via the existing road. There are no local residences to the crossing however there is a river to the south of the access road.** **It is expected that the bridge to the south of the crossing will have restricted clearance once re-opened, therefore access across the bridge by track workers would require a line block or posession. It is therefore beneficial to have access either side of this structure. The cess walkway swaps side in this location.**	**It is recommended the access point is retained in this location with access and a parking area provided to the west.** ***Note - although in close proximity to the Sheldrach LC it is seperated by a resritcted clearance underbridge***	**Yes**	0	
20	Existing Culvert	Culvert	Avoiding.Ghost.Huts	140.69	No	This structure is directly adjacent to the Twenty Foot Road/River level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	20	
21	Existing Culvert	Culvert	Permit.Sweeper.Kickbacks	141.11	No	This structure is directly adjacent to the Fishers Acc. level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	440	
22	Fishers Acc	Level Crossing	Viewers.Shut.Opened	141.12	No	There is no access to this location from the public highway, access is only via a dirt track adjacent to a privately owned farm. The dirt track is in a good condition and appears to be well used.	It is not recommended to convert this level crossing into an access point.	No	450	
23	Existing Culvert	Culvert	Waitress.Listening.Folders	141.63	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	960	Culvert is within the maximum preferred distance from an access point

24	Ballast Pit Acc	Level Crossing	Clip.Sprayer.Preoccupied	142.08	No	There is access to the level crossing via a dirt track just off the B1101 highway. The dirt track is in a good condition and appears to be well used. To both sides is agricultural land. There is ample space to provide a parking area adjacent to the access point.	This location would be ideal to provide an access point. However there are few assets of interest in this area and this is not an existing access point, therefore it is not proposed to convert this level crossing into an access point. If a further access point is required around this location it would be recommended to use this location.	No	1410	Level crossing will be removed so does not create an issue
25	Middle King Acc	Level Crossing	Amended.Professes.Poems	142.66	No	There is no current vehicle access to this crossing	It is not recommended to convert this level crossing into an access point.	No	990	Level crossing will be removed so does not create an issue
26	ME401	Signal		142.87	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	780	Signal is within the maximum preferred distance from an access point
27	ME403	Signal		143.44	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	210	
32	New Overbridge (Coldham)	Overbridge	Suppose.Shredding.Hails	143.46	No	Access stairs could be provided from the overbridge to the trackside. Additional work would be required to the highway to allow suitable space for vehicle acces/parking.	It is not proposed to provide an access point from any of the overbridges on the scheme.	No	190	
29	Existing Culvert	Culvert	Snored.Before.Cured	143.64	No	This structure is directly adjacent to the Station Road level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	10	
30	**Station Road (Coldham)**	**Level Crossing**	**Hopefully.Baseless.Branch**	**143.65**	**Yes**	**Access to location will be achievable from either side following highways realignments. Nearby houses lie to the east, sports field and agricultural land to the west. The cess walkway swaps side in this location.**	**It is recommended the access point is retained in this location with access and a parking area provided at both sides of the crossing to provide access to the cess walkway at either side of the track.**	**Yes**	**0**	
31	Existing Culvert	Culvert	Ivory.Initial.Voucher	143.66	No	This structure is directly adjacent to the Station Road level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	10	
32	Start of passing loop (West)	Track Equipment	Fermented.Erupts.Trickle	143.76	No	There is no current vehicle access to this location. The location is in close proximity to the proposed access at Station Road.	It is not recommended to convert this location into an access point.	No	110	
33	ME405	Signal		144.11	No			No	458	
34	Existing Culvert	Culvert	Overlooks.Hydration.Novelists	144.17	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	450	
35	ME406	Signal		144.12	No			No	470	
36	Existing Culvert	Culvert	Verdict.Riverboat.Rungs	144.31	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	310	
37	End of passing loop (West)	Track Equipment	Students.Compress.Villas	144.32	No	There is no current vehicle access to this location. The location is in close proximity to the proposed access at Crelins Acc.	It is not recommended to convert this location into an access point.	No	300	
38	Existing Culvert	Culvert	Scary.Ruffle.Songbirds	144.62	No	This structure is directly adjacent to the Crelins Acc. level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	300	TBC if this culvert exists during site visit
39	**Crelins Acc**	**Level Crossing**	**Putts.Purchaser.Caves**	**144.62**	**No**	**There access to this location from the public highway is via a dirt track adjacent to a privately owned farm. The dirt track appears to be in fair condition.**	**It is recommended an access point is provided in this location with access and a parking area provided to the west of the rail corridor. Authority may need to be agreed with the current land owner.**	**Yes**	**0**	
40	ME404	Signal		144.69	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	70	
41	Existing Culvert	Culvert	Galloping.Reported.Grab	144.72	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	100	
42	Existing Culvert	Culvert	Faster.After.Indicates	145.00	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	380	
43	New Overbridge (Waldersea) - TBC	Overbridge	Wasps.Giant.Partner	145.27	No	Access stairs could be provided from the overbridge to the trackside. Additional work would be required to the highway to allow suitable space for vehicle acces/parking.	It is not proposed to provide an access point from any of the overbridges on the scheme.	No	180	
44	ME402	Signal		145.30	No	There is no direct access available to this location.	It is not proposed to provide an access point at this location.	No	150	
45	Neads (Heads King) Acc	Level Crossing	Flood.Copycat.Peroxide	145.30	No	The current access is surrounded by agricultural land and is accessible from a dirt track to the west. The level crossing is in very close proximity to the Long drove/Waldersea road crossing	It is not recommended to convert this level crossing into an access point.	No	150	
46	Existing Underbridge (Mulbary Drain)	Underbridge	Crashing.Stiffly.Ideas	145.30	No	This structure is directly adjacent to the Neads Acc. level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this underbridge.	No	150	
47	**Long Drove/Waldersea Road**	**Level Crossing**	**Alas.Flattens.Tens**	**145.45**	**Yes**	**Access to this location will be achievable from either side following highways realignments. There is a farm and agricultural land to the west, to the east there is a historic depot site within the NR boundary.**	**It is proposed to retain this access point. It is proposed to make this access a RRAP, accessible from the east. It is envisaged the depot area may be used as a compound during the works.**	**Yes**	**0**	
48	Existing Culvert	Culvert	Driver.Socket.Boardroom	145.48	No	This structure is directly adjacent to the Long Drove level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	30	
49	Co-op Acc no.16	Level Crossing	Region.Fermented.Haunt	145.70	No	There is no access to this location from the public highway, access is only via a dirt track adjacent to a privately owned farm. The dirt track is in a fair condition.	It is not recommended to convert this level crossing into an access point.	No	250	
50	Existing Culvert	Culvert	Punctured.Moods.Spit	145.89	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	440	
51	Existing Underbridge (Waldersay Drain)	Underbridge	Impaled.Campsites.Venturing	146.09	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this underbridge.	No	640	Access to underbridge will require walking further than the preferred maximum however for the additional length (c.140m it is not proposed to provide an additional access point)
52	Existing Culvert	Culvert	Improve.Supported.Jungle	146.44	No	This structure is directly adjacent to the Co-op Acc. no. 19 level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	650	Culvert is within the maximum preferred distance from an access point
53	Co-op Acc no.19	Level Crossing	Sprouting.Readings.Smarting	146.45	No	There is no access to this location from the public highway, access is only via a privately owned farm from a dirt track.	It is not recommended to convert this level crossing into an access point.	No	640	Level crossing will be removed so does not create an issue
54	Existing Culvert	Culvert	Suitcase.Deprives.Atom	146.72	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	370	

55	**Crooked Bank Road**	**Level Crossing**	**Widget.Routines.Acids**	**147.09**	**No**	**The currently proposed road realignment does not restrict access to this location. Access is achievable from the west via an access road that ends in a public bridleway.**	**It is recommended to convert this level crossing into an access point to allow maintenance access to the nearby proposed overbridge.**	**Yes**	**0**	
56	Existing Culvert	Culvert	Adhesive.Universally.Leaky	147.20	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	110	
57	New Overbridge (Holly Bank/Crooked Bank)	Overbridge	Glitter.Signed.Terms	147.20	No	Access stairs could be provided from the overbridge to the trackside. Additional work would be required to the highway to allow suitable space for vehicle acces/parking.	It is not proposed to provide an access point from any of the overbridges on the scheme.	No	110	
58	Holly Bank	Level Crossing	Glance.Juror.Shot	147.29	No	The proposed highway realignment would sever the access road to this level crossing from both sides. Therefore to create an access route to this level crossing would introduce additional works for the scheme.	It is not recommended to convert this level crossing into an access point.	No	200	
59	Existing Culvert	Culvert	Fully.Reliving.Fictional	147.65	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	560	Culvert is within the maximum preferred distance from an access point
60	New Overbridge (Broad Drove)	Overbridge	Trial.Froth.Bagpipes	147.97	No	Access stairs could be provided from the overbridge to the trackside. Additional work would be required to the highway to allow suitable space for vehicle acces/parking.	It is not proposed to provide an access point from any of the overbridges on the scheme.	No	260	
61	Broad Drove	Level Crossing	Coached.Writers.Amending	148.00	No	The proposed highway realignment would sever the access road to this level crossing from both sides. Therefore to create an access route to this level crossing would introduce additional works for the scheme.	It is not recommended to convert this level crossing into an access point.	No	230	
62	Existing Culvert	Culvert	Magpie.Banquets.Evoked	148.22	No	This structure is directly adjacent to the Redmoor Lane level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	10	
63	**Redmoor Lane**	**Level Crossing**	**Dummy.Groomed.Then**	**148.23**	**Yes**	**It is expected that the highways alignment will be revised to retain access from both sides of Redmoor lane for local residences. Access could be attained to the access from either side however there is limited room for parking and turning due to open drainage ditches either side of the highway. Private residential/agricultural land lies either side of these drainage ditches. There is potential to use adjacent land for parking, where existing drainage crossings are available, however this may involve additional land acquisition.** **It is also expected that once the underbridge adjacent to the crossing is reopened there will be limited clearance to the east track and therefore access would be preffered to the west of the crossing.**	**It is proposed to retain this location as an access point. It is proposed to provide a parking area to the east of the corridor with a turning area available further to the east at the farm crossing.**	**Yes**	**0**	
64	Existing Underbridge (Redmoor Drain)	Underbridge	Daylight.Forgotten.Hamper	148.24	No	This structure is directly adjacent to the Redmoor Lane level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this underbridge.	No	10	
65	New Overbridge (A47 Wisbech Bypass)	Overbridge	Draw.Relocated.Stapled	148.58	No	Access stairs could be provided from the overbridge to the trackside. Additional work would be required to the highway to allow suitable space for vehicle acces/parking.	It is not proposed to provide an access point from any of the overbridges on the scheme.	No	350	
66	A47 Bypass	Level Crossing	Acclaimed.Fees.Lobbed	148.64	No	The proposed highway realignment would sever the access road to this level crossing from both sides. Therefore to create an access route to this level crossing would introduce additional works for the scheme.	It is not recommended to convert this level crossing into an access point.	No	360	
67	Existing Culvert	Culvert	Flats.Node.Before	148.99	No	This structure is directly adjacent to the Newbridge Lane level crossing and is accessed directly from the level crossing.	It is not proposed to provide an access point at this culvert.	No	10	
68	**Newbridge Lane (Labelled as Wisbech Bypass)**	**Level Crossing**	**Abode.Shook.Wiggling**	**149.00**	**Yes**	**Access is available from either side of the level crossing. There is industrial use land to both the east and west of the level crossing. To both the north and south of the crossing is a large draininage ditch. The road is narrow and there is limited space for parking. There appears to be some land available to the east of the crossing, where existing drainage crossings are available, in which a parking/turning area could be provided, however this may involve additional land acquisition. There is a potential turning area to the west of the corridor. The cess walkway swaps side in this location.**	**It is proposed to retain this location as an access point. It is proposed to provide a parking area to both sides of the corridor to provide access to the cess walkway at either side of the track.**	**Yes**	**0**	
69	Existing Culvert	Culvert	Shortage.Spray.Kilowatt	149.14	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	140	
70	Existing Culvert	Culvert	Cave.Songbirds.Panel	149.36	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	360	
71	Weasenham Lane	Level Crossing	Balconies.Waggled.Surgical	149.94	Yes	The proposed highway realignment would sever the access road to this level crossing from both sides. Therefore to create an access route to this level crossing would introduce additional works for the scheme.	Due to the close proximity, and the greater suitability of the Newbridge lane crossing (and Wisbech Station) it is proposed to remove this authorised access point.	No	400	
72	New Overbridge (A47 Wisbech Bypass)	Overbridge	Wiggles.Sits.Honeybees	149.96	No	Access stairs could be provided from the overbridge to the trackside. Additional work would be required to the highway to allow suitable space for vehicle acces/parking.	It is not proposed to provide an access point from any of the overbridges on the scheme.	No	380	
73	Existing Culvert	Culvert	Turkeys.Prawn.Trickling	150.12	No	There is no access route available to this location of the rail corridor.	It is not proposed to provide an access point at this culvert.	No	220	
74	**Wisbech Station (Access Point)**	**Station**	**Plunge.Weaved.Blackmail**	**150.34**	**Yes**	**End of platform ramp will provide pedestrian access point. Additional vehicle access point will be provided from the car park.**	**It is proposed to retain this access point location. Pedestrian access will be provided from the end of platform and a RRAP is proposed from the car park.**	**Yes**	**0**	

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I. Pedestrian Modelling Report

MOTT MACDONALD

March to Wisbech Transport Corridor

Assessment of Station Capacity and Passenger Flow

28 February 2020

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Executive summary

To enable a new train service between Wisbech and March, and ideally running through to Cambridge, with 2 trains per hour (tph), a high-level static analysis of passenger flows was undertaken for both stations.

Wisbech station is a new station, while March station already has 2tph services to Peterborough, Birmingham, Liverpool, Stansted Airport, Ipswich and Norwich. The station has 2 non-operational platforms.

A static analysis was undertaken using estimated passenger demand for the new service. Detailed current passenger demand at March station is unknown and is required to be assessed in subsequent design stages.

A timetable analysis of current services at March station and proposed services during the AM and PM peaks was undertaken and did not indicate that there are any arrival or departure clashes on the same platform during Normal Operations (a clash was assumed to happen when trains are less than 5 minutes apart). There is the potential that clashes happen between arriving and / or departing passengers from different platforms on the footbridge(s). The only way to truly assess whether this will be the case is to have a more detailed view on current passenger demand.

The static analysis identified some areas of March station which would not provide sufficient capacity to accommodate the forecasted passenger demand. A summary of minimum station sizing requirements is given in Table 6. The station would benefit from additional space provision in the following areas:

- Platform 1 width;
- Staircase Platform 2-3 and Platform 4 width, which is a design criterium from Network Rail Station Capacity Planning Guidance (Network Rail, November 2016). Looking purely at platform clearance time however there could be potential to use a narrower staircase;
- Lift size.

The analysis for Wisbech station showed the station is not appropriately sized in some areas according to Network Rail Station Capacity Planning Guidance (Network Rail, November 2016). A summary of minimum station sizing requirements is given in Table 8. The following station areas are recommended for review:

- The ramp should be a minimum of 2.2 metres in width;
- Run offs should be considered at the top and bottom of ramp and staircase.

Furthermore, the following recommendations, which apply to both stations, are made:

- A Diversity Impact Assessment (DIA) shall be undertaken and should inform step-free requirements at the station;
- The evacuation strategy and capacity should be assessed in subsequent design stages;
- Platform infrastructure should be placed away from any circulatory movements as not to impede passenger flow;
- Platform facilities should not be placed on the platform without due consideration to the impact on passenger flows.

1 Scope

For a proposed 2 trains per hour (tph) service between Wisbech and March a high-level assessment of the proposed station designs for March Station and Wisbech Station has been undertaken from a passenger flow perspective. The results of this analysis are presented in this report.

A new service with 2 tph is proposed between Wisbech and March, and ideally running through to Cambridge. To enable this service to run it is proposed to reinstate Platform 3 at March station, and to build a new station with 1 platform for Wisbech. Track and rail operations were assessed in September 2019 (Document reference: 398128 | 007 | A).

The minimum sizing requirements for both stations are based on the latest Network Rail guidance regarding station capacity NR SCPG (Network Rail Station Capacity Planning Guidance, November 2016).

Detailed existing passenger demand for March station was not available, however a demand forecast was available and station sizing requirements have been included on the basis of this forecast. It is highly recommended to undertake a passenger count survey in order to assess current passenger flows in subsequent design stages.

2 Passenger Demand

Mott MacDonald have undertaken an analysis regarding estimated passenger demand for the newly proposed service, based on the drawings presented at IDC (16/12/2019). Detailed passenger count data was not available for March station (There is currently no station at Wisbech and therefore there is no existing passenger demand).

In 2017-2018 approximately 404,000 passengers used March station (Estimates of Station Usage, Office of Rail and Road, 2018), this was an increase of 2% compared with the previous year. This data is not fit for a passenger flow assessment. It is therefore recommended that a passenger count survey is undertaken at March station to ensure the entire station is adequately sized.

Currently, 2tph in each direction serve March station during the peak hours (realtimetrains.co.uk). This will be increased to 4tph when the new service comes into operation.

The busiest time periods with associated passenger demand are shown in Table 1 and Table 2 (M2W Forecast Model v2.3 2039 DS2 - Station Demand RevA & M2W Forecast Model v2.3 2039 DM - Station Demand RevA, internal documents). The demand for an average weekday was uplifted with 25% to account for seasonality. The forecasted year was 2039.

For Platforms 1 and 2 no detailed demand data was available and it was not possible to allocate demand to either platforms. Therefore 75% of demand was assumed on both platforms. 15-minute demand was rounded to the nearest 10.

Table 1: Passenger Demand at March Station

Arrivals / Departures	Time Period	2039 +25%	Time Period
Busiest Arrivals P1	15 minutes	50	17:15 - 17:30
Busiest Departures P1	15 minutes	50	07:45 - 08:00
Combined Busiest P1	15 minutes	70	17:15 - 17:30
Busiest Arrivals P2	15 minutes	50	17:15 - 17:30
Busiest Departures P2	15 minutes	50	07:45 - 08:00
Combined Busiest P2	15 minutes	70	17:15 - 17:30
Busiest Arrivals P3	15 minutes	80	17:15 - 17:30
Busiest Departures P3	15 minutes	80	07:45 - 08:00
Combined Busiest P3	15 minutes	120	17:15 - 17:30

Table 2: Passenger Demand at Wisbech Station

Arrivals / Departures	Time Period	2039 +25%	Time Period
Busiest Arrivals	15 minutes	40	07:45 - 08:00
Busiest Departures	15 minutes	50	17:15 - 17:30
Combined Busiest	15 minutes	80	17:15 - 17:30

The preferred option[1] proposes that all trains between March and Wisbech (in both directions) would usually call at Platform 3. However, there is the operational flexibility for trains calling at March and going towards Wisbech to call at Platform 2, if demand allows for this. The analysis assumes all new trains between March and Wisbech call at Platform 3.

Minimum sizing requirements for both stations are presented in Chapter 4 and 5.

[1] Information received by email from Principal Permanent Way Design Engineer (Mott MacDonald) on 26 November 2019.

3 Timetable Analysis

The current timetable and the proposed timetable have been assessed for this review. The results of the analysis and any potential clashes or issues (regarding passenger flow) are presented below.

Realtime trains (realtimetrains.co.uk, 21 November 2019) was consulted to obtain the current timetable which is presented in Table 3 and Table 4.

Table 3: Current Timetable taken from Realtimetrains.co.uk (November 2019) AM Peak

Arrival	Platform	Origin	Destination	Departure
0800	1	Norwich	Liverpool Lime Street	0800
0808	2	Peterborough	Ipswich	0808
0832	1	Stansted Airport	Birmingham New Street	0832
0834	2	Birmingham New Street	Stansted Airport	0834
0907	1	Norwich	Liverpool Lime Street	0907
0917	1	Ipswich	Peterborough	0918
0932	1	Stansted Airport	Birmingham New Street	0932
0934	2	Birmingham New Street	Stansted Airport	0934

Table 4: Current Timetable taken from Realtimetrains.co.uk (November 2019) PM Peak

Arrival	Platform	Origin	Destination	Departure
1717	1	Ipswich	Peterborough	1718
1732	1	Stansted Airport	Birmingham New Street	1732
1737	2	Birmingham New Street	Stansted Airport	1738
1809	2	Peterborough	Ipswich	1809
1833	2	Birmingham New Street	Stansted Airport	1833
1833	1	Stansted Airport	Birmingham New Street	1834
1859	2	Liverpool Lime Street	Norwich	1900

The indicative timetable for the future services is presented in Table 5 (Document reference: 398128 | 007 | A).

Table 5: Indicative timetable for newly proposed service at March Station

Arrival	Platform	Origin	Destination	Departure
xx:10	3	Wisbech	Cambridge	xx:11
xx:23	3 (or 2)	Cambridge	Wisbech	xx:24
xx:40	3	Wisbech	Cambridge	xx:41
xx:53	3 (or 2)	Cambridge	Wisbech	xx:54

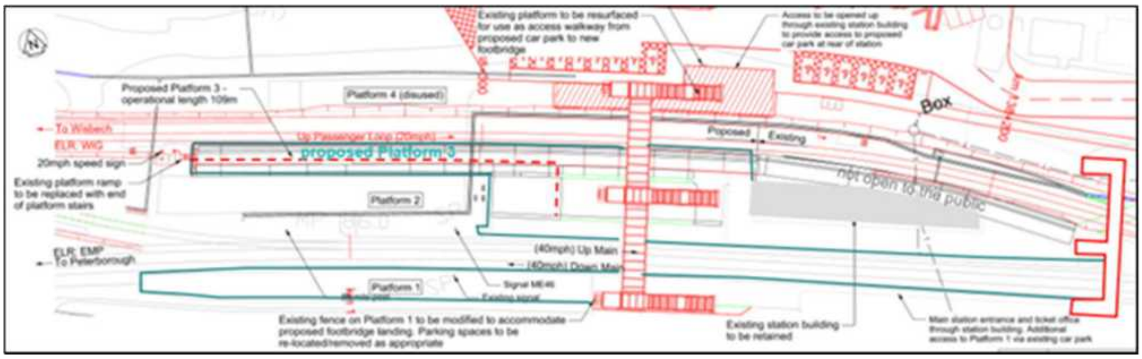
The timetable analysis does not indicate there will be any passenger flow clashes under Normal Operations (a clash was assumed to happen when trains arrive or depart within 5 minutes of each other on the same platform). The analysis cannot fully assess potential clashes on the footbridge (for example when the 17:37 from Birmingham arrives on Platform 2 and the new service from Wisbech arrives at 17:40). This could not be fully assessed because current detailed demand levels per platform are unknown.

4 March Station

March Station serves the town of March (Cambridgeshire) and surrounding area. The station currently has 2 operational platforms. It is proposed to redevelop and reopen a third disused platform to enable the operation of a new service with 2 tph. To ensure this third platform and the station are adequately sized a high-level station capacity analysis was undertaken. The results of this analysis are presented below.

Figure 1 shows the proposed layout and redeveloped Platform 3 for March station. The existing footbridge can be seen at the eastern end of the platform, while the new proposed footbridge is more centrally located on the platforms.

Figure 1: March Station Layout



As the western (Peterborough) end of the disused platform is straighter it was considered easier from a construction perspective to restore to operation (398128 | 007 | A, Mott MacDonald, September 2019). The eastern end of Platform 3 is not open to the public.

Due to the relative position of the existing and the new footbridge on the platforms it was assumed they are used differently depending on each platform. The following routing assumptions were made:

- 75% of passengers approach the station from the car park towards the north of the station;
- 25% of passengers approach the station from the car park towards the south of the station;
- When arriving or departing from Platform 1 25% of passengers are assumed to use the existing footbridge;
- When arriving or departing from Platform 2 40% of passengers are assumed to use the existing footbridge;
- When arriving or departing from Platform 1 10% of passengers are assumed to use the existing footbridge;
- Remaining passengers are assumed to use the new footbridge;
- 10% of demand was added to assumed footbridge use to account for errors in the above assumptions. This was done because no detailed demand data is available.

The platform needs to accommodate a 2-car Class 170 unit which is 47.22m long. It is also advised to provide passive provision for a 4-car train length, which would result in a length of approximately 100 metres long (at least 5 metres additional platform length should be provided above the train length, NR SCPG). The actual length of the platform will be confirmed after a detailed operational and engineering risk assessment has been undertaken (398128 | 007 | A, Mott MacDonald, September 2019). It is recommended to also assess the platform dimensions from a passenger flow perspective.

To enable the comfortable and safe movement of passengers within the station, a static analysis was undertaken using forecasted passenger demand (Chapter 2). However, detailed information about current passenger demand was not available. This should be assessed to ensure the whole station can cope with the proposed additional services. Furthermore, the reinstatement of Platform 3 would result in the closure of the pedestrian walkway leading to Platform 2. This could potentially result in additional passengers using other station areas which also needs to be assessed in subsequent design stages.

Minimum requirements for key areas within the station are presented in Table 6.

Table 6: Minimum Station Sizing Requirements March Station

Station Area	Minimum Requirement	Comments
Gateline	n/a	The station is not gated. If the decision is made to install revenue protection (ticket gates) an analysis of the impact on passenger flows shall be undertaken.
Platform 1 Length Platform 2 Length Platform 3 Length	52.22 metres 52.22 metres 52.22 metres	An additional 5 metres above the train length should be provided.
Platform 1 Width Platform 2 Width Platform 3 Width	3.5 metres 3.5 metres 4.3 metres	This requirement includes an allowance of 0.5 metres for station furniture such as benches. Columns and other obstructions should be at least 2.0 metres clear of the platform edge. Headroom of at least 2.5m is required for a width of up to 2.0m of the platform edge. At least 2.3m is required for distances greater than 2.0m from the platform edge.
All Platforms Yellow Line Zone	0.5 metres	This requirement is included in the minimum platform width. A Yellow line should be provided at least 1.5m from the platform edge where trains pass at speeds greater than 100mph or where freight trains pass through the station at speeds greater than 60mph. The relevant TOC(s) should be consulted whilst defining the width of this zone (the Yellow Line Zone is also used for the safe dispatching of trains).
Station Concourse	46 sqm	A queuing space of at least 4 metres should be provided in front of ticket machines, ticket office or ATMs. This space shall be free

Station Area	Minimum Requirement	Comments
		from obstruction and circulating movements. Space for retail, food and refreshment outlets should be provided in addition to the minimum requirement. Queuing space and seating arrangements should be calculated separately.
Footbridge - existing	2.2 metres	The requirement refers to clear width and does not include an allowance for handrails.
Footbridge - new	3.5 metres	The requirement refers to clear width and does not include an allowance for handrails.
Existing Staircase P1 Existing Staircase P2-3 Existing Staircase P4	1.6 metres 1.6 metres 1.6 metres	The requirement refers to clear width and does not include an allowance for handrails. At least 1 step free route shall be provided.
New Staircase P1 New Staircase P2-3 New Staircase P4	1.7 metres 3.3 metres 3.3 metres	A Diversity Impact Assessment (DIA) shall be undertaken. This shall inform the requirements for a step free route.
Lift P1 Lift P2-3 Lift P4	1 of 10 sqm 1 of 13 sqm 1 of 10 sqm	A Diversity Impact Assessment (DIA) shall be undertaken and shall inform the step-free requirements and thus lift provision requirements.
Run Off / Run On	4.0 metres	A run off / run on of at least 4 metres should be provided from staircases to platform.

The proposed design was compared with the minimum requirements and results are shown in Table 7.

Table 7: Comparison of minimum requirements with proposed station design

Station Area	Minimum Requirement	Proposed Design GRIP 3	Comments
Platform 1 Length Platform 2 Length Platform 3 Length	52.22 metres 52.22 metres 52.22 metres	94 metres 115 metres 109 metres	An additional 5 metres above the train length should be provided.
Platform 1 Width Platform 2 Width Platform 3 Width	3.5 metres 3.5 metres 4.3 metres	**3.2 metres** 4.75 metres 4.75 metres	Based on the static analysis for normal operation, only the existing P1 is not wide enough for forecasted demand in 2039. The exact width of the Yellow Line Zone should be informed by the TOC.

Station Area	Minimum Requirement	Proposed Design GRIP 3	Comments
Station Concourse	46 sqm	Not applicable	The additional requirement associated with new demand on P3 is 26.4 sqm.
Footbridge - existing Footbridge - new	2.2 metres 3.5 metres	2.5 metres 4 metres	The footbridge has sufficient width to cope with forecasted demand. However, there is potential for passenger crowding on the footbridge if 2 trains arrive at the station around the same time. Timetable analysis indicates this would not be the case during Normal Operations.
Existing Staircase P1 Existing Staircase P2-3 Existing Staircase P4 New Staircase P1 New Staircase P2-3 New Staircase P4	1.6 metres 1.6 metres 1.6 metres 1.7 metres 3.3 metres 3.3 metres	2.5 metres 2.5 metres 2.5 metres 2.5 metres **2.5 metres** **2.5 metres**	The staircase does not have sufficient capacity which could result in queues on the platform. The design should be reviewed. If some level of queuing was permitted at the bottom of the staircase then a staircase of 2.2 metres would suffice. This would have to be agreed with Network Rail.
Lift P1 Lift P2-3 Lift P4	1 lift of 7 sqm 1 lift of 13 sqm 1 lift of 13 sqm	**Lifts of approximately 4.8 sqm**	The proposed lift provision is not sufficient. This requirement is based on assumed lift usage of 15%. Ideally this figure should be informed by a DIA.
Run Off / Run On P1 Run Off / Run On P2-3 Run Off / Run On P4	4.0 metres 4.0 metres 4.0 metres	7.2 metres 5.3 metres 10 metres	The run off and run on should be kept clear of obstructions and circulatory movements.

Note: Proposed design taken from IDC drawings – recommended changes to be incorporated for final submission.

4.1 Platform 1

Platform 1 has existing demand but there is no detailed passenger demand data available for the existing services. However, the following recommendation is made regarding this platform:

- It should be ensured that a minimum platform width of 2.5 metres is provided adjacent to the footbridge (if trains pass at speeds greater than 100mph a minimum width of 3.0 metres should be provided);

- It is anticipated that the platform will not be wide enough to safely cope with forecasted demand for 2039. A detailed passenger count survey can provide more detailed insight into passenger flows to confirm this requirement;
- The size of the proposed lifts is not large enough to cope with forecasted demand and assumed lift use (15% of passengers are assumed to use the lifts to future proof the design).

4.2 Platform 2

It is possible that the new service will occasionally call at Platform 2. This should only be done if passenger demand levels on Platform 2 allow for this. A picture of Platform 2 is shown in . Detailed passenger demand data is not available for this platform. It is recommended that a passenger count survey is undertaken to assess this demand in subsequent design stages.

The following recommendations regarding the available infrastructure on Platform 2 can be made without detailed knowledge of current passenger demand levels:

- The platform width adjacent to the existing footbridge staircase is not sufficient. A risk assessment should be undertaken by the TOC to ensure this does not pose a safety risk for passengers;
- The location of the ticket machine and bicycle stands on this platform is not ideal because they could impede circulatory flows between platform and the footbridge. A relocation of this ticket machine and bicycle stand should be considered. This should be in a location where there is enough space for queuing.

Figure 2: Platform 2 at March Station

4.3 Platform 3

The analysis shows that the current sizing of Platform 3 vertical circulation elements are not sufficient for the forecasted passenger demand up to the year 2039 in a few areas. The proposed staircase leading to and from the new footbridge is not wide enough. The proposed lift size is also too small for assumed demand (15% of passengers are assumed to use the lift). If passengers have to queue for the lift this increases the risk of passengers using the staircase with heavy luggage which could pose a safety risk.

Due to the location of the new footbridge relative to the existing footbridge it is likely that significantly more passengers are drawn to the new footbridge. This could result in queuing at the bottom of the staircase on Platform 3 and underutilisation of the existing footbridge.

Furthermore, it is estimated that some existing station infrastructure will not cope with the increase in passenger demand and would potentially need additional space provision in the following area:

- Station concourse (with ticketing facilities, etc.).

The following recommendations are made on top of the minimum sizing requirements:

- A Diversity Impact Assessment shall be undertaken and should inform step-free requirements at the station;
- The evacuation strategy and capacity should be assessed in subsequent design stages;
- Platform infrastructure should be placed away from any circulatory movements as not to impede passenger flow;
- Platform facilities should not be placed on the platform without due consideration to the impact on passenger flows;
- The direction of the staircase to the footbridge will force the majority of passengers using Platform 3 to perform a U-turn on the platform. This will increase crowding experienced at the bottom of the staircase.

4.4 Platform 4

The new footbridge will provide access to Platforms 1 - 4. There will be no trains calling at Platform 4. This platform will act as an access to the proposed car park. The existing Platform 4 will be resurfaced for this purpose. 2 new ticket vending machines (TVMs) are also proposed at the new car park. The following recommendations are made regarding Platform 4:

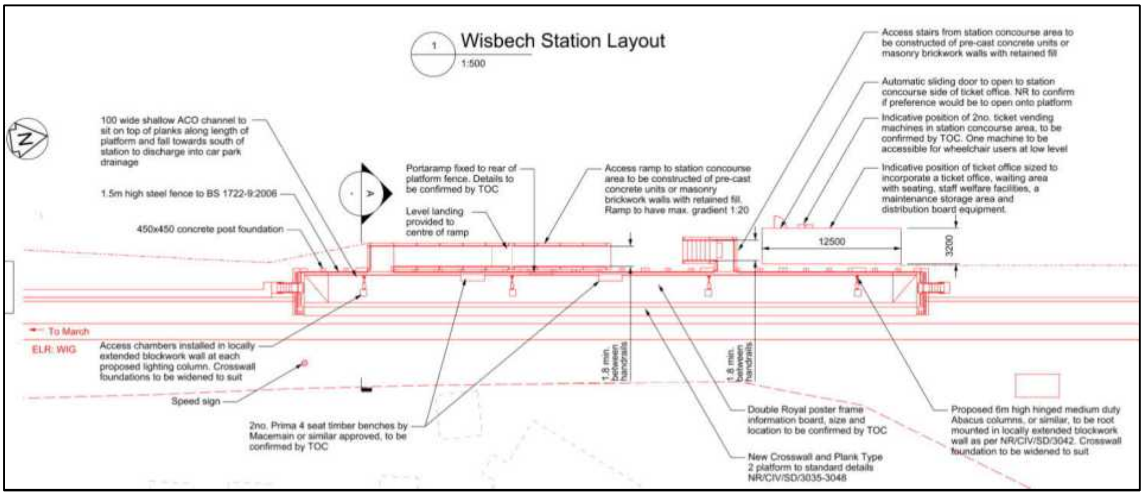
- It should be ensured the passageway width to Platform 4 is a minimum of 2.2 metres as per NR SCPG (clear width);
- A minimum of 4 metres should be provided in front of the TVMs to allow for queuing;
- The proposed staircase is not wide enough;
- The proposed lift size is not large enough to accommodate forecasted demand with the assumed lift use of 15%;
- It is also recommended to provide a fence on Platform 4 to close off any parts of the platform that are not used to access the footbridge.

5 Wisbech Station

Wisbech Station will serve the town of Wisbech (Cambridgeshire) and surrounding area. There is currently no station at Wisbech. It is proposed to build the station with one single face platform to enable the operation of the new service with 2 tph. To ensure the station is adequately sized a high-level station capacity analysis was undertaken. The results of this analysis are presented below.

Figure 3 shows the proposed layout for Wisbech Town station.

Figure 3: Wisbech Station Layout



The station will consist of 1 platform which needs to accommodate a 2-car Class 170 unit which is 47.22m long. It is advised to provide passive provision for a 4-car train length, which would result in a minimum length of approximately 100 metres long (at least 5 metres additional platform length should be provided, NR SCPG). The actual length of the platform will be confirmed after a detailed operational and engineering risk assessment has been undertaken (398128 | 007 | A, Mott MacDonald, September 2019). It is recommended to also assess the platform dimensions from a passenger flow perspective.

To enable the comfortable and safe movement of passengers through the station a static analysis was undertaken using forecasted passenger demand. Minimum requirements for key areas within the station are presented in Table 8.

Table 8: Minimum Station Sizing Requirements for Wisbech Station

Station Area	Minimum Requirement	Comments
Gateline	n/a	The station is not gated. If the decision is made to install revenue protection (ticket gates) an analysis of the impact on passenger flows shall be undertaken.
Platform 1 Length	52.22 metres	An additional 5 metres above the train length should be provided.
Platform 1 Width	3.2 metres	The requirement includes an allowance of 0.5 metres for station furniture such as benches.

Station Area	Minimum Requirement	Comments
		Columns and other obstructions should be at least 2.0 metres clear of the platform edge. Headroom of at least 2.5m is required for a width of up to 2.0m of the platform edge. At least 2.3m is required for distances greater than 2.0m from the platform edge.
Platform 1 Yellow Line Zone	0.5 metres	This requirement is included in the minimum platform width. A Yellow line should be provided at least 1.5m from the platform edge where trains pass at speeds greater than 100mph or where freight trains pass through the station at speeds greater than 60mph. The relevant TOC(s) should be consulted whilst defining the width of this zone (the Yellow Line Zone is also used for the safe dispatching of trains).
Station Concourse	18 sqm	A queuing space of at least 4 metres should be provided in front of ticket machines, ticket office or ATMs. This space shall be free from obstruction and circulating movements. Space for retail, food and refreshment outlets should be provided in addition to the minimum requirement. Queuing space and seating arrangements should be calculated separately.
Ramp	2.2 metres	The requirement refers to clear width and does not include an allowance for handrails. If a central handrail is provided the minimum width of the ramp shall be 1.9 metres on either side of the handrail.
Staircase	1.6 metres	The requirement refers to clear width and does not include an allowance for handrails. At least 1 step free route shall be provided. A Diversity Impact Assessment shall be undertaken. This shall inform the requirements for a step free route.
Run Off / Run On	4.0 metres	A run off / run on of at least 4 metres should be provided from staircase / ramp to platform.

The proposed design was compared with the minimum requirements and results are shown in Table 9.

Table 9: Comparison of minimum requirements with proposed station design

Station Area	Minimum Requirement	Proposed Design GRIP 3	Comments
Platform 1 Length	52.22 metres	55 metres of operational platform length	An additional 5 metres above the train length should be provided.
Platform 1 Width	3.2 metres	3.9 metres	The exact width of the Yellow Line Zone should be informed by the TOC.
Station Concourse	18 sqm	40 sqm including ticket office and staff facilities	15 sqm of waiting and circulating space. This space should be kept clear of obstructions.
Ramp	2.2 metres	**1.8 metres**	The ramp is not wide enough. The design

Station Area	Minimum Requirement	Proposed Design GRIP 3	Comments
			should be reviewed to include the minimum ramp width of 2.2 metres.
Staircase	1.6 metres	1.8 metres	
Run Off / Run On	4.0 metres	**Not provided**, only a landing area is provided for the ramp and staircase before passengers reach the platform.	Design should be reviewed to assess whether this can be improved. The run off and run on should be kept clear of obstructions and circulatory movements.

Note: Proposed design taken from IDC drawings – recommended changes to be incorporated for final submission.

The analysis shows that the proposed station infrastructure is appropriately sized in most areas, except for the ramp and platform length. The following recommendations can be made regarding to the proposed station infrastructure:

- The platform length should be a minimum of the train length + 5 metres. This should consist of space that can be used by passengers;
- The ramp should be a minimum of 2.2 metres in width;
- A Diversity Impact Assessment shall be undertaken and should inform step-free requirements at the station;
- The evacuation strategy and capacity should be assessed in subsequent design stages;
- Platform infrastructure should be placed away from any circulatory movements as not to impede passenger flow;
- Platform facilities should not be placed on the platform without due consideration to the impact on passenger flows.

6 Conclusions and Recommendations

Following a high-level static analysis there are a few areas in both stations which are recommended to be reviewed.

The static analysis identified some areas of March station which would not provide sufficient capacity to accommodate the forecasted passenger demand. A summary of minimum station sizing requirements is given in Table 6. The station would benefit from additional space provision in the following areas:

- Platform 1 platform width;
- Staircase width on Platform 2-3 and Platform 4, which is a design criterium from NRs Station Capacity Planning Guidance. Looking purely at platform clearance time there could be potential to use a narrower staircase. Another option is to encourage passengers to use the existing footbridge but due to its location this is likely to require staff intervention;
- Lift size.

Detailed demand for existing platforms was not available. It is recommended to undertake a passenger count survey to gain insight in current passenger demand patterns.

The analysis for Wisbech station showed the station is not appropriately sized in some areas following Network Rail SCPG (Network Rail, November 2016). A summary of minimum station sizing requirements is given in Table 8. The following station areas are recommended to be increased in size:

- Run-offs at the top of the stairs and ramps should be considered. The current design provides landing areas only;
- The ramp should be a minimum of 2.2 metres in width.

These recommendations are to be incorporated into the design following the IDC meeting (16/12/2019).

Furthermore, the following recommendations, which apply to both stations, are made:

- A Diversity Impact Assessment shall be undertaken and shall inform step-free requirements at the station;
- The evacuation strategy should be assessed in subsequent design stages;
- The location of any platform infrastructure should be placed away from any circulatory movements as not to impede passenger flow;
- Platform facilities should not be placed on the platform without due consideration to the impact on passenger flows.

7 References

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J. Electrical and Plant Station Report

March to Wisbech Transport Corridor

E&P - Station Report

28 February 2020

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March to Wisbech Transport Corridor

E&P - Station Report

28 February 2020

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A	28/02/2020	R. Duddy	M. Shaw	T. Granger	First Issue

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Contents

Tables

Figures

Executive summary

This E&P Station report is related to the March to Wisbech Transport Corridor project, which is concerned with providing a new train route along the historical rail corridor between March and Wisbech.

This document details the existing LV assets installed at March station whilst also detailing the proposed E&P works to be undertaken at this station. Additionally, detailed within this document is the envisaged E&P work required for the proposed Wisbech station. As part of the E&P assessment a site survey was undertaken at March station; the station survey consisted of verifying record information and asset condition assessment.

The E&P works associated with the signalling power and points heating requirements, associated with the reinstatement of the rail line between March and Wisbech, is detailed within the main option selection report.

1 March & Wisbech Stations

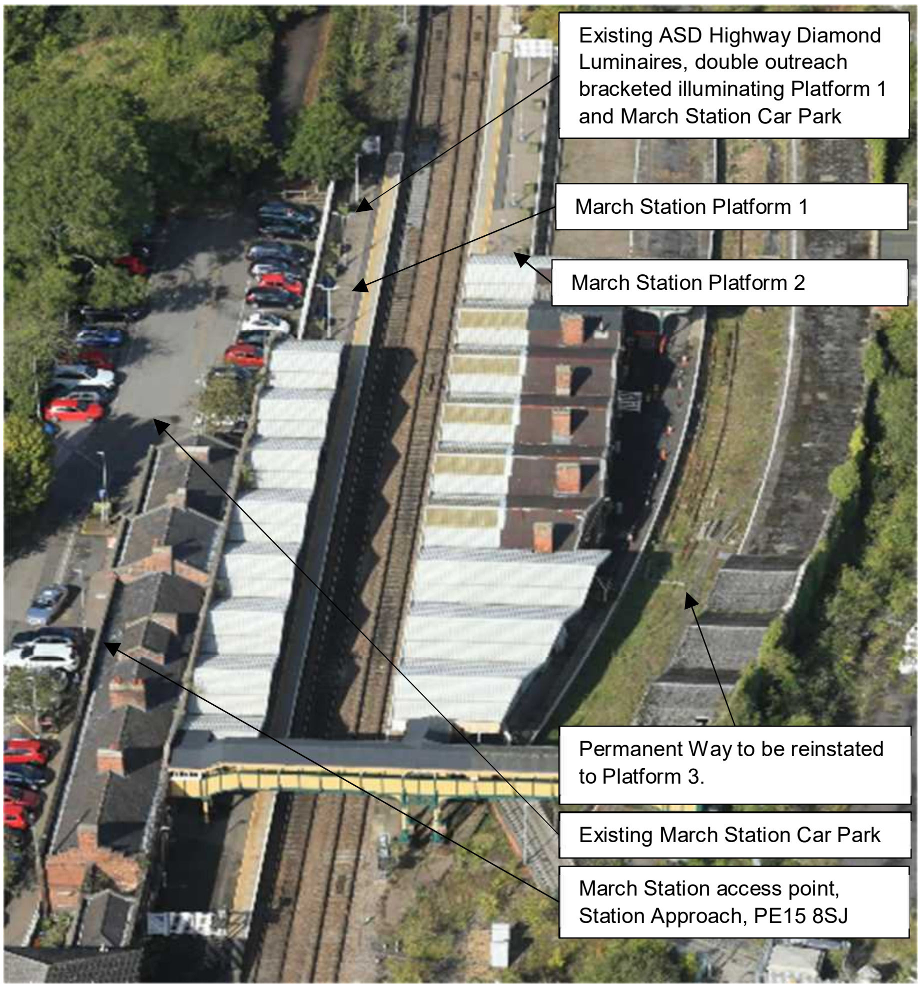
This report details a high-level overview of the proposed works that are required at both March & Wisbech stations. Proposed works at March station relate to the reinstatement of Platform 3 and the associated works that are required in order to bring the platform back into passenger use. Wisbech station will be an entirely new station comprising of a single platform and ticket office/waiting area.

1.1 March Station

March station is located at ELR: WIG 85m 73ch. The nearest pedestrian access point for Platform 1 is via March station off Station Approach, PE15 8SJ. The nearest pedestrian access point for Platform 2 is via a designated walkway off B1101, PE15 8NZ. The two station platforms are currently linked via a footbridge at the south end of the station.

Upgrades to March station are required as a result of the proposed train service between March and Wisbech. In order to satisfy the requirements of this service, March station Platform 3 will be reinstated for passenger use; as a result, LV works are required to be undertaken on Platform 3.

Figure 1: March Station



Source: Routeview, Image: WIG 85m 1496yds (W), 23 Sep 2019 10.29

1.1.1 Platform 1

The existing 50kVA DNO supply at March station is a three-phase, 400V, TN-C-S (PME) supply fitted with an 80A cut out fuse. The DNO supplies a 12-way distribution board identified as 'DB/MSB' which is Platform 1's main LV distribution board situated in the Electrical switch room off Platform 1. Record information made available to MML shows that 'DB/MSB' is supplied via an 125A TP&N incoming isolator. 'DB/MSB' supplies numerous other distribution boards and the main LV switch room domestics, namely: heater, lights and sockets.

Figure 2: DB/MSB External View

Source: MML Survey 23/10/2019

Figure 3: DB/MSB Internal View

Source: MML Survey 23/10/2019

The spot measurements, contained within Table 1, were undertaken at 'DB/MSB' by the Greater Anglia Senior Asset Manager.

Table 1: Spot Measurements – March Station Platform 1 'DB/MSB'

Circuit	Voltage (V)	Current (A)
Bn/Bk/Gy (Station lighting off)	231/241/231	7.1/3.5/2.2
Bn/Bk/Gy (Station lighting on)	-	9.1/4.7/5.7

Source: Senior Asset Manager Greater Anglia - 22/10/19

1.1.2 Platform 2

The existing 100A TN-S DNO, supplying March station platform 2, is understood to be located within the compound of the 11kV UKPN substation. The 11kV substation is situated at the end of the Braza social club car park, adjacent to the pedestrian access to platform 2. Platform 2 has a

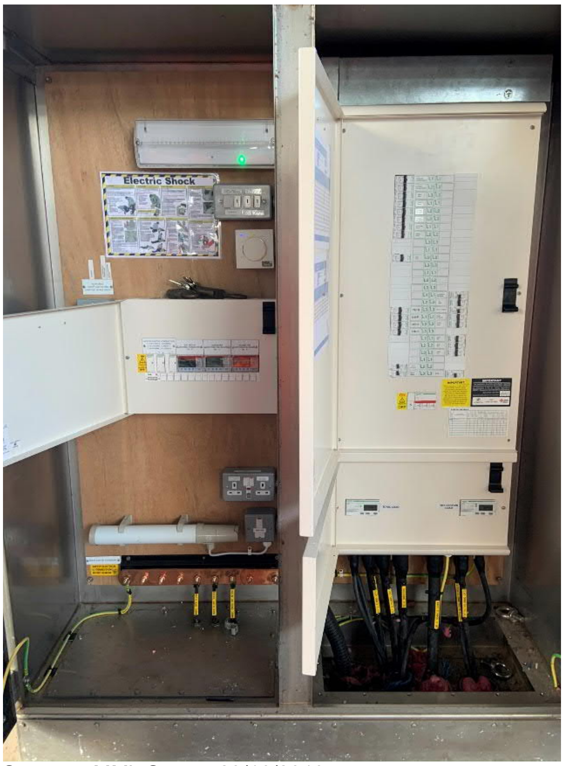
TP&N 16-way LV main distribution board identified as 'DB/A', this DB has a 125A TP&N incoming isolator which is supplied from the DNO cubicle within the substation compound.

'DB/A' supplies platform lighting columns, canopy lighting, footpath lighting, CIS and other circuits related to Platform 2.

Figure 4: DB/A External View of Cubicle

Source: MML Survey 23/10/2019

Figure 5: DB/A Internal View of Cubicle



Source: MML Survey 23/10/2019

The following spot measurements, within Table 2, were undertaken at 'DB/A' by the Greater Anglia Senior Asset Manager.

Table 2: Spot Measurements – March Station Platform 2 'DB/A'

Circuit	Voltage (V)	Current (A)
Bn/Bk/Gy (Station lighting off)	246/247/246	0.5/2.0/1.5
Bn/Bk/Gy (Station lighting on)	-	4.2/2.5/4.5

Source: Senior Asset Manager Greater Anglia - 22/10/19

1.1.3 Proposed Platform 3

The existing 'DB/A' lighting and power cubicle, on Platform 2, has a number of spare ways available. It is proposed that Platform 3 should utilise the existing spare ways within the Platform 2 power cubicle for the supply of the proposed Platform 3 lighting. Platform 2 and Platform 3 will form an island platform therefore 'DB/A' is in an ideal location to supply the proposed lighting circuits. It is understood that sufficient spare capacity is available to supply the proposed lighting and telecoms equipment required to bring Platform 3 back into passenger service. Verification of the existing spare capacity of the LV installation should be undertaken at GRIP4.

A new DNO connection is required in order to supply the 3No. proposed platform lifts, as part of the proposed footbridge to be installed at the West end of the station. It is assumed that each lift shall be suitably sized for 16 people, resulting in approximately 40kVA of load required per lift. Actual DNO requirements will be undertaken at GRIP 4 following the development of the overbridge and lift requirements.

1.1.4 March Station Lighting

Existing lighting across the operational March station platforms consists of column and under canopy lighting. The existing lighting across March station has recently been renewed, with the installation of energy efficient LED luminaires.

The existing lighting installation across the station canopies are ASD lighting Titan 1500 LED 7500 fittings which are high efficiency anti-vandal luminaires. The footbridge connecting both platforms is also illuminated by this type of luminaire. Across both the canopies and footbridge there are a total of 43No. Titan luminaires installed.

Lighting columns are also installed along both platforms, in open platform areas. Lighting columns across both platforms are fitted with ASD Highway Diamond Elite luminaires with LED-integrated lighting fixtures with a 500mA driver current. There are 4No. column luminaires across Platform 1 and the same number across Platform 2. Additionally, across Platform 1, 2No. of the total 4No. lighting columns are fitted with double outreach brackets which illuminate both Platform 1 and the existing station car park. The luminaires illuminating the car park incorporate LED-integrated lighting fixtures with a 700mA driver current, the load requirements for these luminaires are shown in Table 3:

Table 3: March Station Luminaire Load Requirements

Type of Luminaire	No. of Luminaires	Load per luminaire (W)	Total Load (W)
ASD Lighting Titan IP65 LED, 1200mm, 4000K, 7500 Lumen	43	74	3,182
ASD Highway Diamond IP66, 4000K Cree LEDs, Black 12 LED 350mA S8 optics	9	15	135
ASD Highway Diamond IP66, 4000K Cree LEDs, Black 32 LED 500mA S78 optics	8	53	424
ASD Highway Diamond IP66, 4000K Cree LEDs, Black 6 LED 700mA optics flood	22	54	1188

Source: ASD Luminaire Manufacturer

Installed within these luminaires are BEG DALI IP65 PIR sensors which dim the light output after a set period of time and will increase to 100% when a presence is detected by the PIR sensor.

Figure 6: Existing Lighting Infrastructure across March Station - Platform

Source: MML Survey 23/10/2019

Figure 7: Existing Lighting Infrastructure across March Station – Footbridge/Canopy

Source: MML Survey 23/10/2019

The lighting design for March station will adhere to the relevant standards, for a category E station (small staffed). Record information made available to MML shows that the existing lighting infrastructure and lux levels across March station Platforms 1 and 2 is compliant with current standards; however, a detailed lighting assessment for this station should be undertaken to validate the additional lighting requirements. The proposed lighting design will be based on the existing lighting infrastructure to achieve a consistent lighting arrangement across all platforms and not to aesthetically detract from the station. It is proposed that Platform 3 will be approximately 104m in length; preliminary lighting calculations show that 9No. 6m high columns are required across the platform, with a separation distance of 12m, to achieve required lux levels along the platform.

Figure 8: Preliminary Lighting Calculation - March Station Overview

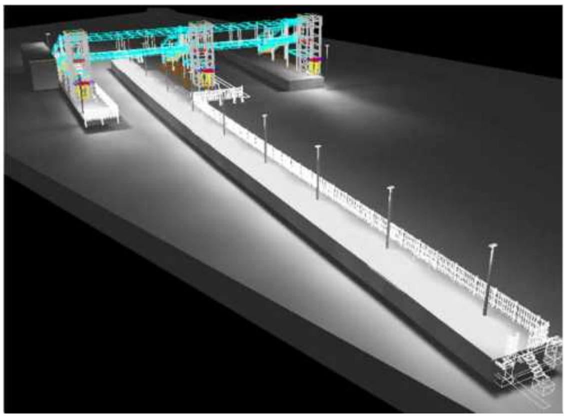
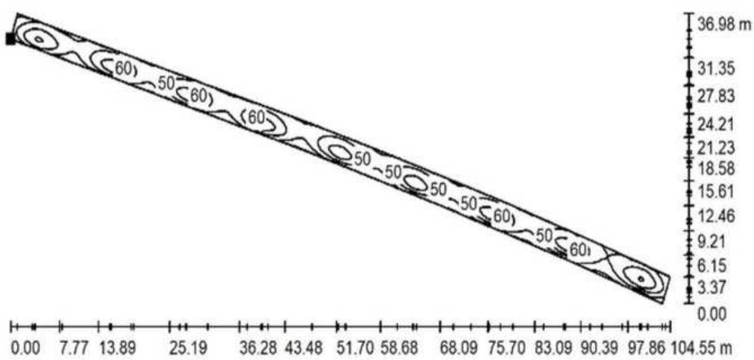


Figure 9: Preliminary Lighting Calculation - March Station Platform 3 Lux Levels



At March station the existing footbridge is not suitable for passengers with reduced mobility. Step free access to Platform 1 is through the March station building with access to Platform 2 made via a designated walkway off B1101. Due to the existing footbridge not being able to cater for lifts it is proposed that a new footbridge is to be installed. The proposed footbridge will provide suitable access to each platform via stairs and lifts providing appropriate accessibility for passengers. The proposed footbridge will be installed across the existing and proposed platforms thus resulting in additional lighting required. Reference should be made to BS 5489-1 which states that the required lux levels for enclosed footbridges should average 350 lux during the day and an average of 100 lux at night. The proposed illumination of this footbridge will be done utilising the Titan luminaire keeping a consistent lighting approach across the station. At this stage it is proposed that these luminaires shall be supplied from the spare ways available from Platform 1's LV cubicle 'DB/1.

Remedial works will be required across Platform 1 and Platform 2 to recover the existing lighting columns that clash with the proposed footbridge. It is envisaged that 2No. lighting columns on Platform 1 and 1No. lighting column on Platform 2 shall be recovered. In order to adhere to the relevant lighting standards an additional lighting column shall be required on Platform 1 to illuminate the section of platform leading to the lift entrance. Due to lack of available space on the platform at this stage it is proposed that the required lighting column should be installed behind the station fence line. The existing lighting columns shall be assessed at GRIP4 against their suitability for reuse.

Platform 4 is being reinstated whilst utilising the existing station building currently situated on Platform 4. This station building will be the access/egress point connecting passengers who utilise the proposed car park with March station proposed footbridge. It is envisaged that 2No. lighting columns are required; these columns will illuminate the station access point and the lift entrance.

1.1.5 March Station Car Park Lighting

The existing capacity of March station car park does not provide for the envisaged increase in station demand; therefore, an additional car park has been proposed to provide additional parking bays. Car park lighting will be required in order to illuminate the proposed car park. An outline lighting design, for the proposed car park, should be undertaken at GRIP4. The existing station car park is illuminated with the use of ASD Highway Diamond luminaires and this type of luminaire will form the basis of the lighting design for the additional March station car park.

BS EN 12464-2 & BS 5489-1 states that the lux levels across the proposed car park should average 10lux with a ≥0.25 uniformity. Preliminary lighting calculations indicate that there will be a requirement for approximately 50No. 6m high lighting columns. The exact number of lighting columns should be verified during GRIP stages 4 and 5. The proposed car park will be supplied from the DB to be installed in the existing station building off Platform 4. This building will be the access point linking the proposed car park to the proposed footbridge allowing access to the in-service platforms.

For any lighting design related to the external environment of an accessible and inclusive built environment adherence should be made to section 11 of BS 8300-1.

The proposed lighting design will be developed with due cognisance of future electrification of the platforms. Designs should be developed as to avoid future earthing and bonding requirements associated with electrification or for the ease of installation of earth bonds. Future provision of electrification should not result in the increase in project costs.

1.1.6 Fire Detection and Alarm System

There is currently no fire alarm system installed at March station.

The proposal of lifts at March station will require the installation of a fire detection and alarm system. At GRIP stage 4 a fire engineer should be appointed and a fire strategy for the station should be produced. At this stage it is understood that the proposed fire protection system should conform to a category L5 system to satisfy a specific fire safety objective. The fire protection system should be designed to monitor the proposed station lift shafts only (refer to section 5.13e of BS 5839-1). The fire system should be provided in accordance with the recommendations of BS 5839 and the fire strategy, associated circuits should be fire rated to at least 30 minutes. As part of the fire strategy the method of fire detection shall be determined, with agreement obtained with the asset owner.

One method of detection is to position the detector at the top of the lift shaft, for testing and maintenance the maintainer would require access to the top of the lift car in order to access the detector. Another method is to use an aspiration system, which would not require assistance from the lift maintainer for system testing; however, this aspiration system has a greater capital cost.

1.1.7 Lift Motor Room

New lift motor rooms will be provided by M&E. The lift rooms would be located to the back of the proposed footbridge, at platform level, to serve the lifts providing access to the station platforms.

The main electrical supplies to each lift should be terminated in the lift motor rooms in suitably rated TP&SN/SP&SN fuse switches. The lift contractor will include for the provision and connection of all services from this point.

A SP&SN DB will be installed in the lift machine room. The DB will incorporate MCBs to provide single-phase supplies such as:

- Machine room lighting;
- Machine room heating;
- Machine room ventilation;
- Power sockets;
- Shaft lighting;
- Car light supply;
- Car maintenance control;
- Lift entrance lighting;
- Moisture and/or other detectors.

Heating and ventilation should be provided within each lift motor room to meet the requirements of NR/SP/ELP/27228. Heating for frost protection should be by direct electrical heating, and cooling should be provided via mechanical ventilation system or air conditioning to suit selected lift equipment (5°C to 40°C traction lifts and 5°C to 35°C for hydraulic lifts). Final selection of plant will be by the lift contractor. Local control will be provided for lift room mechanical building services.

Lighting shall be provided within the lift motor room to achieve 200lux with a ≥0.4 uniformity, refer to BS EN 12464-1.

Liaising with a lift specialist will be done at later GRIP stages, the lift specialist will provide the lifts to be installed across March station and also input on the lift motor room layout and requirements for this room.

1.1.8 Interface with other disciplines

E&P/M&E shall interface with Civils, Telecoms and Signalling disciplines throughout GRIP stages 4 & 5.

1.2 Wisbech Station

A new single platform station is proposed to be built at Wisbech as part of the reintroduction of train services between March and Wisbech; this station would be the termination point of the route from March. The proposed platform is to be 55m in length and will serve the rail services towards March.

1.2.1 DNO

It is understood that a DNO connection at Wisbech station for the LV station supply will be feasible and not cost prohibitive; the proposed location of the station is not rural and is within an area of mixed residential and industrial buildings.

The proposed DNO will be of GRP construction and will meet the requirements of NAT/TW/InfraInv/ENG/EP6248683. The DNO will be located in a position affording unrestricted access for the relevant Distribution Network Operator, the Electricity Service Provider meter reader and Network Rail maintenance staff. The cubicle should also not obstruct public rights of way, including during time of maintenance/testing.

The proposed DNO will house metering equipment and distribution switchgear within a double-sided cubicle. The DNO should consist of two compartments, DNO side where the main incoming supply and DNO metering equipment is housed and an NR side where the distribution switchgear is housed.

The DNO will supply Wisbech station main LV DB in which all services will be supplied from. Details regarding the number of ways of the DB and the MCB ratings should be specified in detail at later GRIP stages.

Power requirement studies should be undertaken at GRIP4 in order to specify the capacity of the required DNO. A DNO application will be submitted at GRIP4.

1.2.2 Wisbech Station Lighting

At the proposed Wisbech station it is envisaged that there would be 4No. 6m high lighting columns installed, the location of these columns will be at the points of the proposed crosswall and plank foundations with a 450mm offset. Access/egress to Wisbech station will be via stairs or a ramp. For access/egress to Wisbech station the targeted lux levels for stairs and ramps should adhere to BS 8300-1.

The lighting installation to illuminate the ramp and stairs can be done via a high performance bespoke engineered LED handrail system this option complies with the targeted lux levels in BS 5489-1 and BS 8300-1. Another option to illuminate the stairs and ramp is to utilise the proposed lighting columns using double outreach brackets; this option would result in 2No. luminaires installed on 3No. of the 4No. columns. The columns utilising the double outreach bracket will have one of the luminaires lighting the platform and the other luminaire lighting the stairs/ramp.

The proposed lighting installation will be designed to provide safe and reliable operation throughout the working life of the equipment. The use of LED luminaires would provide an energy efficient solution for the life cycle of the project whilst also adopting a minimum maintenance strategy.

The lighting design will be in compliance with all referenced standards for a category E station as defined in RIS-7702-INS. In accordance with GI/RT7016 Part 10 lux levels across the proposed 55m platform will meet the target lux levels specified in Table 4.

Table 4: Lighting Calculation Table

Description		Target Levels
Open Platform	Average	> 20 Lux
	Uniformity	> 0.4
Platform Edge	Minimum	> 10 Lux
	Uniformity	> 0.4
Vertical illuminance at 1m, 0.3m from platform edge	Minimum	6 Lux

Preliminary lighting calculations utilised the illuminated LED handrail option which shows that the targeted lux levels can be achieved by the specified means of lighting arrangement; detailed calculations will be undertaken at subsequent GRIP stages.

Figure 10: Preliminary Lighting Calculation – Wisbech Station General Overview

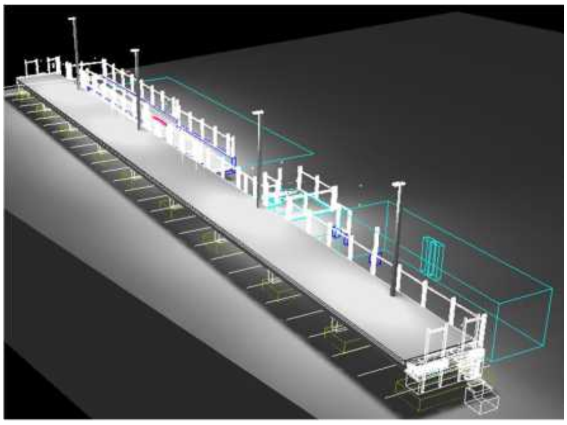


Figure 11: Preliminary Lighting Calculation – Lux Levels for Wisbech Platform

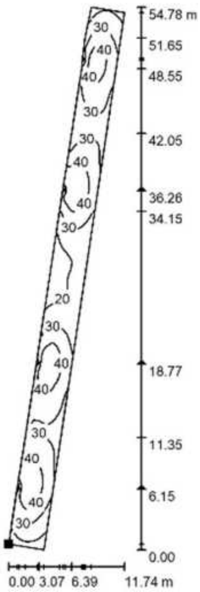


Figure 12: Preliminary Lighting Calculation – Wisbech Station Stairs Access

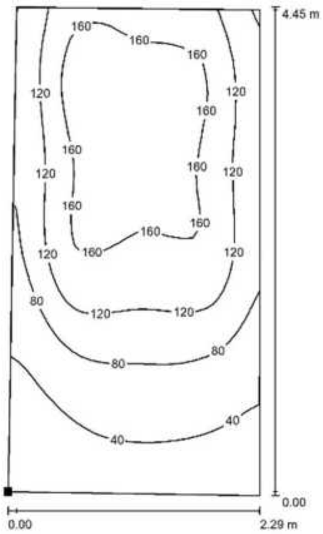
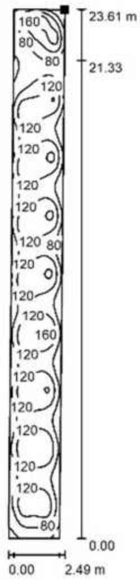


Figure 13: Preliminary Lighting Calculation – Lux Levels for Wisbech Station Ramp Access



The proposed luminaires would be supplied and controlled using a 2-pole contactor in combination with an automatic time switch and photocell arrangement. Where a photocell is installed it should be angled away from any artificial sources of light.

Detailed energy efficient control methods should be examined in detail at a later GRIP stage. However, consideration should be given to the installation of PIR sensors which would individually dim the light output after a set period of time and would increase to 100% when a presence is detected by the sensor. Luminaire diming settings should be reprogrammable.

The approximate load for the lighting will need to factor in the load requirements per luminaire to be installed. Currently the proposed bespoke engineered LED handrail luminaires load requirements is approximately 6W per luminaire. The proposed luminaires illuminating the platform is approximately 60W per luminaire, therefore it is envisaged that the approximate total lighting load requirements across the platform at Wisbech station will be 390W.

If the double outreach bracket option is selected to illuminate the access/egress to Wisbech platform then the approximate total lighting load requirements across the platform will be 420W.

The proposed lighting design will be developed with due cognisance of future electrification of the platform. Designs will be developed as to avoid future earthing and bonding requirements associated with electrification or for the ease of installation of earth bonds. Future provision of electrification should not result in the increase in project costs.

Future extensions to proposed platform have been devised; however, any proposed extension shall alter the proposed number of lighting columns currently identified to achieve uniformity across the platform.

1.2.3 Wisbech Station Car Park Lighting

An additional lighting design would be required for Wisbech station car park; at this stage it is envisaged that the car park lighting requirements will be supplied from the station DNO as to reduce installation and ongoing costs. BS EN 12464-2 & BS 5489-1 states that the lux levels across the proposed car park will average 10lux with a ≥0.25 uniformity. Preliminary lighting calculations indicate that there will be approximately 55No. 6m high lighting columns installed, verification of this approximation will be done at the later GRIP stages determining the exact number of columns required.

For any lighting design related to the external environment of an accessible and inclusive built environment adherence to section 11 of BS 8300-1 will be required.

1.2.4 Interface with other disciplines

E&P/M&E shall interface with Civils, Telecoms and Signalling disciplines throughout GRIP stages 4 & 5.

1.3 External Lighting

Considerations factoring in the lighting not specifically related to both March and Wisbech stations should be assessed at GRIP4.

1.3.1 Highway Lighting

Highway lighting in the vicinity of railways need to factor in the field of view of the train driver as the design should avoid comprising the visibility of signals, Section 7.8.3 of BS 5489-1 states that specific factors should be factored in, such as:

- Light spill should be minimised in the vicinity of a railway bridge crossing/passing above a road;
- Columns should be placed as far away as practicable from a rail bridge or the fence line of railway track;
- Unwanted glare should be minimized for the train driver by the use of luminaires conforming to an appropriate G class selected from BS EN 13201-2:2003, Table A.1 or shielding.

An assessment of the existing highway lighting and any implications on the railway should be undertaken at GRIP4.

1.4 EV Charging Bays

Requirements for the provision or passive provision of EV charging bays at either or both station car parks shall be determined by the combined authority of Cambridgeshire and Peterborough councils, prior to GRIP4. EV charging bay requirements shall detail the number of bays required and the type of EV charger to be specified, i.e. Rapid, Fast or Slow.

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K. Telecoms Option Selection Report Addendum

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CAMBRIDGESHIRE & PETERBOROUGH COMBINED AUTHORITY

March to Wisbech Transport Corridor

Telecoms Option Selection Report Addendum

5 May 2020

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March to Wisbech Transport Corridor

Telecoms Option Selection Report Addendum

5 May 2020

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Information class: Standard

Contents

1 Abbreviations

Abbreviation	Term
AC	Alternating Current
AFFL	Above Finished Floor Level
AFIL	Audio Frequency Induction Loop
AIP	Approval in Principle
ASL	Application Solution Limited
BS	British Standard
BT	British Telecommunications
BTP	British Transport Police
CCTV	Closed Circuit Television
CIS	Customer Information System
CMS	Cable Management System
CRE	Contractor Responsible Engineer
CSC	Customer Service Centre
dB	Decibel
dBA	Decibel (noise emission)
DC	Direct Current
DNO	Distribution Network Operator (Mains Power Supply)
DHEMR	Designer Health and Environmental Management Register
EA	Equality Act
ELR	Engineers Line Reference
ELV	Extra Low Voltage
EMC	Electro Magnetic Compatibility
FTN	Fixed Telecommunications Network
FTNx	Next generation Fixed Telecommunications Network
GB	Giga Bit
GRIP	Governance for Railway Investment Projects
GSM-R	Global System for Mobile Communication – Railway
GUI	Graphical User Interface
HMI	Human Machine Interface
IL	Induction Loop
IP	Ingress Protection or Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode

LLPA	Long Line Public Address
M&E	Mechanical & Electrical
Mbps	Megabits per second
NR	Network Rail
NRT	National Rail Telecoms
NTI	Next Train Indicator
NTP	Network Termination Point
LLPA	Long Line Public Address
PAPC	Public Address Personal Computer
PC	Personal Computer
PHP	Passenger Help Point
PoE	Power over Ethernet
PSU	Power Supply Unit
PSTN	Public Switched Telephone Network
RSD	Reference System Design
RFI	Request for Information
ROC	Railway Operations Centre
SFO	Station Franchise Operator
SISS	Station Information and Surveillance Systems
SOA	Summary of Arrival
SOD	Summary of Departure
SPT	Signal Post Telephone
TB	Tera Bits
TOC	Train Operating Company
TVM	Ticket Vending Machine

Table 1: Table of Abbreviations

2 Existing Infrastructure

2.1 Existing Conditions of Station Information and Surveillance System (SISS) and Operations Telecoms

As part of the Telecoms GRIP 3 works a SISS site survey was undertaken at March station on the 23/10/2019 and Operational Telecoms Survey on 24/03/20.The outcome of these site surveys resulted in a detailed asset assessment across the station. This included: SISS and Operational Telecoms.

At this GRIP stage (GRIP 3) no track access provided, further surveys of lineside Telecoms infrastructure have not been undertaken.

2.1.1 SISS

Currently March station is served by SISS assets which are positioned on both platforms (platform 1 & 2) of the station. The station is manned, although not on a 24hr basis. Although the survey was non-intrusive, all indications were from the visual survey undertaken and the testament of the Station Operational Staff was that all SISS assets were functional.

The station has a Long Line Public Address (LLPA) system, Closed Circuit Television (CCTV), Passenger Help Point (PHP) and Customer Information System (CIS), there are also Ticket Vending Machines.

All systems are connected back to head end equipment installed within a telecoms cabinet, which is located at the rear of the station ticket office. Further survey is recommended to establish spare capacity of the SISS head end equipment at GRIP 4 RSD for AIP.

There is no local control of these systems from the station. All images from the CCTV are recorded remotely whilst being transmitted to the Train Operating Companies (TOC's) Control Centre where they can be viewed on request by an Operator.

There is no existing SISS systems at Wisbech station, this station is a proposed new station which is yet to be built.

2.1.2 Operational Telecoms

There are existing trough routes within the disused track bed in the proximity of the proposed track for Platform 3, this runs the duration of the disused platform. (see below).

Figure 1: Existing Trough Route

There is a level crossing (March East), which is located immediately to the London End of the station.

2.1.2.1 Relay Room

The relay room is located on the opposite side of the public highway from March East Signal Box. The following telecoms infrastructure are housed within the Relay Room:

- STS Telephone Concentrator
- MDF
- FTN
- UPS.

Figure 2: Telephone Concentrator & Telecoms MDF

The Voice Recorder is located in an adjacent REB to the Relay Room. There appears to be a 20 Pair and 2 Pair Copper Cable connecting the Relay Room and REB to carry the voice circuits to the Voice Recorder.

Cables Presented on the MDF are as follows:

50 pair to March East Signal Box, there appears to be 9 spare circuits on this cable.

54 pair to MAS200, there appears to be 12 spare circuits on this cable.

20 pair to DP REB

The existing Telephone Concentrator and supporting Telecoms infrastructure appear in good condition with some spare Capacity for future expansion.

2.1.2.2 GSM-R

The nearest existing GSM-R base station is ID 3070, located at the March East as detailed in Section 5.5.4 of the GRIP 2 Heavy Rail Feasibility Report. There is FTN Infrastructure presented within this REB by form of Copper and 24 Fibre Tail cable from Joint number 3070 with Fibres going to 6069 and BDEA. Only Fibres 1-8 appear to be in operation.

Figure 3: March East GSM-R Mast & REB (3070)

2.1.2.3 SPT's

The operational telephones provided within the area of works are mainly SPT handsets (see Figure 4 below).

The SPTs utilise the existing Telecoms infrastructure to connect to the Telephone Concentrator at the March East Signal Box for direct dial connections.

Figure 4: SPT handsets

2.1.2.4 FTN/FTNx

The only FTN infrastructure identified was within the March East GMS-R REB (3070) as seen below:

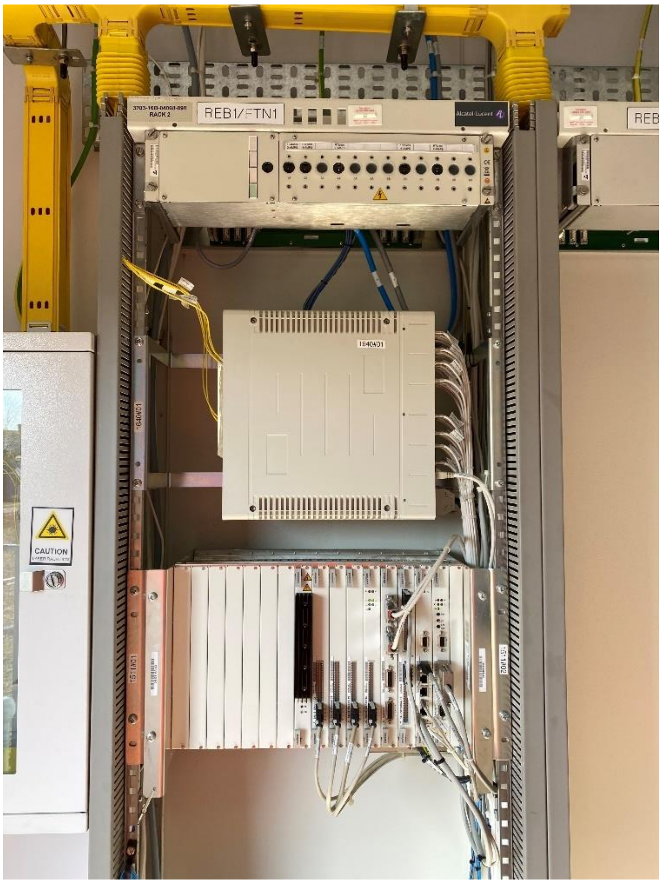

Figure 5: FTN

3 Proposed Infrastructure

3.1 General

For passenger information, safety and security, all public areas of the station including platforms, footbridge and concourse shall be served by CCTV, CIS, PHP and LLPA systems to provide passengers with up to date travel and safety related information.

The station telecoms systems (station information and security systems, SISS) proposed for March and Wisbech Stations are as follows;

- Closed circuit television (CCTV);
- Customer information system (CIS);
- Passenger help point (PHP);
- Local area network (LAN);
- Long line public address (LLPA);
- Ticket vending machine (TVM); and
- Lift communications – To be provided by lift contractor.

The above-mentioned systems shall be validated with stakeholders once stakeholder requirements have been captured or received. The above-mentioned systems and requirements shall be validated prior to GRIP 4 reference system design (RSD) for approval in principle (AIP). All SISS positions shall be confirmed at GRIP 4 RSD for AIP. Layouts and schematics shall also be provided at GRIP 4 RSD for AIP. The above-mentioned systems shall communicate using the internet protocol (IP) standard where practicable (e.g. CCTV, CIS, PHP etc.). All station telecoms cabling shall use the new cable management system (CMS) routes to be established around additional platform and footbridge at March station and the proposed new station at Wisbech. All the systems shall comply with Network Rail standards, British Transport Police (BTP), British Standards and European Norms (BS / EN) and Codes of Practice. The specific standards used shall be defined in the GRIP 4 RSD for AIP. All existing SISS equipment currently installed at March Station shall be assessed and confirm that they are compliant and suitable for use. Equipment deemed suitable for use shall be re-used and all other equipment shall be recovered.

3.2 CCTV System

3.2.1 Station CCTV

All internal and external CCTV cameras shall operate 24/7 and shall be specified to be weatherproof and vandal resistant. The CCTV system shall provide views of the building interior and exterior, as well as the platforms in accordance with NR/GN/TEL/50017 and the BTP Stakeholder Brief. The CCTV system shall be able to record and store live CCTV images in accordance with NR/GN/TEL/50017 and provide means for the recorded images be viewed locally and remotely, if required (subject to stakeholder requirements).

At this stage it is proposed to re-use existing CCTV cameras head-end installed within the existing station building at the rear of the ticket office of March station (refer drawings within Appendix A). At March station the locations of existing CCTV cameras within the existing station building and platforms shall remain in situ.

At this stage it is proposed a new CCTV head-end shall be provided at Wisbech station outside the proposed new station building on a designated area and within an intermediate cabinet at the proposed platform for March station ((refer drawings within Appendix A).

For March station further details of the existing station CCTV system including the re-use (based on asset condition and system coverage) and recovery of asset shall be examined in the GRIP 4 RSD for AIP.

Existing system non-conformities will be further investigated with NR and the TOC / SFO also in the GRIP 4 RSD for AIP.

3.2.2 Non-Station CCTV

CCTV coverage for the landscaped areas, approaches and car parks require further consideration during GRIP 4 RSD for AIP based on stakeholder requirements, also to be captured during GRIP 4 RSD for AIP.

Non-station CCTV systems and associated infrastructure (network nodes, cabling, network links, integration with existing control rooms etc.) also require consideration at GRIP 4 RSD for AIP in consultation with stakeholders.

3.3 CIS and PHP

3.3.1 General

Information systems such as the CIS and PHP systems shall be installed at appropriate locations determined by a pedestrian flow assessment and shall be linked to AFILs, for the hearing-impaired passengers.

The re-use of existing CIS and PHP systems at March station shall be assessed during GRIP 4 RSD for AIP based on asset condition and asset locations.

3.3.2 CIS System

Summary of departure boards (SODs) shall be provided at all station entrances and key circulation spaces. Next train indicators (NTIs) shall be provided on platforms. Information displays shall be provided in key selected locations to be agreed with stakeholders during the GRIP 4 RSD for AIP.

The CIS system shall connect to a PAPC (station controller) via the station LAN. The station PAPC shall connect via the TOC / SFO WAN to data sources e.g. TD.net and TRUST via the TOC / SFO control centre.

The CIS system shall be provided in accordance with NR/L2/TEL/30130, NR/L2/OCS/060 and TOC / SFO requirements.

3.3.3 PHP System

Passenger help points (with integral AFILs) shall be provided on platforms at station entrances and other key locations based on mobility requirements and stakeholder requirements. Location of PHP units and call routing to be agreed with stakeholders during the GRIP 4 RSD for AIP.

The PHP system shall be provided in accordance with mobility, stakeholder and TOC / SFO requirements.

3.4 Station Network

3.4.1 Station LAN

The existing SISS head-end equipment and component installed at the rear of ticket office at March station shall be assessed and confirm that they are still compliant and suitable for use. SISS head-end equipment and component deemed to be suitable for use shall be re-used, as defined in the following sections.

At Wisbech station a new primary external Telecoms cabinet shall be provided outside of the new main station building. This cabinet shall house the primary SISS head-end network equipment proposed for the new station.

The parameter where the Telecoms equipment cabinet to be installed shall be large enough to provide space clearances around the equipment cabinet including any provisions for future equipment expansion / addition in accordance with BS EN 50174-2. and shall also be climate controlled (ventilated and air-conditioned).

At March station an intermediate cabinet (network node) shall be provided at the proposed new platform, to serve new SISS equipment located on the footbridge and platform 3. As aforementioned, it shall be large enough to provide space clearances around the equipment cabinet including any provisions for future equipment expansion / addition in accordance with BS EN 50174-2 and shall also be climate controlled (ventilated and air-conditioned).

At March station a new fibre optic links shall be provided to interconnect the network equipment in the intermediate cabinet with the existing equipment installed in the existing telecoms equipment cabinet at the rear of the ticket office.

All proposed telecommunication cabling shall be provided in accordance with NR/L2/TEL/30151 throughout the stations.

At March station all proposed telecommunication cabling shall cross the rail tracks via a new cable route to be run along the new footbridge containment.

3.4.2 Station Wireless Local Area Network (WLAN)

A station WLAN (e.g. Wi-Fi) shall be considered during the GRIP 4 RSD for AIP based on stakeholder requirements.

3.4.3 Station TOC / SFO WAN Connectivity

The existing communications systems located within the station building of March station are currently connected to the TOC / SFO WAN via a 3rd Party connection.

At Wisbech station new WAN connection shall be provided to the new station building primary CER. It is expected WAN links shall be provided be the TOC / SFO. Specific WAN requirements including data traffic shall be examined during the GRIP 4 RSD for AIP. To ensure consistency the TOC will be required to facilitate a 3rd party provider to allow connection of this cabinet to the Control Centre, in line with the current set up at March.

3.5 LLPA System

Both Wisbech and March station e.g. station building, footbridge, platforms etc. shall be provided with standard LLPA speakers. The LLPA speakers which are to be installed at platforms and the new footbridge. A PA/VA system is not proposed unless required by the fire and life safety strategy due to the category of this station. The proposed LLPA system will be provided in accordance with NR/L2/TEL/30134.

At this stage it is proposed to re-use existing LLPA head-end equipment at March station installed within the existing station ticket office. Further investigation required at GRIP 4 to ensure capacity of the current system allows new equipment to be connected.

At this stage it is proposed a new LLPA system head-end shall be provided at Wisbech station.

Long line public address (LLPA) announcements shall be transmitted from the TOC / SFO control centre via the station LAN / TOC WAN to station PAPC.

The existing station PAPC shall be considered for re-use based on asset condition at March station. Further details of the existing station LLPA system including the re-use (based on asset condition and system coverage) and recovery of assets shall be examined in the GRIP 4 RSD for AIP.

Existing system non-conformities shall be further investigated with NR and the TOC / SFO also in the GRIP 4 RSD for AIP.

3.6 Smart Card Reader (SCR)

Requirements and positions of any SCRs and passenger validators (PVALs) shall be agreed with TOC / SFO prior to GRIP 4 RSD for AIP. SCRs / PVALs may be located on platforms.

3.7 Ticket Vending Machine (TVM)

Requirements and positions of any TVMs shall be agreed with TOC / SFO and Architect prior to GRIP 4 RSD for AIP. TVMs may be located at station entrances as shown on the architecture layouts.

3.8 Lift Communications

All lifts shall be factory fitted with CCTV and a multi circuited broadband (or similar) emergency communication system (lift telephone) to allow contact with the station control facility (SCF) and outside emergency services (lift contractor to provide and specify).

3.9 Disabled Refuge Points

Any communications requirements at the disabled refuge points shall be agreed with TOC / SFO prior to GRIP 4 RSD for AIP, also based on mobility requirements.

3.10 Station Control Facility (SCF)

At Wisbech station new SCF shall be provided within the ticket office, subject to TOC / SFO operational requirements. This shall be a central point for command and control of the station. The SCF shall provide facilities to allow staff to view CCTV on a live basis, to make local announcements on the PA system and to respond to any emergencies communicated via the PHP systems (PHP communications and response to be agreed with TOC /SFO). The new SCF and associated SISS equipment shall be agreed with the TOC / SFO based on stakeholder requirements to be further examined during the GRIP 4 RSD for AIP.

3.11 Operational Telecommunications

As per the GRIP 2 report there is a requirement for provision of operational telecommunications systems.

There is an existing trough route on the proximity of the reinstated track which runs through close to reinstated track into an existing troughing route (see section 4.1.2 above). The existing Trough would then be removed and a new URX installed to allow the new and existing cabling to cross the new track. This would then connect to the existing trough route at the London end of Platform 3.

3.11.1 Telephone Concentrator

No access was granted to the Signal Box on the Survey's due to the COVID-19 pandemic. From the limited surveys that took place it appears there are space card slots and circuits available on the STS Telephone Concentrator.

3.11.2 GSM-R

As per the GRIP 2 report there is a provision of new GSM-R Repeater Location in Coldham Area but as there was no track access provided, this cannot be undertaken at GRIP 3. Surveys to be facilitated at GRIP 4 to allow the development of any GSM-R design/proposals.

3.11.3 Lineside Telephones

Not undertaken at GRIP 3, as there was no track access provided. This shall be conducted at the next stage of the design. Surveys to be facilitated at GRIP 4 to allow the development of any Lineside Telephones design/proposals. From surveys within the March East Relay Room, there appears to be sufficient spare circuits to carry the Lineside Telephones back to the March East Signal Box Telephone Concentrator.

3.11.4 FTN/FTNx

Not undertaken at GRIP 3, as there was no track access provided. This shall be conducted at the next stage of the design. Surveys to be facilitated at GRIP 4 to allow the development of any FTN/FTNx design/proposals. From Surveys within March East GSM-R REB, there appears to be sufficient spare Fibres to extend the FTN/FTNx infrastructure on the Proposed Route.

3.11.5 Legacy Cabling

Not undertaken at GRIP 3, as there was no track access provided. This shall be conducted at the next stage of the design. Surveys to be facilitated at GRIP 4 to allow the development of any Legacy Cabling design/proposals. From Surveys within REB's & Relay Room, there appears to be sufficient spare capacity to extend the Legacy Cabling infrastructure on the Proposed Route or migrate all existing circuits and new circuits onto FTN/FTNx.

3.11.6 Lineside Telecoms – March to Ely - Option 4C

Additional Telecoms infrastructure is required to facilitate signalling equipment to the east of March East Level Crossing, towards Ely (Refer Civils drawings 398128-MMD-00-XX-DR-C-0098 and 0099 which details the proposed locations of these additional lineside assets). The FTN/FTNx infrastructure appears to be capable of supporting the proposed Signalling and Telecoms Circuits to support the new works.

3.11.6.1 Signal Structures and Signal Post Telephones (SPTs)

There are a total of 3no. new signal structures in this area, as confirmed by the Signalling discipline. All new signals capable of displaying a stop aspect will be provided with a SPT. The SPTs will be mounted on proprietary posts mounted on proprietary precast concrete foundations in front of the signal. There is sufficient capacity within the existing Copper and/or Fibre Networks to support the new Telephones. The Telephone Concentrator also appears to have sufficient capacity for the new Telephones.

SPT walkways shall be provided where required and as recommended by the Signal Sighting Committee (SSC). The walkway is typically 8m long on approach to the SPT and 500mm wide.

3.11.6.2 Cable Route

There is an existing cable route adjacent to the Up Main/Up Goods Line that, it is assumed, can be adopted for any additional cable routes required. There appears to be some capacity within the existing cable route at stages and a requirement for new/modified route to support the new infrastructure.

A. Drawings

Table 1: Design drawings

Drawing Number	Title	Sub-Title
398128-MMD-00-XX-DR-T-0001	MARCH STATION	PROPOSED SISS GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-T-0002	MARCH STATION	PROPOSED SISS BLOCK DIAGRAM
398128-MMD-00-XX-DR-T-0003	WISBECH STATION	PROPOSED SISS GENERAL ARRANGEMENT
398128-MMD-00-XX-DR-T-0004	WISBECH STATION	PROPOSED SISS BLOCK DIAGRAM
398128-MMD-00-XX-DR-T-0005	WISBECH STATION	PROPOSED SISS GENERAL ARRANGMENT - CAR PARK

ABOVE LISTED DRAWINGS SUBMITTED SEPARATELY

mottmac.com

L. Culvert Risk Assessments

Technical Note

Project:	March to Wisbech GRIP 3		
Our reference:	398128-MMD-00-XX-TN-0001A	**Your reference:**	
Prepared by:	Kieron Stimpson	**Date:**	20/08/2019
Approved by:	Gavin Jennings	**Checked by:**	Gerry Dissanaike
Subject:	Culvert Risk Assessment		

1 Introduction

There are 20 known culverts that need to be assessed to check if they are suitable to carry the proposed re-opened line from March to Wisbech. The majority of the culverts are pipes which range from 600 mm diameter to 900 mm diameter with the larger ones being masonry arches with a maximum clear span of 1.5m.

2 Assessment Methodology

The review of the culverts has been carried out on a risk based qualitative approach using network rail standard NR/L3/CIV/006/1C Issue 4, to get a CRAS (Culvert Risk Assessment Score) score which considers the risks for time elapsed between examinations based on cover depth, condition at last inspection, span or diameter, track category and risk of flooding. A numerical score is generated for each culvert from 0 to 1000 with the highest being the most at risk.

NR/L3/CIV/006/1C Issue 4 has been superseded by Issue 5 which no longer includes the CRAS scoring system. It is understood from Network Rail that CIV/006 is being updated again and the updated version will include a new prioritisation for culverts similar to CRAS in Issue 4.

3 Assessment Results

Assessment results are included in Appendix A.

A summary of the CRAS score is shown below.

Structure	CRAS	Risk Level	Span	Inspection	Condition	Replace
WIG 901650	700	Higher	NR	No record	NR	Yes
WIG 921012	525	Higher	1450		Poor	Yes
WIG 890440	350	Higher	NR	No record	NR	Yes
WIG 910814	350	Higher	NR		poor	Yes
WIG 891650	315	Medium	NR		poor	Yes
WIG 921430	280	Medium	1500		fair	
WIG 930484	224	Medium	1200		fair	
WIG 921232	201.6	Medium	1200		fair	
WIG 910308	189	Lower	940		good	
WIG 920154	168	Lower	750		fair	
WIG 880000	151.2	Lower	900		fair	
WIG 861320	112	Lower	600		fair	
WIG 870198	112	Lower	750		fair	
WIG 871210	112	Lower	600		fair	
WIG 891012	112	Lower	750		fair	
WIG 891166	112	Lower	750		fair	
WIG 900154	112	Lower	750		fair	
WIG 901100	112	Lower	600		fair	
WIG 870704	89.6	Lower	450		fair	
WIG 891606	84	Lower	600		good	

4 Conclusions and Recommendations

The majority of the culverts are in a good to fair condition with low CRAS scores.

Based on the review of the culverts to NR/L3/CIV/006/1C Issue 4 it is recommended that the following culverts be replaced:

- WIG 901650
- WIG 921012
- WIG 890440
- WIG 910814
- WIG 891650

Appendix A – CRAS Assessment

Purpose
This spreadsheet calculates the Culvert Risk Assessment Score (CRAS) as explianed in NR/L3/CIV/006/1C/Issue 4.
This risk level determines the maximum time allowed between detailed inspections. See 'Extracts from Code' tab.
NR/L3/CIV/006/1C/Issue 4
Appendix A gives the factors considered to calculate the CRAS and the value of each factor depending on the structure being assessed.
Table 1C.8 gives a risk rating of Lower, Medium or High depending on the CRAS.

Spreadsheet Use
Each tab calculates the CRAS for a particular culvert.
Input a score for each factor and the CRAS and risk level is calculated automatically.

Input
Output

Assumptions
It has been assumed that none of the culverts have structures near by that could flood. Therefore factor 6 is always 0.7.
It has been assumed that the track category is 1A. There factor 5 is always 1.

6.4 Culverts

The risk category shall be allocated in accordance with Tables 1C.8. The maximum examination interval shall be determined from Table 1C.9.

Attribute	Variation		
	Lower	Medium	Higher
Culvert Risk Assessment Score	< 200	200 - 350	> 350

Table 1C.8: Risk category Culverts

The Culvert Risk Assessment Score should be determined based on the characteristics and location of the Culvert in accordance with Appendix A utilising the following parameters:

- date of last compliant Detailed Examination;
- depth of cover;
- internal Culvert diameter or span;
- condition at last Detailed Examination;
- track category;
- risk of flooding to adjacent property.

A numerical score between 0 and 1000 will be generated for each Culvert, the highest being the most at risk.

Structural form and primary material	Maximum interval between Detailed Examinations (years)		
	Lower	Medium	Higher
Brick barrel	18	12	6
Concrete pipe, box or other flat soffit	12	6	3
Metallic sections	6	6	3
Stone slab	6	3	1
Vitreous clay	3	2	1
Timber or timber soffit	3	2	1

Table 1C.9: Examination intervals Culverts

For a Culvert constructed from more than one material, the primary material in Table 1C.9 should be that applicable to the form of construction of the Culvert subject to loading from the track.

Structure	CRAS	Risk Level	Span	Inspection	Condition	Replace	
WIG 901650	700	Higher	NR	No record	NR	Yes	
WIG 921012	525	Higher	1450		Poor	Yes	
WIG 890440	350	Higher	NR	No record	NR	Yes	
WIG 910814	350	Higher	NR		poor	Yes	
WIG 891650	315	Medium	NR		poor	Yes	Timber
WIG 921430	280	Medium	1500		fair		
WIG 930484	224	Medium	1200		fair		
WIG 921232	201.6	Medium	1200		fair		
WIG 910308	189	Lower	940		good		
WIG 920154	168	Lower	750		fair		
WIG 880000	151.2	Lower	900		fair		
WIG 861320	112	Lower	600		fair		
WIG 870198	112	Lower	750		fair		
WIG 871210	112	Lower	600		fair		
WIG 891012	112	Lower	750		fair		
WIG 891166	112	Lower	750		fair		
WIG900154	112	Lower	750		fair		
WIG 901100	112	Lower	600		fair		
WIG 870704	89.6	Lower	450		fair		
WIG 891606	84	Lower	600		good		

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.3	1	300	0.4	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

112

Risk Category

Lower

Description of Structure

300mm diameter earthenware pipe with upstream masonry headwall and downstream sandbag headwall. Approximately 30m long.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.5	1	750	0.4	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

112

Risk Category

Lower

Description of Structure

Masonry arch culvert with masonry headwalls. 10.5m length under single track.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	5	0.8	450	0.4	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

89.6

Risk Category

Lower

Description of Structure

Brick manholes connecting concrete pipes with a length of 33m.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.7	1	600	0.4	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

112

Risk Category

Lower

Description of Structure

Brick headwalls at either end of a 19.6m plastic pipe.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	2.7	0.9	900	0.6	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

151.2

Risk Category

Lower

Description of Structure
Armco pipe with a length of 20m.
Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	2	1	No record	1	No record	1	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

350

Risk Category

Higher

Comment

Culvert sugmerged and therefore not examined fully.

Description of Structure

Manhole at upside.Masonry headwall at downside.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.3	1	750	0.4	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

112

Risk Category

Lower

Description of Structure

Masonry arch culvert with 9.2m length.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.7	1	750	0.4	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

112

Risk Category

Lower

Description of Structure

9.8m long armco pipe with masonry headwalls.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.5	1	600	0.4	Good	0.6	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

84

Risk Category

Lower

Description of Structure

The structure is a single span side culvert carrying a fenland drain below a famers access approach to a LC. Constructed of a 600mm Dia PVC pipe with concrete bagwork headwalls to both ends

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	2.3	0.9	No Record	1	Poor	1	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

315

Risk Category

Medium

Description of Structure

9.4m long timber box culvert.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1	1	750	0.4	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

112

Risk Category

Lower

Description of Structure
9.4m long masonry arch culvert.
Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.3	1	600	0.4	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

112

Risk Category

Lower

Description of Structure
8.95m long masonry arch culvert.
Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
Unknown	1000	No Record	1	No Record	1	No Record	1	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

700

Risk Category

Higher

Comment

No detailed examination made available Unable to locate structure at given mileage.

Description of Structure

Masonry arch with masonry headwalls.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
8	750	0.94	1	930	0.6	Good	0.6	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

189

Risk Category

Lower

Description of Structure

9.5m masonry arch with masonry headwalls.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1	1	No Record	1	Poor	1	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

350

Risk Category

Higher

Description of Structure

11m masonry arch with masonry headwalls.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.4	1	900	0.6	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

168

Risk Category

Lower

Description of Structure

11.3m masonry arch with masonry headwalls.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
9	750	0.75	1	1450	1	Poor	1	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

525

Risk Category

Higher

Description of Structure
16.5m masonry arch with masonry headwalls.
Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	2	0.9	1200	0.8	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

201.6

Risk Category

Medium

Description of Structure

32m long armco pipe with masonry headwalls.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1	1	1500	1	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

280

Risk Category

Medium

Description of Structure

11m masonry arch with masonry headwalls.

Photo of Structure

Factor A		Factor B		Factor C		Factor D		Factor E		Factor F	
Time since last known compliant Detailed Examination (Years)	Score	Depth of Cover (m)	Score	Size mm (internal diameter or span)	Score	Condition of Culvert at last compliant Detailed Examination	Score	Track category	Score	Risk of flooding to adjacent property	Score
4	500	1.5	1	1200	0.8	Fair	0.8	1A	1	No Evidence	0.7

Culvert Risk Assessment Score CRAS A*B*C*D*E*F

224

Risk Category

Medium

Description of Structure
21m masonry arch with masonry headwalls.
Photo of Structure

M. Preliminary Assessment of Existing Underbridges

MOTT MACDONALD

Network Rail Structural Assessment

Preliminary Assessment of 4 Network Rail Underbridges on March East Junction to Wisbech (WIG) Line

3 April 2020

Confidential

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Network Rail Structural Assessment

Preliminary Assessment of 4 Network Rail Underbridges on March East Junction to Wisbech (WIG) Line

3 April 2020

Confidential

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Contents

Executive summary

A high-level structural assessment of four underbridges on the disused March East Junctions to Wisbech (WIG) line was carried out, with an aim to determine whether they are structurally sound to carry passenger trains should the line be reopened. This assessment report was completed with remedial and strengthening work proposals for each underbridge.

This assessment assumes RA6 at 60mph to be reflective of use with passenger trains. The assessed structures are as follows:

- WIG 2314 – Chain Bridge
- WIG 2315 – Mulbary Drain
- WIG 2317 – Waldersey Drain
- WIG 2319 – Redmoor Drain

In summary, all the structures considered can accommodate RA6 at 60mph. These underbridges historically carried twin tracks for freight trains, and they are now proposed to carry passenger trains on single track. The reserve capacities in the structures result in only relatively minor repair works being required, despite many of the structural components being in poor condition.

The remedial and strengthening solutions of each structure were proposed based on a ‘do minimum’ approach, to ensure they can accommodate RA6 at 60mph or below only. The repair schedules are presented in the next few pages.

It is suggested that further detailed inspections to all bridges should be carried out, following blast cleaning (and intrusive surveying if required) to ascertain the viability of the proposed solutions, before any detailed design of remedial and strengthening works is carried out.

WIG 2314 – Chain Bridge

Proposed Works	Indicative Quantity	Remark
Blast cleaning metallic elements	Entire structure – approximately 550m^2 total surface area	Essential
Repainting metallic elements	Entire structure – approximately 550m^2 total surface area	Essential
Replacing defective rivets	Between 100No to 200No rivets	Essential
Web plate patch repairs	200x100x10 steel angles, approximately 100m to 150m long in total length	Essential
Flange plate patch repairs	Approximately 10m^2 of 12mm thick steel plate in total	Ad hoc repairs
Bearing replacement	6No bearings in the original span	Essential
Replacement of waybeams and timber decking	Stiffened steel decking of approximately 36m x 5m in plan	Essential
Abutment & pier repairs - repointing, replacing displaced bricks	Approximately 150m^2 to 200m^2 of total surface area	Essential
Handrail modification	2No handrails of approximately 20m long each	Essential
High mileage abutment reconstruction	Concrete abutment approximately 4m high x 1m thick x 6m wide, and piled foundation with 6-8No mini concrete piles, plus associated demolition works, earthworks and temporary works	Essential

WIG 2315 – Mulbary Drain

Proposed Works	Indicative Quantity	Remark
Blast cleaning metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Repainting metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Replacing defective rivets	Between 50No to 100No rivets	Essential
Flange plate patch repairs	Approximately 5m^2 of 10mm thick steel plate in total	Ad hoc repairs
Bearing replacement	6No bearings	Ad hoc repairs
Abutment repairs - repointing, replacing displaced bricks	Approximately 25m^2 to 35m^2 of total surface area	Essential
Stitching of shear and longitudinal cracks in abutment	6No to 12No stitching bars, approximately 500mm long	Ad hoc repairs
Handrail modification	2No handrails of approximately of 10m long each	Essential

WIG 2317 – Waldersey Drain

Proposed Works	Indicative Quantity	Remark
Blast cleaning metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Repainting metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Replacing defective rivets	Between 50No to 100No rivets	Essential
Flange plate patch repairs	Approximately 2.5m^2 of 10mm thick steel plate in total	Ad hoc repairs
Bearing replacement	6No bearings	Ad hoc repairs
Abutment repairs - repointing, replacing displaced bricks	Approximately 10m^2 to 20m^2 of total surface area	Essential
Handrail modification	2No handrails of approximately of 10m long each	Essential

WIG 2319 – Redmoor Drain

Proposed Works	Indicative Quantity	Remark
Blast cleaning metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Repainting metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Replacing defective rivets	Between 50No to 100No rivets	Essential
Flange plate patch repairs	Approximately 3m^2 of 10mm thick steel plate in total	Ad hoc repairs
Bearing replacement	6No bearings	Ad hoc repairs
Abutment repairs - repointing, replacing displaced bricks	Approximately 25m^2 to 35m^2 of total surface area	Essential
Stitching of shear and longitudinal cracks in abutment	6No to 12No stitching bars, approximately 500mm long	Essential
Handrail modification	2No handrails of approximately of 10m long each	Essential

1 Introduction

The aim of this report is, for the purposes of informing a GRIP3 submission, to provide a high-level assessment of the capacity of four underbridges on the March East Junctions to Wisbech (WIG) line. Repairs and strengthening measures are proposed as appropriate, should the line be reopened to passenger trains.

This assessment assumes RA6 at 60mph to be reflective of use with passenger trains. The assessed structures are as follows:

- WIG 2314 – Chain Bridge
- WIG 2315 – Mulbary Drain
- WIG 2317 – Waldersey Drain
- WIG 2319 – Redmoor Drain

There were no record drawings or assessment reports available at the time of writing this report. This preliminary assessment was therefore based on a Mott MacDonald site assessment carried out in February 2020 supplemented by the previous Detailed and Visual Examinations.

2 Chain Bridge WIG 2314

2.1 Structural Description

Underbridge WIG 2314 – Chain Bridge is a disused 3-span metallic underbridge on the WIG line between March East Junction and Wisbech carrying a single track. The original structure was reconstructed circa 1970 for a river improvement scheme; the South abutment was relocated further back from the embankment at the time to allow for the river widening. To accommodate the increased span length on the low mileage embankment, a separate simply supported bridge (military span) was provided between the original pier and the reconstructed abutment. See Figure 1.

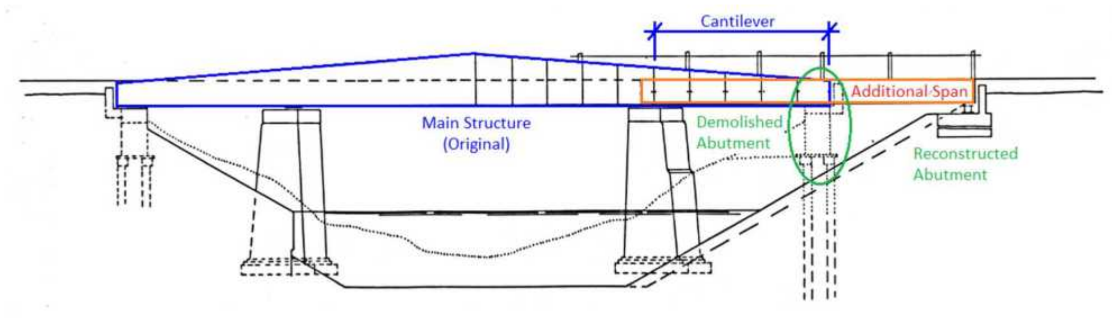


Figure 1 - Chain Bridge – Elevation Extracted from Record Drawing

The main structure was modified again at a later date after the reconstruction; the width was reduced by half – the downside longitudinal girder and all the associated cross girders were removed. See Figure 2.

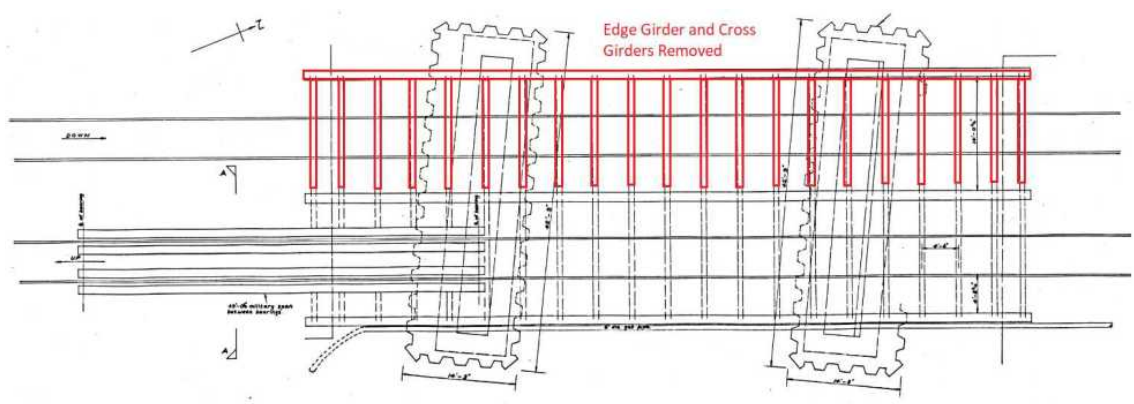


Figure 2 - Chain Bridge – Plan Extracted from Record Drawing

The main structure currently comprises twin hog-back girders of riveted angle plate construction, the largest span is circa 13.9m. These are continuous over two brick piers onto a masonry abutment at the high mileage end.

The additional span is simply supported between the brick piers and a brick masonry abutment at low mileage end. The simply supported span is made up of 4 No longitudinal metallic girders with metallic cross members and bracing. It has a span of circa 15.3m.

The track in each span is supported by timber waybeams, with the deck made up of timber planks.

Figure 3 - Chain Bridge – Topside

Figure 4 - Chain Bridge - Upside Elevation

2.2 Available Record Information

At the time writing this report, the most recent examinations available to Mott MacDonald were as follows:

- Visual Examination carried out by Amey in 2017 (Exam ID – 9043282)
- Underwater Examination & Stage 1 Scour Assessment carried out by Amey in 2016 (Exam ID – 8069181)
- Detailed Examination carried out by Amey in 2012 (Exam ID – 305039)

No recent record drawings or previous assessment reports were provided for this structure, although approximate high-level dimensions are contained in the Detailed Examination. A Site Inspection was carried out by Mott MacDonald in February 2020, reviewing the condition of the structure and sizes of the main structural elements.

2.3 Sketches from Site Inspection

Based on the information recorded during the site inspection carried out by Mott MacDonald, sketches were prepared detailing the main geometry and defects. The sketches are can be found in Appendix A. The sketch numbers for Chain Bridge are as follows:

- 398128-MMD-00-XX-SK-S-0100 – WIG 2314 - Chain Bridge - Metalwork General Arrangement - Sheet 01 of 02
- 398128-MMD-00-XX-SK-S-0101 – WIG 2314 – Chain Bridge – Metalwork General Arrangement - Sheet 02 of 02
- 398128-MMD-00-XX-SK-S-0102 – WIG 2314 - Chain Bridge Typical Defects - Sheet 01 of 02
- 398128-MMD-00-XX-SK-S-0103 – WIG 2314 - Chain Bridge Typical Defects - Sheet 02 of 02

2.4 Inspection Summary – Conditions & Defects

2.4.1 Hog-back Longitudinal Girders

The original main longitudinal girders from each span appear to be in similarly fair condition, with widespread minor surface corrosion and coating breakdown throughout. these defects are shown in Figure 5. The most recent Detailed Examination carried out in 2012 also noted areas of laminated corrosion to the stiffeners, localised minor loss of section to the web through its entire thickness at low level, and missing rivets in various locations throughout.

Figure 5 - Chain Bridge - Hog-back Girder – Defects

2.4.2 Original Span - Cross Members

The cross girders on the original span were all found to be generally in fair condition. Typical defects note were widespread minor surface corrosion and coating loss, with moderate loss of section at the edges of the flanges, particularly beneath the timber waybeams. These defects can be seen in Figure 6. Missing rivets were also identified at various locations throughout.

Figure 6 - Chain Bridge - Cross Girder Defects

2.4.3 Waybeams & Planks

The timber waybeams were generally found to be in fair condition throughout. These members showed minor splitting and light loss growth throughout. The most recent detailed exemption also identified localised rotting to the timber planks which were found to be partially displaced in many locations.

2.4.4 Longitudinal Girders in Simply Supported Span

The longitudinal girders in the additional simply supported span were found to be in poor condition, primarily due to severe localised corrosion and section loss in the lower section of the web (entire thickness in some areas). This is shown in Figure 7. In addition to these defects, severe corrosion was identified in areas of the bottom flange, which can be seen in Figure 8. Additional defects identified included; minor widespread corrosion, paint loss and coating breakdown.

Figure 7 - Chain Bridge - Addition Span - Longitudinal Girder - Web Section Loss

Figure 8 - Chain Bridge - Additional Span - Longitudinal Girder - Bottom Flange Corrosion

2.4.5 Additional Span – Cross Members

The cross members in the additional span were found to be in fair condition, these with minor surface corrosion and paint breakdown throughout, particularly at the connection to the longitudinal girders. These members are shown in Figure 9.

Figure 9 - Chain Bridge - Additional Span - Cross Members

2.4.6 Additional -Span Bracing

The bracing was found to be in fair condition throughout the structure. Noted defects included minor corrosion sores throughout, as well as paint and coating breakdown. See Figure 10.

Figure 10 - Chain Bridge – Bracing

2.4.7 Piers & Abutments

The high mileage abutment, which is shown in Figure 11, was identified as being in poor condition, noting that only the top 9 courses of brick were visible during inspection. Based on the contents of the most recent detailed examination, settlement has occurred at the downside under the main girder estimated at 55 mm vertically abutment has also moved outwards by 90 mm detaching the bearings. The nature of the settlement is not known, it is likely to be rotational based on the provided description. This defect is shown in Figure 12.

This abutment brick and mortar was generally found to be weathered throughout. Visibility of the bearings was limited during the inspection, however the most recent detailed examination noted these to comprise flat plates which were in poor condition. Noted defects included corrosion to all 4 faces, with the downside bearing found to be detached due to settlement of the abutment.

Figure 11 - Chain Bridge - High Mileage Abutment

Figure 12 - Chain Bridge - Settlement to High Mileage Abutment

During the site inspection there was limited access to the low mileage abutment, with only part of the concrete bankseat visible, as shown in Figure 13. This was found to be in fair condition, with minor honeycombing noted. Visibility of the bearings was limited but the most recent detailed examination noted these to be in fair condition, with moderate corrosion to all exposed sides.

Figure 13 - Chain Bridge - Low Mileage Abutment Bankseat

Both piers were found to be in fair condition. Defects included brickwork spalling, localised joint loss and generally weathering. A typical pier is shown in Figure 14. Visibility of the bearings was limited during inspection, but the most recent detailed examination noted these to be in fair condition, with moderate corrosion to all exposed sides.

Figure 14 - Chain Bridge - Typical Pier

2.5 Preliminary Assessment

2.5.1 Methodology

A preliminary assessment was carried out with a view to determining the RA rating of the main structural members of the superstructure, based on conservative interpretation of the current structural condition. This was to determine if the line can be reopened without major modification, and to inform the extent of strengthening measures required, if applicable.

The desired RA rating was a minimum of RA6 at 60mph, representative of passenger trains. The bridge was assessed and analysed in 2 separate segments; the original continuous spans with hog back girders and the additional simply supported span. RA ratings were determined for the following:

- longitudinal girders (continuous spans)
- cross girders (continuous spans)
- longitudinal girders (simply supported span)
- cross girders (simply supported span)

The grade of the timber waybeams was unknown based on available record information. It is assumed that the waybeams will be removed as part of any subsequent proposed modification works to the structure, therefore an RA rating for the waybeams was not calculated in this assessment exercise.

Full assessment of structural elements including the stiffeners, plan bracing and connections are out-with the scope of this preliminary GRIP3 assessment, their capacities shall be determined at subsequent GRIP stages.

In the absence of any detailed record drawing or abutment coring information, the substructures were assessed qualitatively. Since historically these have accommodated 2 tracks under freight train loading, it is assumed they are able to accommodate the lesser loading of RA6 at 60mph for passenger trains on the provision the high mileage abutment is strengthened as recommended in Section 2.6.**Error! Reference source not found.** This is subject to confirmation at subsequent GRIP stages by means of intrusive investigations and detailed design calculations.

A summary of the assessment methodology used for the spans with the hog back girders is as follows:

- The assessment was carried out in accordance with NR/GN/CIV/025 – The Structural Assessment of Underbridges and BS5400-3: Code of Practice for Design of Steel Bridges. The extent of design code checks carried out in this preliminary assessment were bending including lateral torsional buckling (LTB), shear and combined bending and shear where applicable.
- The structure was analysed by creating a simple planar grillage in FE analysis package LUSAS, with only the 3 original spans modelled. This geometry is shown in Figure 15.
- At the low mileage end the hogback girder cantilevers from the pier, however no live load is applied to this span, as the live load is carried by the additional simply supported span.
- The inbuilt RA load (only vertical loading considered) model and moving load functions in LUSAS were used to determine the worst-case positions in terms of producing the maximum bending moments and shear forces. These were validated using simple hand calculations.
- To approximate the hog-back girders, the central span was created using the maximum cross section, with the 2 end spans created using the minimum cross section. This was

deemed sufficient as it had minimal effect on the grillage analysis output which is this instance is only used for load distribution.

- Conservative interpretations of the section losses identified on site were implemented when calculating section capacities (discussed further for each element in Section 2.5.2.)
- The effective length of the compression flange for the longitudinal girders was not calculated in full. The ratio of effective length over overall length (L_e/L) was taken as 0.45. This deemed to be relatively conservative based on experience working on similar structures. This is subject to verification by full calculation at subsequent GRIP stages.
- The effective length used for the cross girders considers their compression flange laterally restrained where the waybeams are connected to them (which gives $L_e/L = 0.345$).

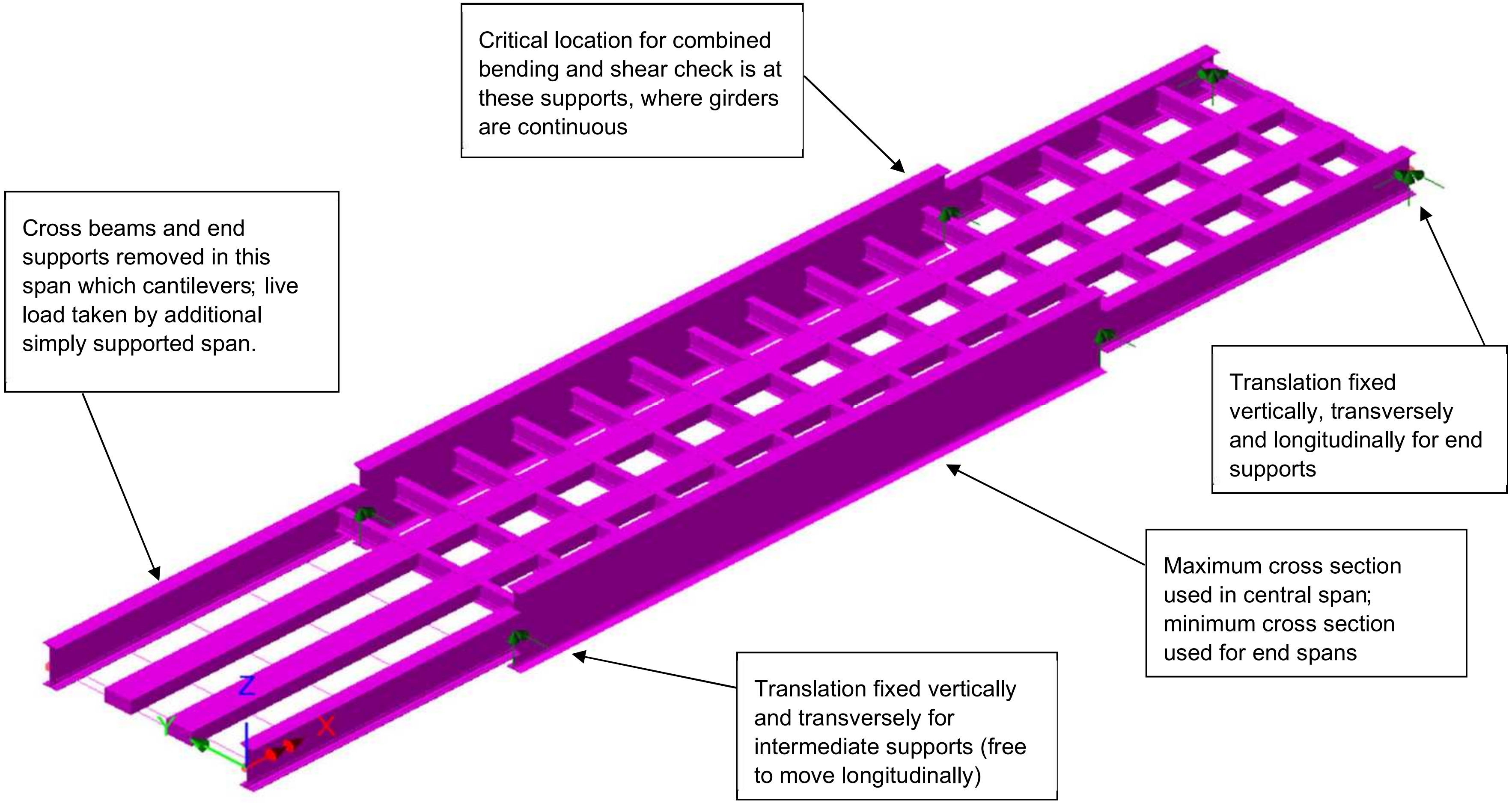


Figure 15 - Chain Bridge - Grillage Geometry

A summary of the assessment methodology used for the additional simply supported span is as follows:

- The assessment was carried out in accordance with NR/GN/CIV/025 – The Structural Assessment of Underbridges and BS5400-3: Code of Practice for Design of Steel Bridges. The extent of design code checks carried out in this preliminary assessment were bending/LTB and shear.
- The structure was analysed using simple statics, considering only vertical RA loading.
- For the longitudinal girders, the structure was analysed for live loading utilising EUDLs in accordance with NR/GN/CIV/025 Clause 4.3.1.3 which are applicable due to the girder being simply supported.
- RA loading was applied to the cross girders using the short lengths between axles identified in NR/GN/CIV/025 Clause 4.3.1.3 which by inspection are critical.
- The effective length of the compression flange for the longitudinal girders was not calculated in full. The ratio of effective length over overall length (L_e/L) was taken as 0.45. This deemed to be relatively conservative based on experience working on similar structures. This is subject to verification by full calculation at subsequent GRIP stages.
- The full cross girder length was used in effect length calculations (conservative).

2.5.2 Results

2.5.2.1 Summary

The results from each of the assessed structural elements are summarised in Table 1 on the following page. Notes on the section losses considered and the conclusions drawn from the assessed capacities are contained in following sub-sections.

Table 1 - Chain Bridge Preliminary Assessment Results Summary

Member Identification	Design Code Check	Condition	RA Rating @ 60mph
Hog-back longitudinal girder	Bending (LTB) with L_e/L taken as 0.45	Full properties (at midspan)	8
	Shear	Full properties (at end supports)	7
	Combined bending and shear	Full properties (at critical location at intermediate support)	6
Original Span Cross members	Bending (LTB) with L_e/L taken as 0.345	Full properties	14
	Shear	Full properties	15
Additional Span – longitudinal girders	Bending (LTB) with L_e/L taken as 0.4	Full properties	14
		Conservatively considered 50% loss of thickness in bottom flange, 20% loss in web depth and thickness, from bottom of web	9
	Shear	Full properties	15
		Conservatively considered 50% loss of thickness in bottom flange, 20% loss in web depth and thickness, from bottom of web	15
Additional Span – cross girder	Bending (Le/L taken as 1)	Full properties	15
	Shear	Full properties	15
Substructure	The substructures were assessed qualitatively. Historically, the abutment and piers have accommodated 2 tracks under freight train loading, it is assumed they will able to accommodate the lesser loading of RA6 at 60mph for passenger trains providing remedial and strengthening works are carried out as recommended.		

2.5.2.2 Hog back girders

As outlined previously in Section 2.4.1, the hog back girders were found to be in fair condition, with minimal appreciable section loss. The RA ratings calculated using full section properties throughout were RA8 in bending(mid-span) and RA7 in shear (end supports) and RA6 in combined bending and shear (intermediate supports). From this it can be concluded that in the structures current condition it appears to be able to accommodate RA6 at 60mph, with minimal repairs.

2.5.2.3 Original span cross girders

As outlined previously in Section 2.4.2 the cross girders are in fair condition with no significant defects. The assessment using full section properties resulted in RA14 in bending and RA15 in shear. This is significantly greater than the desired RA6 at 60mph. meaning no further reduction is section properties were applied due to minimal defects and significant reserve capacity. It can be concluded that no significant repairs or strengthening will be required for these members.

2.5.2.4 Additional span longitudinal girders

As identified in Section 2.4.4, these longitudinal girders are in poor condition with holes in the web plates and low levels and areas of severe corrosion to the bottom flange plate. Using full section properties, RA ratings of 14 & 15 for bending and shear respectively. To allow for the defects a 20% reduction in web section (depth and thickness from the bottom of the web) was considered, with a 50% reduction in thickness for the bottom flange. This is illustrated in Figure 16. This gave assessment results of RA9 for bending and RA15 for shear. This suggests this element can accommodate in excess of RA6 in its current condition. It is however recommended that any future refurbishment works use patch repair plates for the holes in the web.

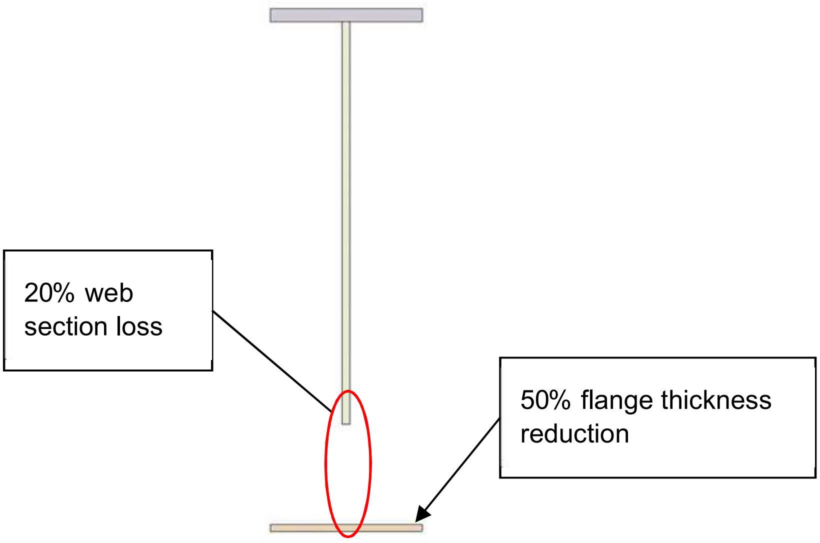


Figure 16 - Chain Bridge - Additional Span - Longitudinal Girder - Reduced Section

2.5.2.5 Additional span cross girder

These cross girders were identified to be in fair condition with minor defects. The RA ratings calculated using full section properties were RA15 for both bending and shear. This indicates that no significant strengthening will be required for these members, as they have capacities far in excess of RA6, including an allowance for any minor defects.

2.6 Proposed Repairs & Strengthening Measures

2.6.1 Metal Girders

Metal girders shall be blast cleaned to remove all rust and loose material. This should first be applied on a test patch in each structural element to ensure the grit blasting does not affect the integrity of the structure. Subsequently, a thickness survey should be carried out to establish loss of section and extent of pitting so repairs can be carried out. Patch plates or steel angles shall be installed to the web of the longitudinal girders in the simply supported span, in locations where holes are present. Refer to engineering sketch in Appendix B:

- 398128-MMD-00-XX-SK-S-0104 – WIG 2314 - Chain Bridge - Proposed Metalwork Repairs - Sheet 01 of 01

Additional bottom flange plates should also be considered in the areas of this element where corrosion is severe. It should also be considered replacing any stiffeners which are deemed to be sufficiently corroded, however these seem to be in fair condition, meaning the extent of replacement will likely be dependent on more detailed design calculations at subsequent GRIP stages. All missing rivets shall be replaced with high strength friction grip bolts. All metallic elements shall be repainted.

It is suggested the bearings to be replaced with either like-for-like steel plate bearings or an elastomeric bearing. The bearing type is subject to more detailed calculations at subsequent GRIP stages.

2.6.2 Timber Decking & Waybeams

It is suggested that the timber deck and waybeams are replaced with a new lightweight stiffened steel deck.

2.6.3 Piers & Abutments

It is proposed that spalled and missing bricks are replaced and re-pointed throughout all abutments and piers.

It is not known if the high mileage abutment is subjected to excessive horizontal movement and/or settlement as identified in previous examination reports, and whether these movements have subsided. A monitoring regime, consisting of installation of tilt meters, will be required to determine the nature of these movements.

Abutment reconstruction was first proposed in 1965, but it is unclear if the works was carried out or not. The proposed abutment reconstruction in the past is shown in Figure 17. It is unlikely that the high mileage abutment would move or settle excessively if the previously proposed abutment reconstruction was completed.

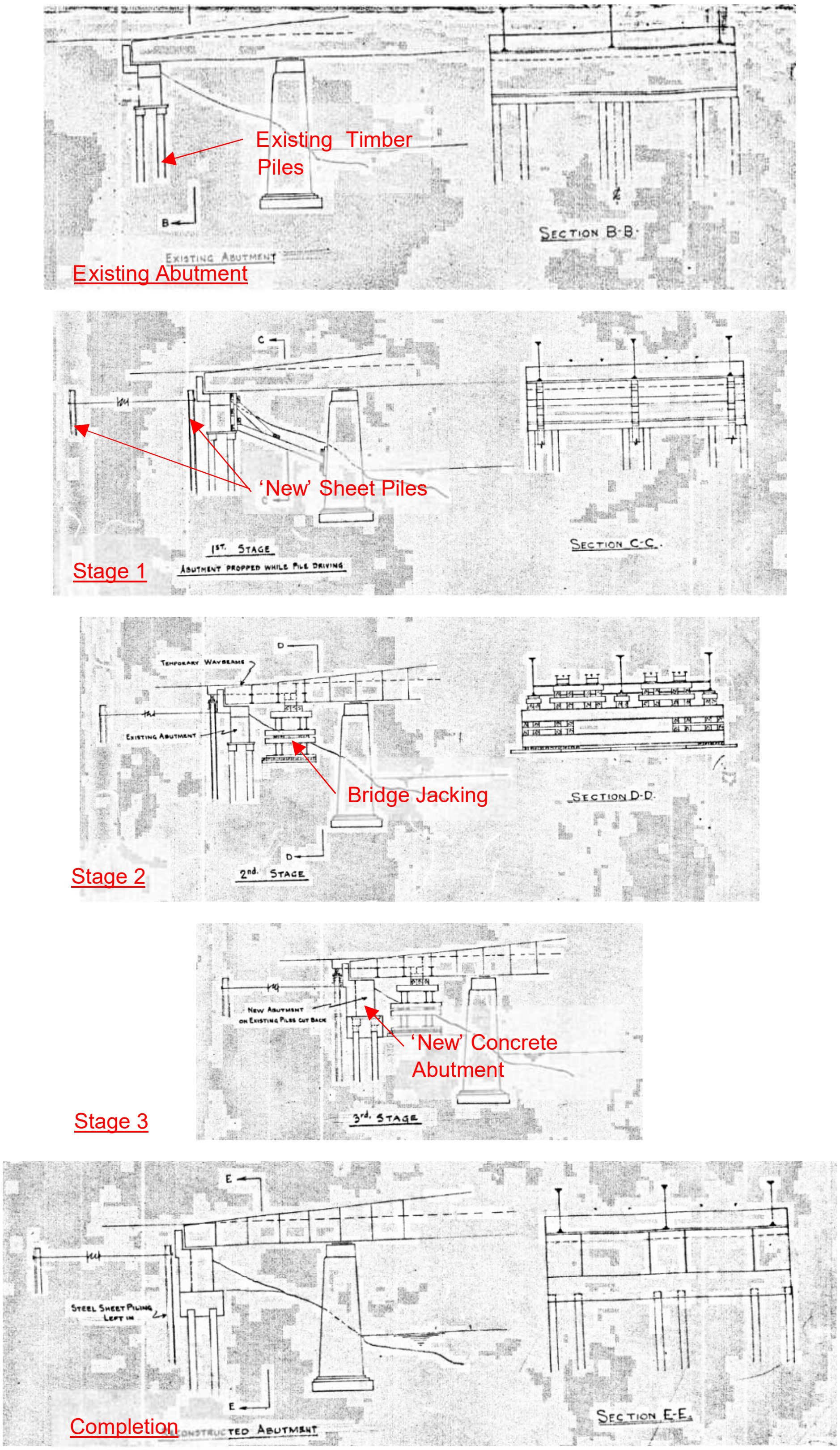


Figure 17 - Proposed Abutment Reconstruction Extracted from Record Drawing

Based on the recent site visit, the high mileage abutment was found to be made of masonry; therefore, it can be assumed that the historic abutment reconstruction does not exist. For that reason, it is recommended the abutment to be rebuilt, which is a clear solution to the horizontal movement and/or settlement issue; this will also extend the design life of the bridge.

The new high mileage abutment shall incorporate a reinforced concrete wall supported on piled foundation with mini concrete piles, i.e. similar to the existing substructure arrangement but replacing masonry wall with concrete wall and timber piles with concrete piles. The reconstruction works also include demolition of the existing abutment and installation of temporary works.

It should be noted that the existing abutment needs to be inspected thoroughly, e.g. core sampling shall be included, before any detailed design of the reconstruction works is carried out.

Also, vegetation surrounding the low mileage abutment needs to be adequately removal for the additional span bearings and bankseat to be inspected in detail.

2.7 Indicative Quantity of Remedial and Strengthening Works

The indicative quantity of remedial and strengthening works for Chain Bridge is presented below in Table 2.

Table 2 - Chain Bridge - Repair Schedule

Proposed Works	Indicative Quantity	Remark
Blast cleaning metallic elements	Entire structure – approximately 550m^2 total surface area	Essential
Repainting metallic elements	Entire structure – approximately 550m^2 total surface area	Essential
Replacing defective rivets	Between 100No to 200No rivets	Essential
Web plate patch repairs	200x100x10 steel angles, approximately 100m to 150m long in total length	Essential
Flange plate patch repairs	Approximately 10m^2 of 12mm thick steel plate in total	Ad hoc repairs
Bearing replacement	6No bearings in the original span	Essential
Replacement of waybeams and timber decking	Stiffened steel decking of approximately 36m x 5m in plan	Essential
Abutment & pier repairs - repointing, replacing displaced bricks	Approximately 150m^2 to 200m^2 of total surface area	Essential
Handrail modification	2No handrails of approximately 20m long each	Essential
High mileage abutment reconstruction	Concrete abutment approximately 4m high x 1m thick x 6m wide, and piled foundation with 6-8No mini concrete piles, plus associated demolition works, earthworks and temporary works	Essential

3 Mulbary Drain WIG 2315

3.1 Structural Description

WIG 2315 – Mulbary Drain Underbridge is a disused, single span steel underbridge on the WIG line between March East Junction and Wisbech. The structure has an approximate skew of 29 degrees and consists of 3No longitudinal built up plate girders (maximum length circa 9.6m) with transverse tee stiffeners and 2No transverse trough decks. The structure is supported on RC bedstones as part of blue brick abutments and spans over Mulbary Drain, a small stream. Although the structure only carries 1 disused track (upside), the structural layout suggests historically it likely accommodated 2 tracks.

There are two other similar underbridges along the WIG line, namely Waldersey Drain Underbridge and Redmoor Drain Underbridge. The preliminary structural assessment was only carried out for Mulbary Drain Underbridge, as the assessment results of Mulbary Drain Underbridge is representative for the other two drain underbridges. Refer to Section 3.5.1 for detail.

Figure 18 - Mulbary Drain Underbridge - Downside Elevation

Figure 19 - Mulbary Drain Underbridge - Trackside View looking to High Mileage End

3.2 Available Record Information

At the time writing this report, the most recent examinations available to Mott MacDonald were as follows:

- 2017 Underwater Exam & Stage 1 Scour Assessment carried out by Amey (Exam ID 9038775)
- 2017 Visual Examination carried out by Amey (Exam ID – 9043311)
- 2015 Detailed Examination carried out by Amey (Exam ID -7071958)

No record drawings or previous assessment reports were provided for this structure, although approximate high-level dimensions are contained in the Detailed Examination. A Site Inspection was carried out by Mott MacDonald in February 2020, reviewing the condition of the structure and sizes of the main structural elements.

3.3 Sketches from Site Inspection

Based on the information recorded during the site inspection carried out by Mott MacDonald, sketches were prepared detailing the main geometry and defects. The sketches are can be found in Appendix C. The drawing sketch for Mulbary Drain are as follows:

- 398128-MMD-00-XX-SK-S-0200 – WIG 2315 – Mulbary Drain - Metalwork General Arrangement - Sheet 01 of 01
- 398128-MMD-00-XX-SK-S-0201 – WIG 2315 – Mulbary Drain – Typical Defects - Sheet 01 of 01

3.4 Inspection Summary - Condition & Defects

3.4.1 Longitudinal Girders

Overall, all 3 longitudinal girders can be said to be in similarly poor condition. This is primarily due to laminated corrosion of the bottom flange plates (the highest bottom flange plate in particular). Although this is widespread, this defect is particularly prominent close to the bearings An example of this is shown in Figure 21, which also shows corrosion to the lower section of the web plate. The majority of the steelwork paint for this structure has been lost (over 50%), this is case throughout the entire superstructure. There are also handrails attached to the outer girders which appear to be non-compliant with respect to current Network Rail Design Standards.

Figure 20 - Lamination & Corrosion - Inner Girder

Figure 21 - Lamination & Corrosion - Outer Girder

Localised pitting of the bottom flange and corrosion of rivet heads, was also identified, as shown in Figure 22.

Figure 22 - Pitting - Inner Girder

The top flange plates and upper sections of the web appear to be in fair condition with minimal corrosion or section loss in comparison to the lower web and bottom flange plates. However, sections of the web were not visible in the inspection due to being buried in ballast.

Figure 23 - Typical Condition Top Flange & Web - Outer Girder

3.4.2 Troughing

The transverse troughing in the structure was only visible from the underside. The troughs appear to be in fair condition. However localised corrosion is present where the troughs meet the longitudinal girders. This is particularly prevalent close to the abutments. This type of defect is shown in Figure 24., which also shows heavy corrosion of the drip pipes to the point of being flush with the underside of the trough.

Figure 24 - Localised Trough Corrosion

3.4.3 Abutments

The abutments appear to be in poor condition, with fractures and displacement in abutments bed joints, particularly at the bedstones and near bridge deck corners, as well as defective pointing throughout. There is also significant separation in vertical joints, which appears to be longstanding based on previous examination reports. An example of this type of defect is shown in Figure 25.

Figure 25 - Low Mileage Abutment Fractured at Bedstone

3.5 Preliminary Assessment

3.5.1 Methodology

A preliminary assessment was carried out with a view to determining the RA rating of the main structural members of the superstructure, specifically the longitudinal girders and transverse troughs. This was based on conservative interpretation of the current structural condition, to determine if the line can be reopened as part of the project and to inform the extent of strengthening measures required, if applicable. The desired RA rating was a minimum of RA6 at 60mph, representative of passenger trains.

It was decided it was sufficient to carry out the assessment for Mulbary Drain alone, with the results obtained being considered representative of both Waldersey Drain and Redmoor Drain, due to the similarities in the structures, with Mulbary Drain having the largest span, and broadly speaking being in the worst overall condition, this is summarised in Table 3. It should be noted that highly conservative worst-case losses of section were applied in the assessment, considering defects off all 3 similar structures.

In the absence of any detailed record drawing or abutment coring results, the substructures were assessed qualitatively. Since historically these have accommodated 2 tracks under freight train loading, it is assumed they are able to accommodate the lesser loading of RA6 at 60mph for passenger trains on the provision of the implementation of the strengthening measures as recommended in Section 3.6. This is subject to confirmation at subsequent GRIP stages by means of intrusive investigations and detailed calculations.

Table 3 - Drain Underbridges

Bridge Identifier	Maximum Girder Length (m)	Skew (degrees)
WIG 2315 - Mulbary Drain	9.601	29
WIG 2317 - Waldersey Drain	9.601	8
WIG 2319 - Redmoor Drain	9.474	32

A summary of assessment methodology used is as follows:

- The assessment was carried out in accordance with NR/GN/CIV/025 – The Structural Assessment of Underbridges and BS5400-3: Code of Practice for Design of Steel Bridges.
- The structure was analysed using simple statics and hand calculations, considering only vertical RA loading for line speed 60mph.
- For the longitudinal girders, the structure was analysed for live loading utilising EUDLs in accordance with NR/GN/CIV/025 Clause 4.3.1.3, which are applicable due to the girders being simply supported.
- RA loading was applied to the transverse troughs utilising the short lengths between axles identified in NR/GN/CIV/025 Clause 4.3.1.3, which by inspection are critical. The longitudinal and transverse distribution of these axle live loads through the ballast, in accordance with NR/GN/CIV/025 Clause 4.4.3.3
- When determining the longitudinal girders design resistance in bending, the effective length was conservatively taken as the full girder length, ignoring any intermediate points

of lateral restraint to the compression flange provided by the troughs and transverse stiffeners.

- Conservative interpretations of the section losses identified on site for all 3 similar structures were utilised, more details of this are contained in Section 3.5.2 of this report.

3.5.2 Results

3.5.2.1 Summary

The results from each of the assessed structural elements are summarised in the following table. Notes on the section losses considered and the conclusions drawn from the assessed capacities are contained in following sub-sections. The results of these assessments are subject to confirmation by more detailed assessment and analysis and GRIP4&5.

Table 4 – Drain Bridges Preliminary Assessment Results Summary

Member Identification	Design Code Check	Condition	RA Rating @ 60mph
Outer Girder	Bending at midspan (effective length taken as full girder length)	Full properties at midspan	15
		Full LoS in lowest flange plate	6
	Shear	Full properties at supports	14
Inner Girder	Bending at midspan (effective length taken as full girder length)	Full properties at midspan	15
		Full LoS in lowest flange plate	15
	Shear	Full properties at supports	9
Transverse Troughing	Bending	Full properties	15
		50% reduction in bottom flange thickness	7
	Shear	Full properties	15
Substructure	The substructures were assessed qualitatively. Historically, the abutment and piers have accommodated 2 tracks under freight train loading, it is assumed they will able to accommodate the lesser loading of RA6 at 60mph for passenger trains providing remedial and strengthening works are carried out as recommended.		

3.5.2.2 Outer Girder

As discussed in the Section 3.3, the site inspection identified the loss of section in the outer girders was concentrated in the bottom flange plates and there were no significant defects in the web or top flange plates. Using full section properties, RA ratings of RA15 for bending and RA14 for shear were calculated. To allow for the defects to the bottom flange, complete loss of section of the lowest flange plate was considered, as shown in Figure 26. This was deemed to be a conservative approximation of the worst-case section loss throughout the girder in relation to bending capacity. In reality, the corrosion in the bottom flange is more severe closer to the supports (lower bending moment) and predominantly in the upper bottom flange plate (slightly less critical when calculating section properties). This revised assessment considering this section loss gave RA6 in bending. It should be noted that this is very conservative, as it considers the full girder length as the effective length. The defects in the bottom flange have a negligible effect on the shear capacity, as there were no significant defects in the web and the calculation using full section properties gave RA14, no further calculations were required for the web as this is far in excess of the required RA6 at 60mph.

In conclusion the outer girders can accommodate in excess of RA6 at 60mph in their current condition. However, consideration should be given to patch repairs to the bottom flange in locations where the corrosion is particularly severe.

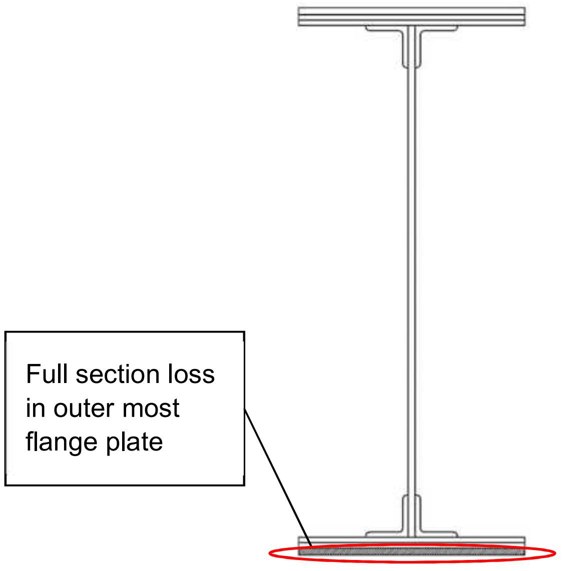


Figure 26 - Mulbary Drain - Outer Girder - Section Loss Considered

3.5.2.3 Inner Girder

The inner girder was identified previously as being in broadly similar condition to the outer girder and was assessed using the same methodology. Using full section properties RA rating of RA15 in bending and RA9 in shear were calculated. When reducing the bottom flange depth by assuming total section loss of the lowest plate (in a similar manner to discussed previously for the outer girder) an RA rating of RA15 was achieved.

In conclusion the inner girder can accommodate in excess of RA6 at 60mph in its current condition. However, consideration should be given to patch repairs to the bottom flange in locations where the corrosion is particularly severe.

3.5.2.4 Transverse Troughing

The site inspection identified that in general the troughing is in fair condition, except for the section where the troughs meet the longitudinal girders. As the trough is buried in ballast by the track above, the current of the topside of the trough is unknown. Using full section properties, RA ratings of RA15 was calculated for both bending and shear. Applying conservative reduced section properties to the bottom flange of the trough by reducing its thickness by 50%, an RA rating of RA7 was obtained.

In conclusion in their current condition the troughs can accommodate in excess of RA6 at 60mph and not significant strengthening or repairs works are required.

3.6 Proposed Repairs & Strengthening Measures

3.6.1 Longitudinal Girders

The longitudinal girders shall be blast cleaned to remove all rust and loose material. This should first be applied on a test patch in each element to confirm its effect on the structure A thickness survey should be carried out to establish loss of section and extent of pitting so repairs can be carried out. Patch repair plates to the bottom flange should be used where corrosion is severe, particularly close to the supports. A typical suggested repair detail is NR/CV/SD/828 – Flange Repair Details, an extract of which is shown in Figure 27. It can also be found in Appendix F.

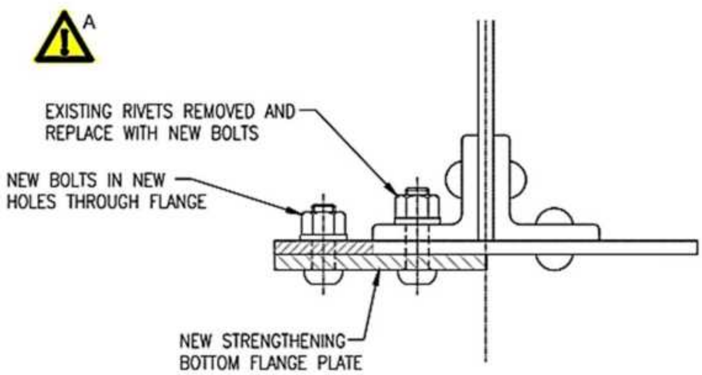


Figure 27 - NR/CIV/SD/282 - Flange Repair Detail (Extract)

Should any stiffeners be found to be sufficiently corroded, these could be replaced, however the stiffeners seem to be in fair condition. Missing rivets shall be replaced with high strength friction grip bolts. The current handrails shall be modified to make compliant with current design standards. It is also proposed the entire structure is re-painted.

The bearings were hidden behind the abutment walls; therefore, their conditions are unknown. The bearings should be replaced if they are found to be sufficiently corroded.

3.6.2 Transverse Troughing

The trough decking shall be blast cleaned to remove all rust and loose material, follow by recoating of protective paint. Due to the reserve capacity in relation to the RA rating, it is deemed unlikely any further trough repairs are required.

3.6.3 Abutments

Spalled and missing bricks at the abutments shall be replaced and repointing carried out. All cracks and fractures shall be pointed, tabbed and repaired.

Brick and masonry stitching shall be provided to large shear cracks and longitudinal cracks. Details of the stitching shall be proposed based on Network Rail drawings NR/CV/SD/109 & 110, which are attached to Appendix F of this report.

Should future inspections reveal any settlement to abutments an expanding geopolymer resin or grout could injected local to the settled area.

3.7 Indicative Quantity for Remedial Works

The indicative quantity of remedial and strengthening works for Mulbary Drain is presented below in Table 5.

Table 5 – Mulbary Drain - Repair Schedule

Proposed Works	Indicative Quantity	Remark
Blast cleaning metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Repainting metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Replacing defective rivets	Between 50No to 100No rivets	Essential
Flange plate patch repairs	Approximately 5m^2 of 10mm thick steel plate in total	Ad hoc repairs
Bearing replacement	6No bearings	Ad hoc repairs
Abutment repairs - repointing, replacing displaced bricks	Approximately 25m^2 to 35m^2 of total surface area	Essential
Stitching of shear and longitudinal cracks in abutment	6No to 12No stitching bars, approximately 500mm long	Ad hoc repairs
Handrail modification	2No handrails of approximately of 10m long each	Essential

4 Waldersey Drain WIG 2317

4.1 Structural Description

WIG 2315 – Waldersey Drain Underbridge is a disused, single span steel underbridge on the WIG line between March East Junction and Wisbech. The structure has an approximate skew of 8 degrees and consists of 3 No longitudinal built up plate girders (maximum length circa 9.6m), with transverse tee stiffeners and 2No transverse trough decks. The structure is supported on blue brick abutments which have concrete skirts running along their bases. The structure spans over Waldersey Drain, a small stream. Although the structure currently carries 1 disused track (high mileage side), the structural layout suggests historically it likely accommodated 2 tracks.

This underbridge is a similar construction to Mulbary Drain but less skewed. The assessment results of Mulbary Drain are also representative for Waldersey Drain; therefore, preliminary assessment of Waldersey Drain was not carried out here. Refer to Section 3.5.1 for detail.

Figure 28 - Waldersey Drain - Downside Elevation

Figure 29 - Waldersey Drain - Topside View looking to High Mileage End

4.2 Available Record Information

At the time writing this report, the most recent examinations available to Mott MacDonald were as follows:

- 2017 Underwater Exam & Stage 1 Scour Assessment carried out by Amey (Exam ID 9038776)
- 2017 Visual Examination carried out by Amey (Exam ID – 9043317)
- 2015 Detailed Examination carried out by Amey (Exam ID -6029926)

No record drawings or previous assessment reports were provided for this structure, although approximate high-level dimensions are contained in the Detailed Examination. A Site Inspection was carried out by Mott MacDonald in February 2020, reviewing the condition of the structure and sizes of the main structural elements.

4.3 Sketches from Site Inspection

Based on the information recorded during the site inspection carried out by Mott MacDonald, sketches were prepared detailing the main geometry and defects. The sketches can be found in Appendix D. The drawing numbers for Waldersey Drain are as follows:

- 398128-MMD-00-XX-SK-S-0300 – WIG 2317 – Waldersey Drain - Metalwork General Arrangement - Sheet 01 of 01
- 398128-MMD-00-XX-SK-S-0301 – WIG 2317 – Waldersey Drain – Typical Defects - Sheet 01 of 01

4.4 Inspection Summary – Condition & Defects

4.4.1 Longitudinal Girders

Overall, the 3 main longitudinal girders can be said to be in similarly poor condition, this is due to widespread corrosion of the bottom flange plates, particularly at the bearing ends. Lamination of the inner girder is also present. These defects are shown in Figure 30. There is also significant paint loss throughout the entire structure.

Figure 30 - Waldersey Drain - Inner Girder - Bottom Flange Corrosion

The top flange plates, web plates and transverse stiffeners appear to be in fair condition with moderate surface corrosion having occurred, particularly at the base of the stiffeners. Not all the web plate was visible during the inspection due to it being buried in ballast. These elements are shown in Figure 31. There are also handrails attached to the outer girders which are corroded with missing parts and geometry non-compliant with current Network Rail Design Standards.

Figure 31 - Outer Girder – Surface Corrosion

4.4.2 Transverse Troughing

The transverse troughing appears to be in fair condition, with moderate surface corrosion throughout and more severe concentrated corrosion where the trough deck meets the longitudinal girders (particularly prominent at outer girder connections). The drip pipes are also heavily corroded at these locations, to the point of being close to flush with the bottom flange plate in many instances. These defects are shown in Figure 32.

Figure 32 - Waldersey Drain - Transverse Troughing Corrosion

4.4.3 Abutments

The abutments appear to be in fair condition, with minor fractures, spalling and defective pointing throughout. Water percolation also appears to be occurring through the abutment. These defects are shown in Figure 33. In addition to this, there missing bricks in the top course directly below the longitudinal girders, visible in Figure 32.

Figure 33 - Waldersey Drain - Low Mileage Abutment.

4.5 Preliminary Assessment

The assessment results stated previously in Section 3.5.2, are also applicable to this structure, taking conservative cognisance of its defects.

In summary, with relatively minor steelwork repairs the structure can accommodate in excess of the required RA6 in the longitudinal girders and transverse trough, although this is subject to a more detailed assessment being carried out at subsequent GRIP stages.

4.6 Proposed Repairs and Strengthening Measures

In general, the structural condition of Waldersey Drain was better than Mulbary Drain.

The proposed strengthening measures are similar to those specified previously for Mulbary Drain. Refer to Section 3.6.

4.7 Indicative Quantity for Remedial Works

The indicative quantity of remedial and strengthening works for Waldersey Drain is presented below in Table 6.

Table 6 – Waldersey Drain - Repair Schedule

Proposed Works	Indicative Quantity	Remark
Blast cleaning metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Repainting metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Replacing defective rivets	Between 50No to 100No rivets	Essential
Flange plate patch repairs	Approximately 2.5m^2 of 10mm thick steel plate in total	Ad hoc repairs
Bearing replacement	6No bearings	Ad hoc repairs
Abutment repairs - repointing, replacing displaced bricks	Approximately 10m^2 to 20m^2 of total surface area	Essential
Handrail modification	2No handrails of approximately of 10m long each	Essential

5 Redmoor Drain WIG 2319

5.1 Structural Description

WIG 2319 – Redmoor Drain Underbridge is a disused, single span steel underbridge on the WIG line between March Each Junction and Wisbech. The structure has an approximate skew of 32 degrees and consists of 3 longitudinal built up plate girders (maximum length circa 9.5m) with transverse tee stiffeners and 2No transverse trough decks. The structure spans over Redmoor Drain, a small stream, and it is located adjacent to a level crossing. Although the structure currently carries 1 disused track upside), the structural layout suggests historically it likely accommodated 2 tracks.

This underbridge is a similar construction to Mulbary Drain but slightly shorter. The assessment results of Mulbary Drain are also representative for Redmoor Drain; therefore, preliminary assessment of Redmoor Drain was not carried out here. Refer to Section 3.5.1 for detail.

Figure 34 - Redmoor Drain - View on Upside

Figure 35 - Redmoor Drain - View from road

5.2 Available Record Information

At the time writing this report, the most recent examinations available to Mott MacDonald were as follows:

- 2016 Underwater Exam & Stage 1 Scour Assessment carried out by Amey (Exam ID 8069182)
- 2017 Visual Examination carried out by Amey (Exam ID – 904331)
- 2015 Detailed Examination carried out by Amey (Exam ID -7071962)

No dimensioned record drawings or previous assessment reports were provided for this structure, although approximate high-level dimensions are contained in the Detailed Examination. A Site Inspection was carried out by Mott MacDonald in February 2020, reviewing the condition of the structure and sizes of the main structural elements.

5.3 Sketches from Site Inspection

Based on the information recorded during the site inspection carried out by Mott MacDonald, sketches were prepared detailing the main geometry and defects. The sketches can be foundation in Appendix E. The drawing numbers for Redmoor Drain are as follows:

- 398128-MMD-00-XX-SK-S-0400 – WIG 2319 – Redmoor Drain - Metalwork General Arrangement - Sheet 01 of 01
- 398128-MMD-00-XX-SK-S-0401 – WIG 2319 – Redmoor Drain – Typical Defects - Sheet 01 of 01

5.4 Inspection Summary – Conditions & Defects

Only the topside of the structure was visible during the site inspection, therefore much of the defects summarised in this section are based on the record examinations.

5.4.1 Longitudinal Girders

The longitudinal girders are in similarly poor condition, primarily due to corrosion and section loss in the bottom flange plates. This is particularly severe in the low mileage outer girder closest to the supports as shown in Figure 36. There is also laminated corrosion to the bottom flange plates. There also appears to be moderate localised corrosion of the web plates close to the bottom flanges.

Figure 36 - Redmoor Drain - Low Mileage Outer Girder - Bottom Flange Corrosion

Figure 37 - Redmoor Drain - Outer Girder - Laminated Corrosion

The extents of the top flanges plates, transverse stiffeners and web plates where they are visible above the ballast to be in fair condition, with moderate surface corrosion throughout, this is shown in Figure 38 - Redmoor Drain - Topside view of Outer Girder The stiffeners on the outer side of the girders all exhibit moderate corrosion, particularly at their bases, can be seen in Figure 39.

Figure 38 - Redmoor Drain - Topside view of Outer Girder

Figure 39 - Redmoor Drain - Transverse Stiffeners - Corrosion

5.4.2 Transverse Troughing

The trough decks are generally in fair condition with moderate corrosion throughout. However, there are localised areas of severe corrosion on the underside at their connections to the longitudinal girders, with the drop pipes also heavily corroded. The top of the troughs were not visible in the site inspection or previous examinations, due to being buried in ballast.

Figure 40 - Redmoor Drain - Transverse Troughing – Corrosion

5.4.3 Abutments

Overall both abutments appear to be in fair condition, although there are multiple areas of fracturing, spalling and defective pointing throughout. There are also areas of displaced brickwork, particularly immediately below the longitudinal girders and at the corners of the bridge deck. There also appears to be water percolation through the abutments.

Figure 41 - Redmoor Drain - Abutments - Typical Displaced Brickwork

5.5 Preliminary Assessment

The assessment results stated previously in Section 3.5.2, are also applicable to this structure, taking conservative cognisance of its defects.

In summary, with relatively minor steelwork repairs the structure can accommodate in excess of the required RA6 in the longitudinal girders and transverse trough, although this is subject to a more detailed assessment being carried out at subsequent GRIP stages.

5.6 Proposed Repairs & Strengthening Measures

The structural condition of Redmoor Drain was slightly better than Mulbary Drain, except local defects of the abutment wall. Displacements of the abutments in Redmoor Drain were deemed to be the worst compared to the other drain underbridges.

The proposed strengthening measures are similar to those specified previously for Mulbary Drain. Refer to Section 3.6.

5.7 Indicative Quantity for Remedial Works

The indicative quantity of remedial and strengthening works for Redmoor Drain is presented below in Table 7.

Table 7 – Mulbary Drain - Repair Schedule

Proposed Works	Indicative Quantity	Remark
Blast cleaning metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Repainting metallic elements	Entire structure – approximately 150m^2 total surface area	Essential
Replacing defective rivets	Between 50No to 100No rivets	Essential
Flange plate patch repairs	Approximately 3m^2 of 10mm thick steel plate in total	Ad hoc repairs
Bearing replacement	6No bearings	Ad hoc repairs
Abutment repairs - repointing, replacing displaced bricks	Approximately 25m^2 to 35m^2 of total surface area	Essential
Stitching of shear and longitudinal cracks in abutment	6No to 12No stitching bars, approximately 500mm long	Essential
Handrail modification	2No handrails of approximately of 10m long each	Essential

6 Conclusion

In conclusion, all 4No structures considered can accommodate RA6 at 60mph in both bending (LTB), shear and combined bending and shear (where applicable), resulting in only relatively minor repair works being required. This is despite many of the structural components being in poor condition.

WIG 2314 Chain Bridge

For Chain Bridge, the proposed rating is RA6 at 60mph, which is governed by the hog-back longitudinal girders.

It is proposed that all metallic elements are blast cleaned to remove any rust or loose material; the blast cleaning should first be spot tested before being applied to the entire structure. Following the blast cleaning, further inspection should be carried out to confirm the condition of the structure and whether the proposed remedial works are suitable; for example, more defects may be revealed after blast cleaning. Also, the top side of the bridge was not accessible during Mott MacDonald's inspection due to missing timber decking; therefore, temporary access will be required for the detailed inspection.

Patch repair plates shall be applied to the webs and bottom flanges of the longitudinal girder in the additional span. All defective or corroded rivets shall be replaced with HSFG bolts. Also, it is suggested all bearings are replaced. The entire superstructure shall be repainted prior to completion.

The existing timber decking and waybeams shall be replaced with a lightweight steel deck.

The cracks and fractures in the brickwork abutments and piers shall be repointed, tabbed and repaired, with any missing bricks replaced. The high mileage abutment needs to be inspected thoroughly, e.g. core sampling shall be included, before any detailed design of the reconstruction works is carried out. The current proposal involves demolishing the existing masonry abutment and building new reinforced concrete abutment wall and new piled foundation with mini concrete piles. Also, vegetation surrounding the low mileage abutment needs to be adequately removal for the additional span bearings and bankseat to be inspected in detail.

WIG 2315 Mulbary Drain, WIG 2317 Waldersey Drain & WIG 2319 Redmoor Drain

For the drain underbridges, the proposed rating is RA6 at 60mph, which is governed by the outer girders based on a conservative assumption of section loss in bottom flange.

The recommendations for Mulbary Drain, Waldersey Drain and Redmoor Drain are similar. All metallic elements shall be blast cleaned (spot-checked initially) to remove all rust and loose material. It is recommended to carry out further detailed inspections, following blast cleaning to ascertain the viability of the proposed solutions, before any detailed design of remedial works is carried out.

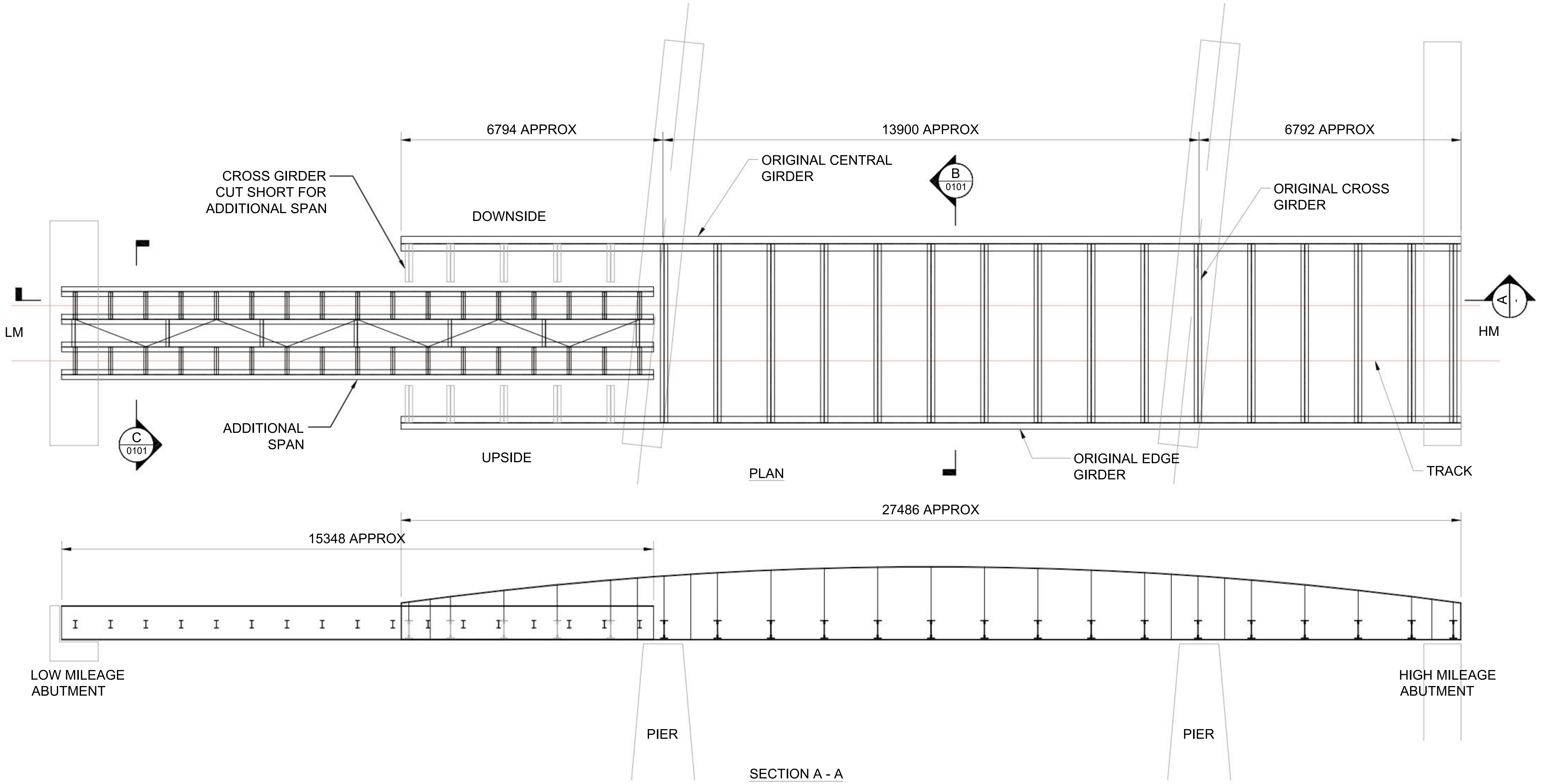
Patch repair plates should be applied to the bottom flanges of the main girders, where corrosion is at its most severe. All defective or corroded rivets shall be replaced with HSFG bolts. The condition of the bearings are unknown, the bearings shall be replaced if found to be severely corroded. Also, all metallic elements shall be repainted.

The cracks and fractures in the brickwork abutments and piers shall be pointed, tabbed and repaired, with any missing bricks replaced. Stitching shall be proposed as a remedial solution for significant shear cracks and longitudinal cracks in the abutments.

Appendices

A. Chain Bridge – Sketches from Site Inspection

- 398128-MMD-00-XX-SK-S-0100 – WIG 2314 - Chain Bridge - Metalwork General Arrangement - Sheet 01 of 02
- 398128-MMD-00-XX-SK-S-0101 – WIG 2314 – Chain Bridge – Metalwork General Arrangement - Sheet 02 of 02
- 398128-MMD-00-XX-SK-S-0102 – WIG 2314 - Chain Bridge Typical Defects - Sheet 01 of 02
- 398128-MMD-00-XX-SK-S-0103 – WIG 2314 - Chain Bridge Typical Defects - Sheet 02 of 02



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P01.1	01\04\2020	LL	First Issue	AK	GD

Title
March to Wisbech Transport Corridor
WIG 2314 Chain Bridge
Metalwork General Arrangement
Sheet 01 of 02

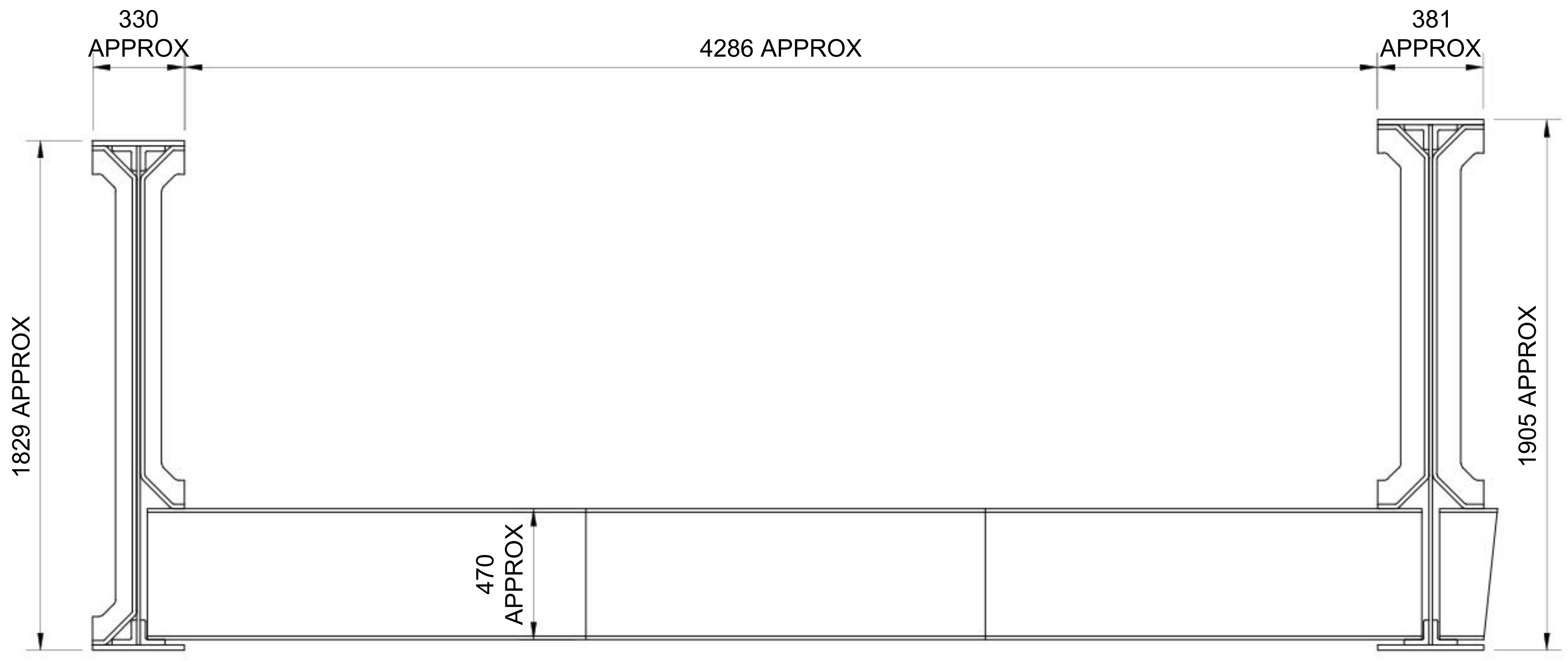
Suitability Description
Suitable for Review & Comment

Drawing Number
398128-MMD-00-XX-SK-S-0100

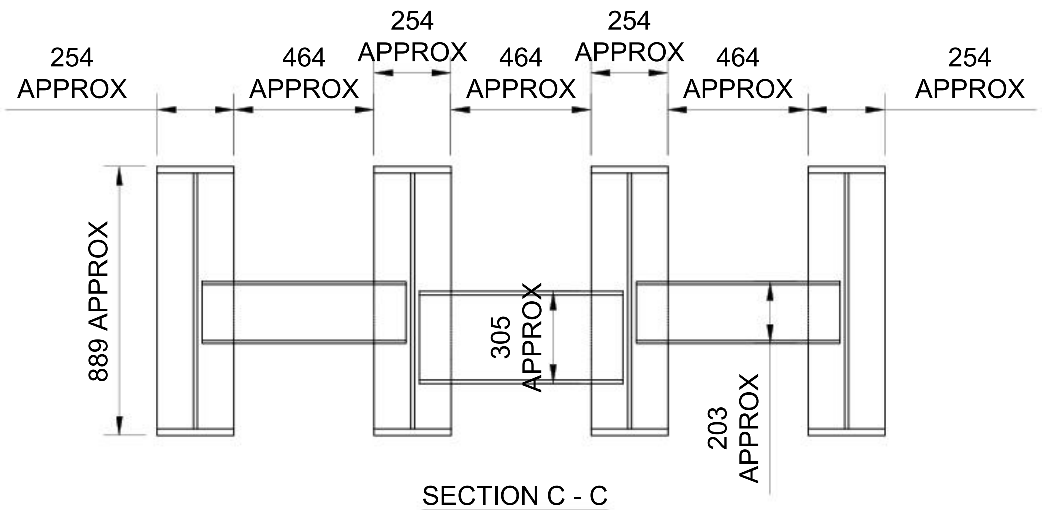
Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Revision	Suit. Code	Security
P01.1	S3	STD

Status Stamp
NOT FOR CONSTRUCTION



SECTION B - B



SECTION C - C

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P01.1	01\04\2020	LL	First Issue	AK	GD

Title
March to Wisbech
Transport Corridor
WIG 2314 Chain Bridge
Metalwork General Arrangement
Sheet 02 of 02

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Suitability Description
Suitable for Review & Comment

Status Stamp
NOT FOR CONSTRUCTION

Drawing Number
398128-MMD-00-XX-SK-S-0101

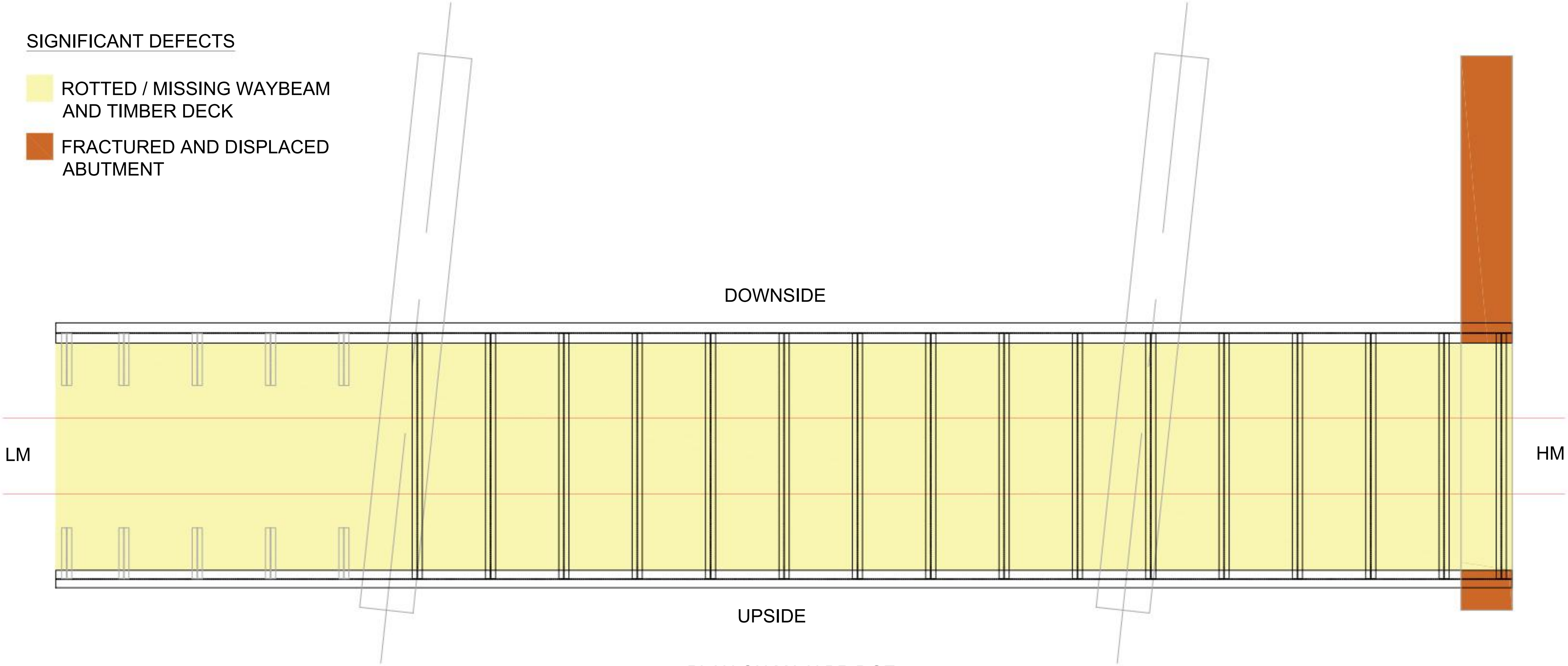
Revision	Suit. Code	Security
P01.1	S3	STD

D:\Projects\398128\Engineering Sketch\398128-MMD-00-XX-SK-S-0101.dwg Apr 5, 2020 - 6:11PM LUK89126

Sheet Size A3 420 x 297

SIGNIFICANT DEFECTS

- ROTTED / MISSING WAYBEAM AND TIMBER DECK
- FRACTURED AND DISPLACED ABUTMENT



PLAN ON MAIN BRIDGE

ROTTED / MISSING WAYBEAM AND TIMBER DECK

FRACTURED AND DISPLACED ABUTMENT

MINOR PROTECTIVE COATING LOSS

VEGETATION OVERGROWTH

LOCALISED CORROSION IN MAIN GIRDER BOTTOM FLANGE NEAR BEARING

CRACKING AND LOSS OF MORTAR IN PIER

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Title
March to Wisbech
Transport Corridor
WIG 2314 Chain Bridge
Typical Defects
Sheet 01 of 02

Suitability Description
Suitable for Review & Comment

Drawing Number
398128-MMD-00-XX-SK-S-0102

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

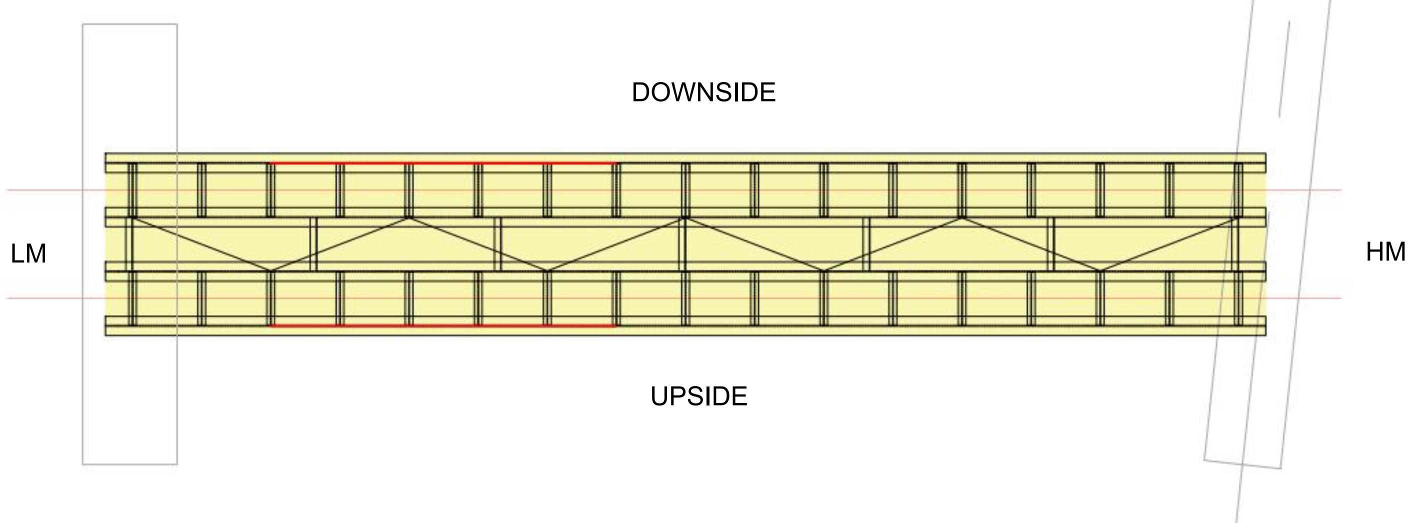
Revision	Suit. Code	Security
P01.1	S3	STD

Status Stamp
NOT FOR CONSTRUCTION

SIGNIFICANT DEFECTS

ROTTED / MISSING WAYBEAM AND TIMBER DECK

LOSS OF SECTION



PLAN ON ADDITIONAL SPAN

LOSS OF SECTION IN MAIN GIRDER WEB NEAR BOTTOM FLANGE

ROTTED / MISSING WAYBEAM AND TIMBER DECK

LAMINATED CORROSION IN MAIN GIRDER BOTTOM FLANGE

LOCALISED CORROSION IN MAIN GIRDER BOTTOM FLANGE

VEGETATION OVERGROWTH

MINOR LAMINATED CORROSION AND PITTING IN STEEL GIRDER

LOSS OF PROTECTIVE COATING

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Title
March to Wisbech
Transport Corridor
WIG 2314 Chain Bridge
Typical Defects
Sheet 02 of 02

Suitability Description
Suitable for Review & Comment

Drawing Number
398128-MMD-00-XX-SK-S-0103

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Revision	Suit. Code	Security
P01.1	S3	STD

Status Stamp
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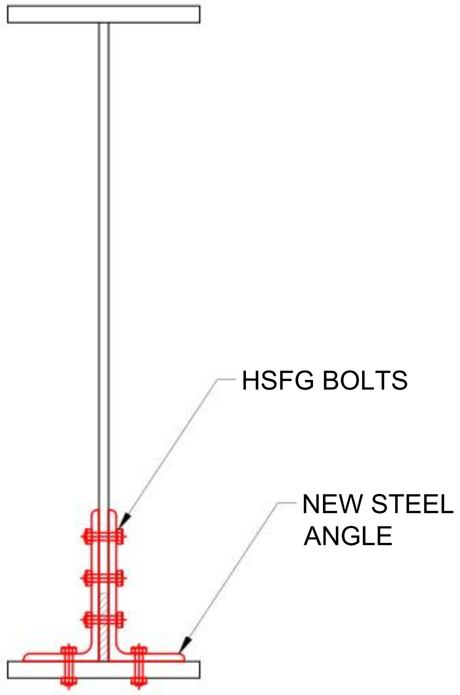
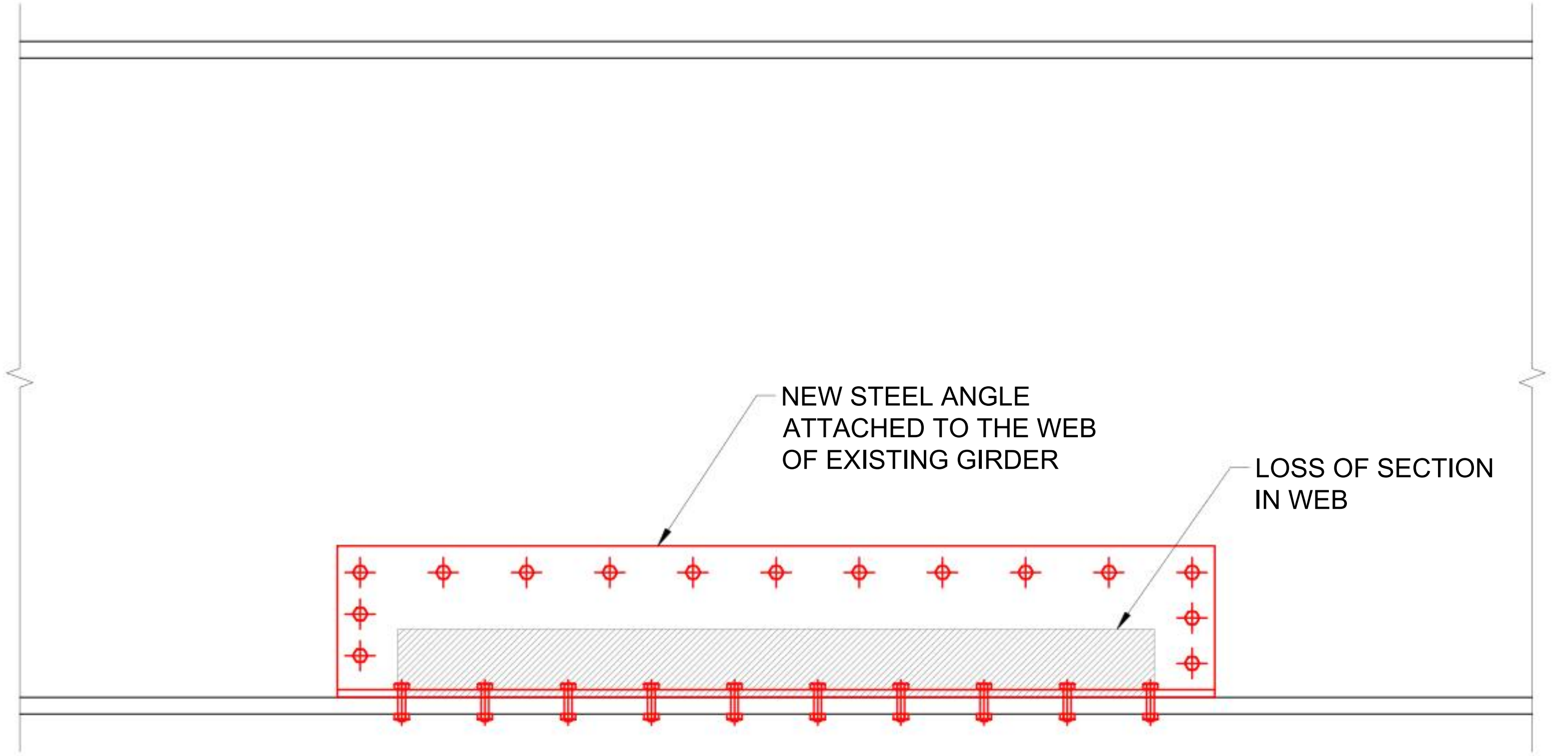
Sheet Size A3 420 x 297

B. Chain Bridge – Proposed Metalwork Repairs

- 398128-MMD-00-XX-SK-S-0104 – WIG 2314 - Chain Bridge - Proposed Metalwork Repairs - Sheet 01 of 01



ADDITIONAL SPAN MAIN GIRDER
WEB REPAIR - CROSS SECTION



ADDITIONAL SPAN MAIN GIRDER
WEB REPAIR - ELEVATION

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Title
March to Wisbech
Transport Corridor
WIG 2314 Chain Bridge
Proposed Metalwork Repairs
Sheet 01 of 01

Suitability Description
Suitable for Review & Comment

Drawing Number
398128-MMD-00-XX-SK-S-0104

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Revision	Suit. Code	Security
P01.1	S3	STD

Status Stamp
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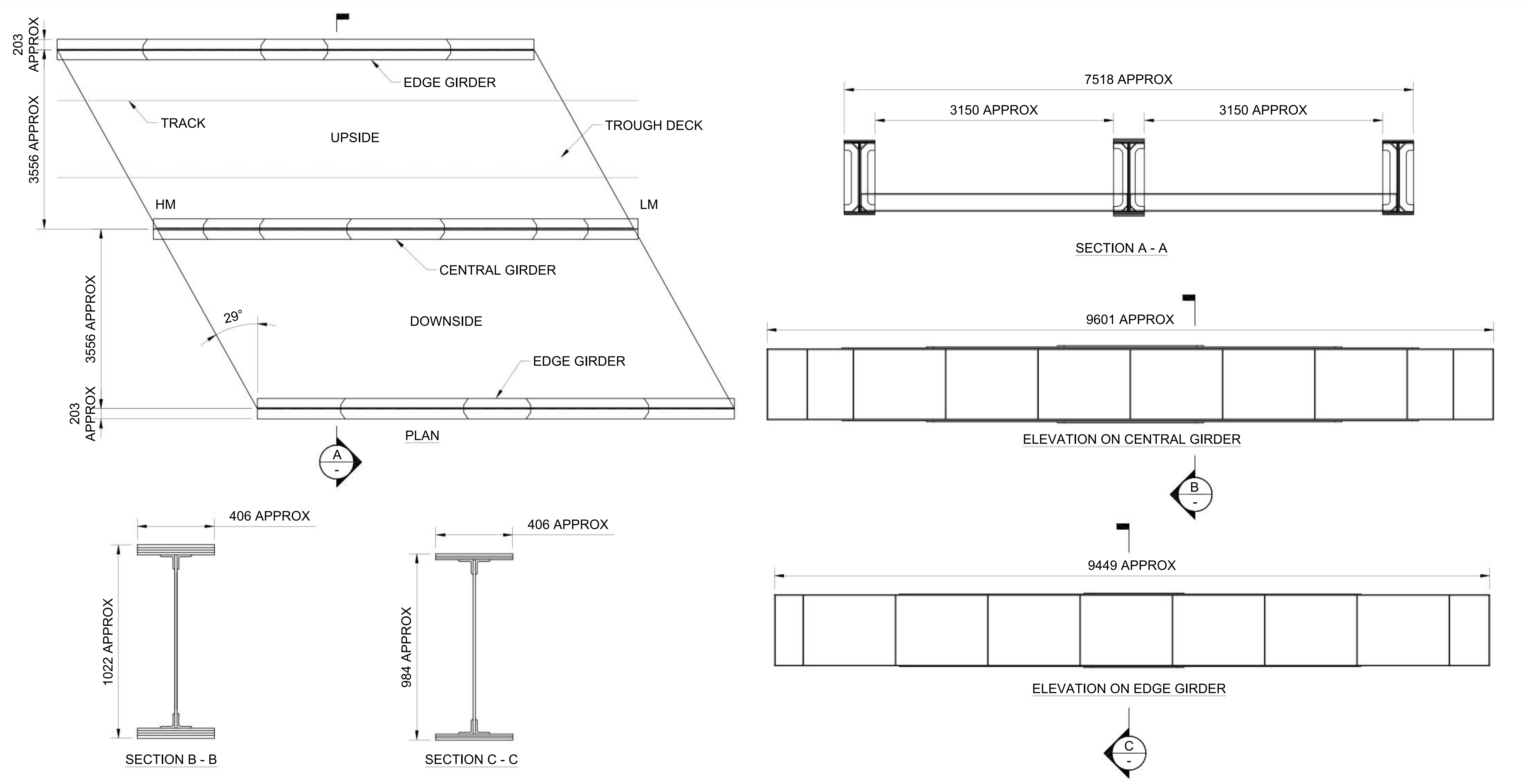
C. Mulbary Drain Underbridge – Sketches from Site Inspection

- 398128-MMD-00-XX-SK-S-0200 – WIG 2315 – Mulbary Drain - Metalwork General Arrangement - Sheet 01 of 01
- 398128-MMD-00-XX-SK-S-0201 – WIG 2315 – Mulbary Drain – Typical Defects - Sheet 01 of 01



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Title
March to Wisbech
Transport Corridor
WIG 2315 Mulbary Drain
Metalwork General Arrangement
Sheet 01 of 01

Suitability Description
Suitable for Review & Comment

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Status Stamp
NOT FOR CONSTRUCTION

Drawing Number
398128-MMD-00-XX-SK-S-0200

Revision	Suit. Code	Security
P01.1	S3	STD

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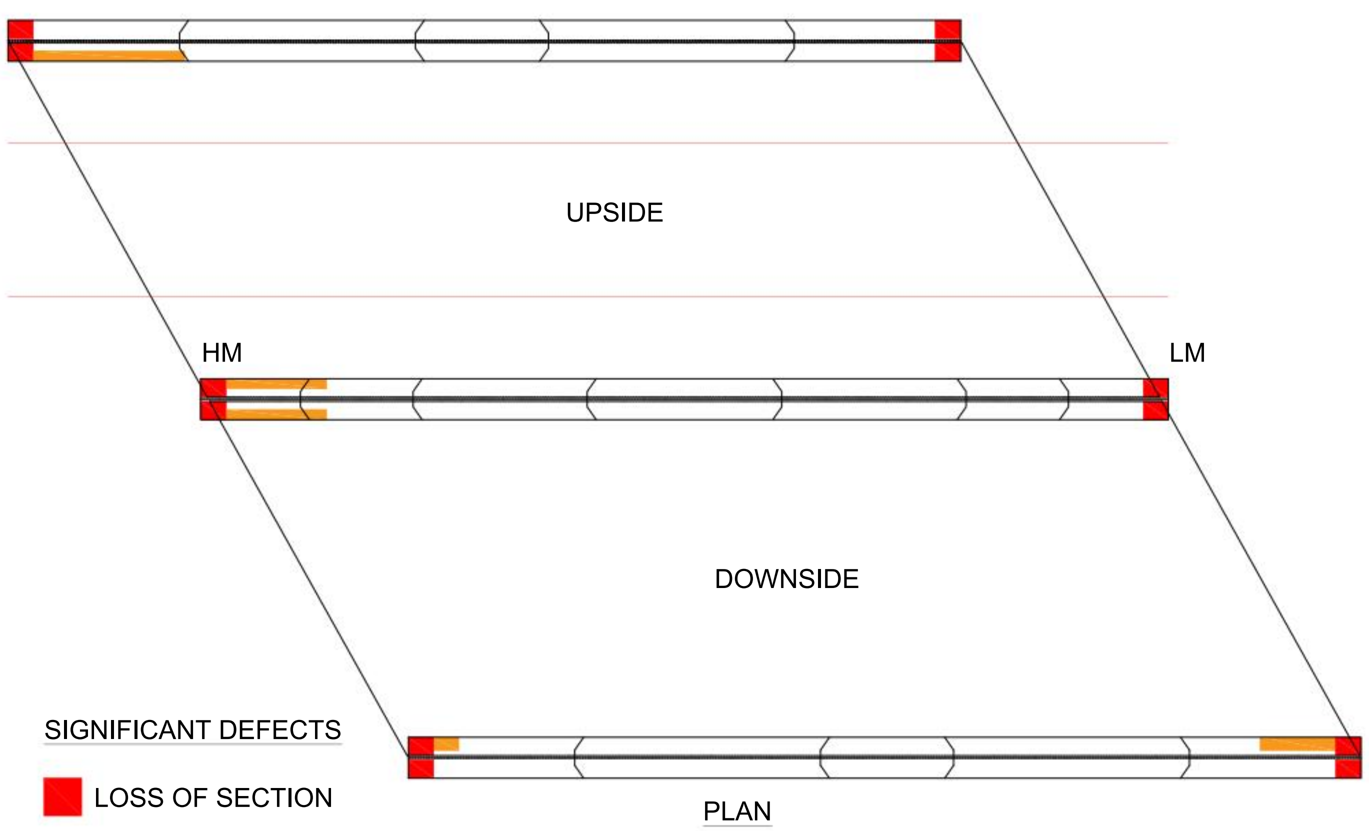

SIGNIFICANT DEFECTS

- LOSS OF SECTION
- LAMINATED CORROSION

LOSS OF SECTION IN MAIN GIRDER BOTTOM FLANGE NEAR BEARING

FRACTURED BED STONE AND BRICKWORK AT ABUTMENT CORNER

LAMINATED CORROSION OF MAIN GIRDER BOTTOM FLANGE NEAR ABUTMENT

LAMINATION AND PITTING OF MAIN GIRDER BOTTOM FLANGE

LOCALISED CORROSION OF TROUGHING

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Title
March to Wisbech Transport Corridor
WIG 2315 Mulbary Drain
Typical Defects
Sheet 01 of 01

Suitability Description: Suitable for Review & Comment

Drawing Number: 398128-MMD-00-XX-SK-S-0201

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Revision	Suit. Code	Security
P01.1	S3	STD

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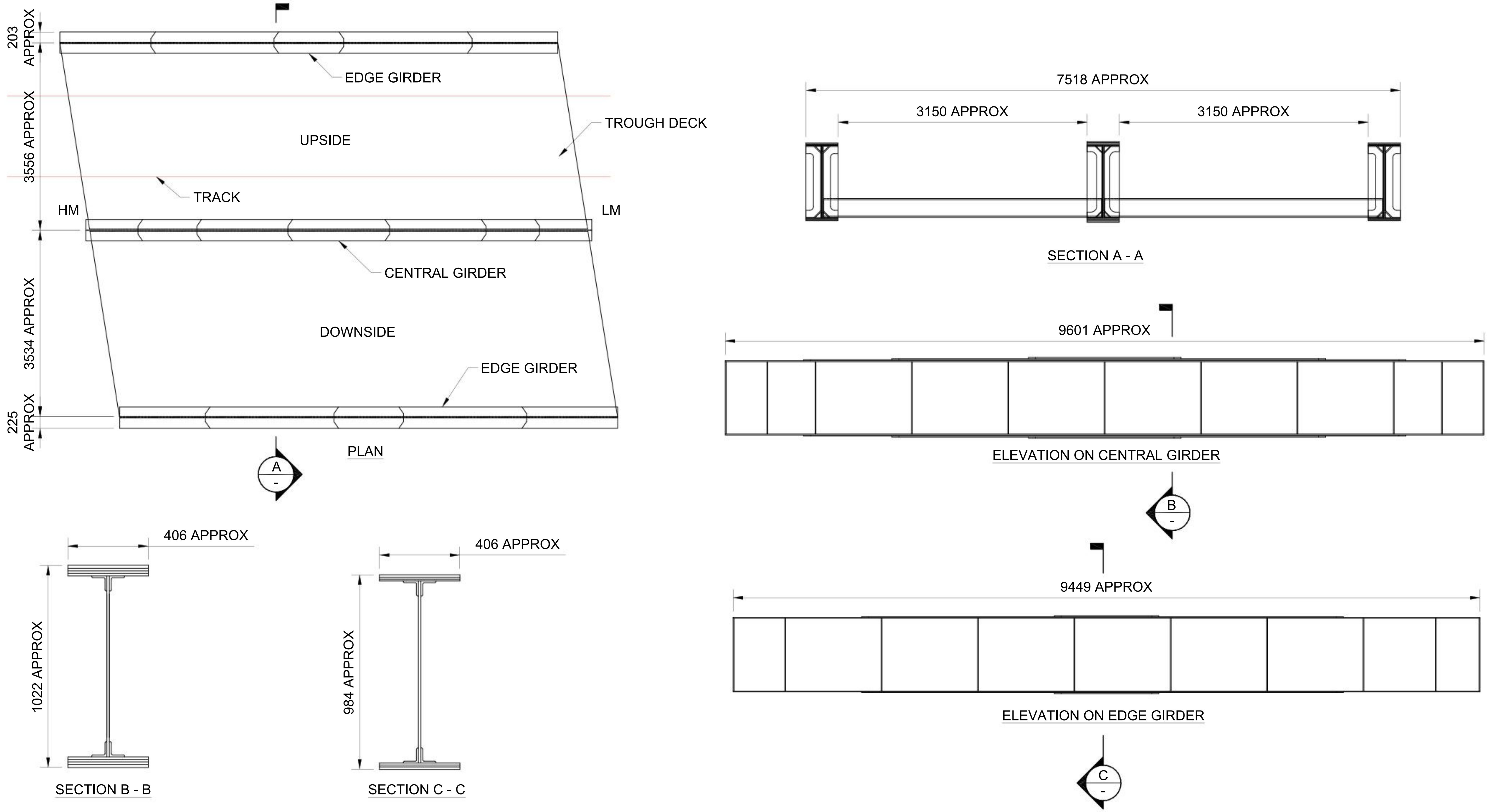
Sheet Size A3 420 x 297

D. Waldersey Drain Underbridge – Sketches from Site Inspection

- 398128-MMD-00-XX-SK-S-0300 – WIG 2317 – Waldersey Drain - Metalwork General Arrangement - Sheet 01 of 01
- 398128-MMD-00-XX-SK-S-0301 – WIG 2317 – Waldersey Drain – Typical Defects - Sheet 01 of 01



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Title
March to Wisbech
Transport Corridor
WIG 2317 Waldersey Drain
Metalwork General Arrangement
Sheet 01 of 01

Suitability Description
Suitable for Review & Comment

Drawing Number
398128-MMD-00-XX-SK-S-0300

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Revision	Suit. Code	Security
P01.1	S3	STD

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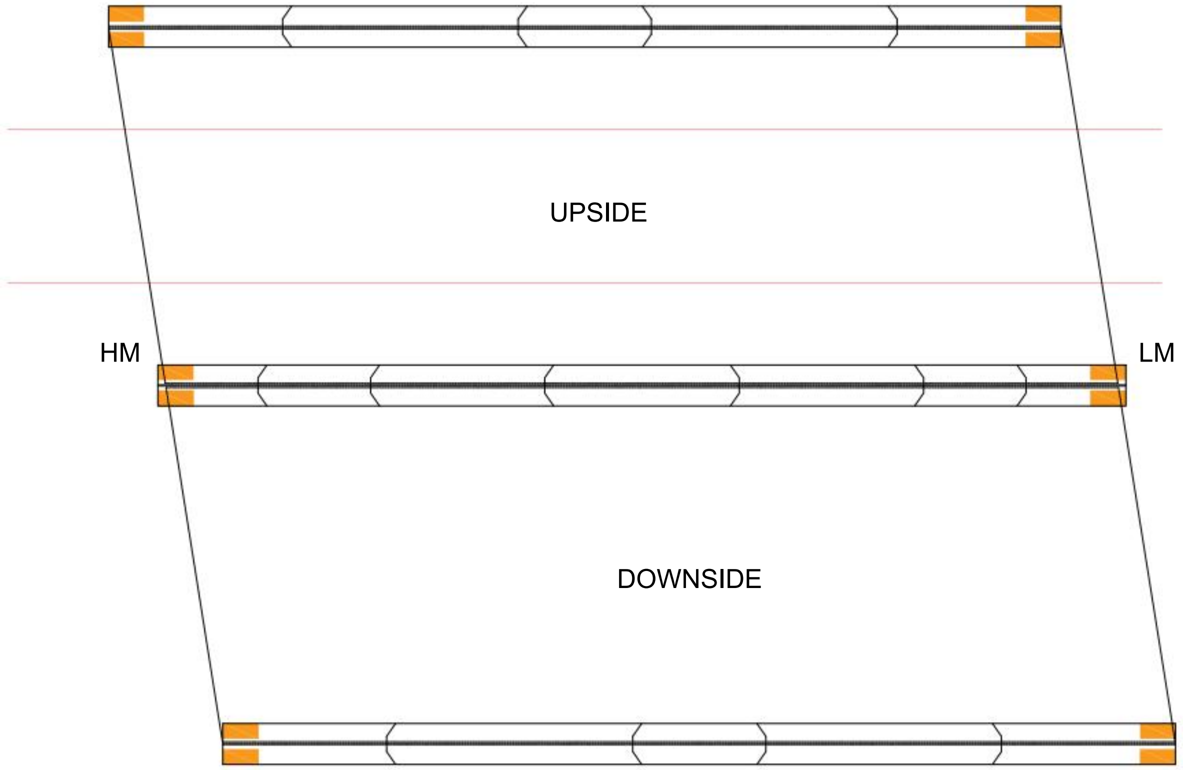

SIGNIFICANT DEFECTS

PLAN

LAMINATED CORROSION

LAMINATED CORROSION OF MAIN GIRDER BOTTOM FLANGE NEAR BEARING

CRACKED BRICKWORK IN ABUTMENT WALL

LOCALISED PITTING OF MAIN GIRDER BOTTOM FLANGE

SPALLED BRICKWORK NEAR THE TOP OF ABUTMENT

LOCALISED CORROSION OF TROUGHING

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P01.1	01\04\2020	LL	First Issue	AK	GD

Title
March to Wisbech
Transport Corridor
WIG 2317 Waldersey Drain
Typical Defects
Sheet 01 of 01

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Suitability Description
Suitable for Review & Comment

Status Stamp
NOT FOR CONSTRUCTION

Drawing Number
398128-MMD-00-XX-SK-S-0301

Revision	Suit. Code	Security
P01.1	S3	STD

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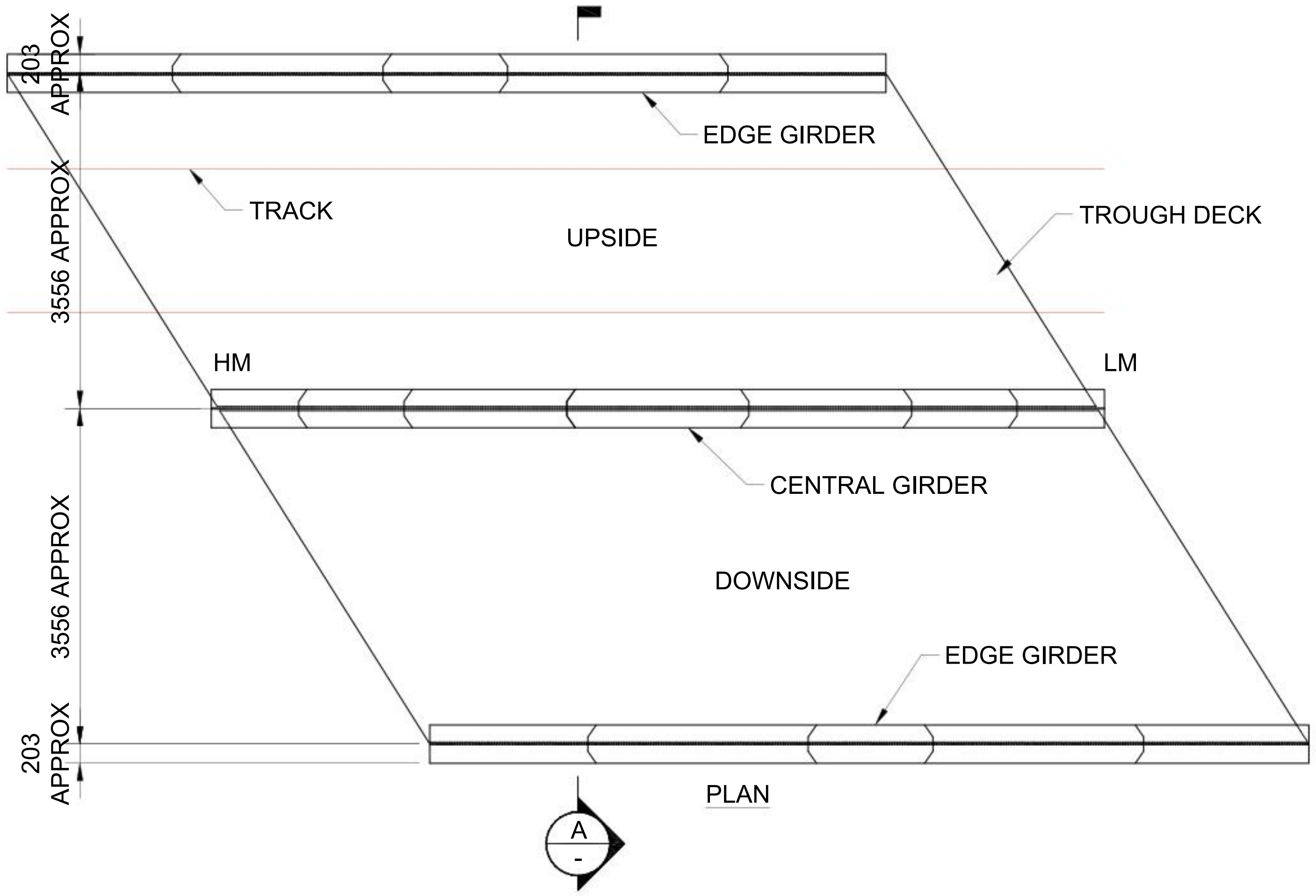
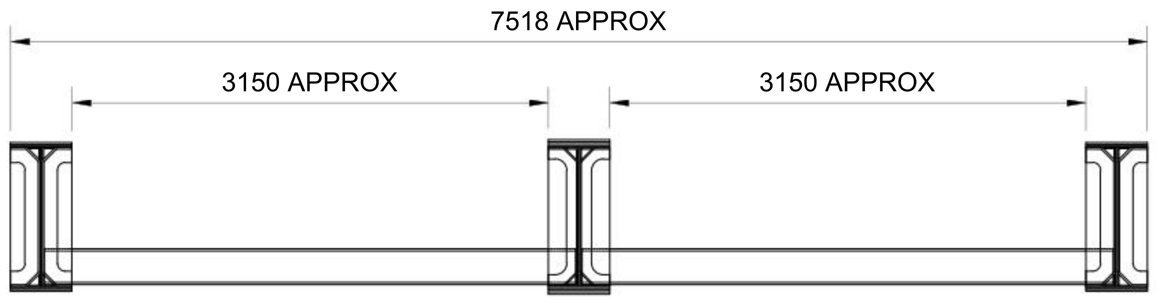
Sheet Size A3 420 x 297

E. Redmoor Drain Underbridge – Sketches from Site Inspection

- 398128-MMD-00-XX-SK-S-0400 – WIG 2319 – Redmoor Drain - Metalwork General Arrangement - Sheet 01 of 01
- 398128-MMD-00-XX-SK-S-0401 – WIG 2319 – Redmoor Drain – Typical Defects - Sheet 01 of 01



PLAN



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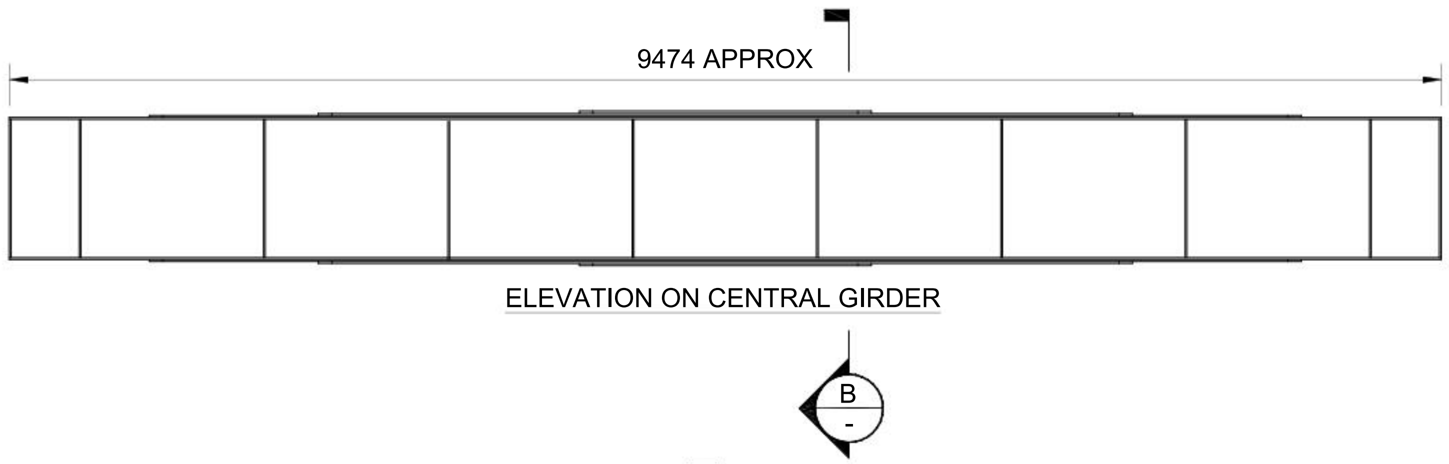
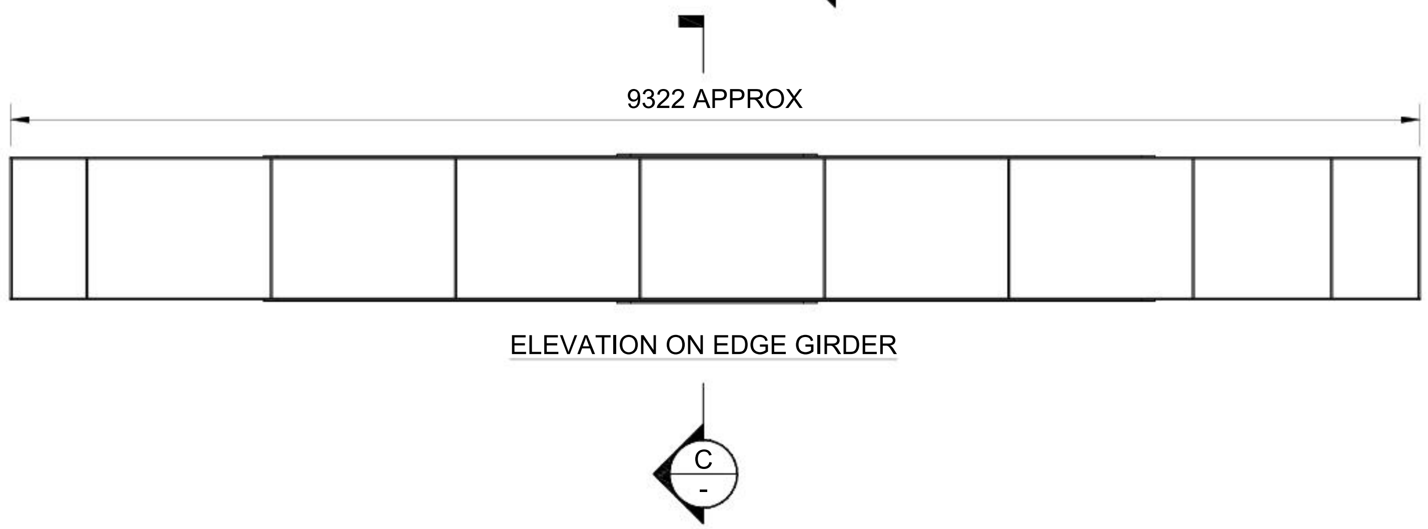


ELEVATION ON CENTRAL GIRDER



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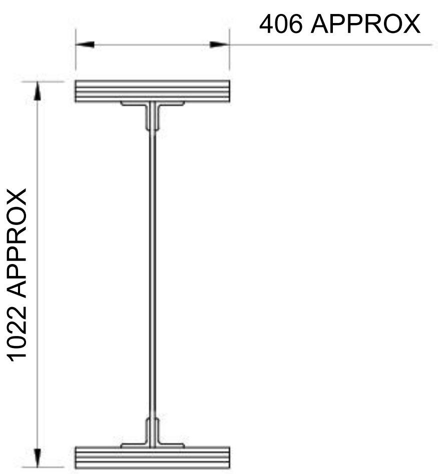

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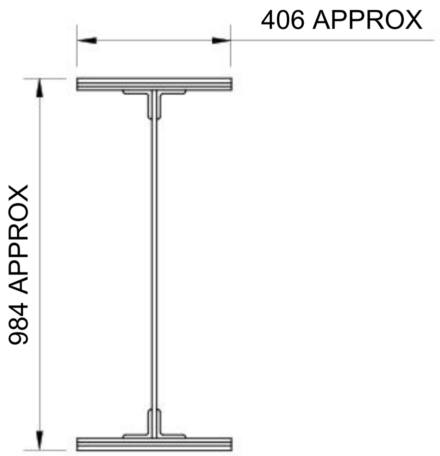

SECTION C - C

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Title
March to Wisbech
Transport Corridor
WIG 2319 Redmoor Drain
Metalwork General Arrangement
Sheet 01 of 01

Suitability Description
Suitable for Review & Comment

Drawing Number
398128-MMD-00-XX-SK-S-0400

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Revision	Suit. Code	Security
P01.1	S3	STD

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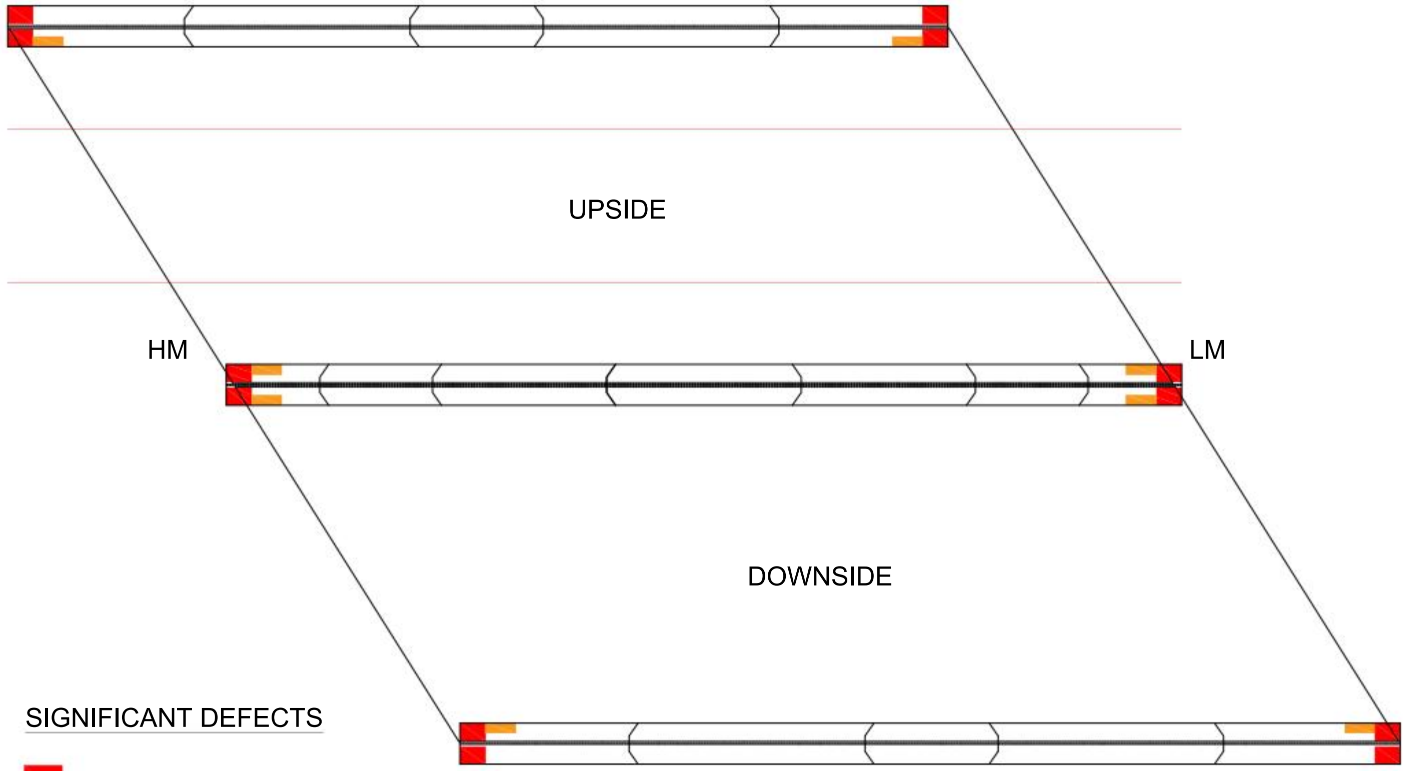
Sheet Size A3 420 x 297



PLAN

SIGNIFICANT DEFECTS

- LOSS OF SECTION
- LAMINATED CORROSION

LOSS OF SECTION OF MAIN GIRDER BOTTOM FLANGE NEAR BEARING

DISLODGED BED STONE AND BRICKWORK AT ABUTMENT CORNER

LAMINATED CORROSION OF MAIN GIRDER BOTTOM FLANGE

FRACTURED BRICKWORK IN ABUTMENT WALL

LOCALISED CORROSION OF TROUGHING

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P01.1	01\04\2020	LL	First Issue	AK	GD

Title
March to Wisbech Transport Corridor
WIG 2319 Redmoor Drain
Typical Defects
Sheet 01 of 01

Designed	L. Luk	LL
Drawn	L. Luk	LL
Dwg Check	A. Kelly	AK
Eng Check	A. Kelly	AK
Coordination	L. Luk	LL
Approved	G. DISSANAIKE	GD
Scale at A3	NTS	
MMD Num.	398128	

Suitability Description
Suitable for Review & Comment

Drawing Number
398128-MMD-00-XX-SK-S-0401

Revision	Suit. Code	Security
P01.1	S3	STD

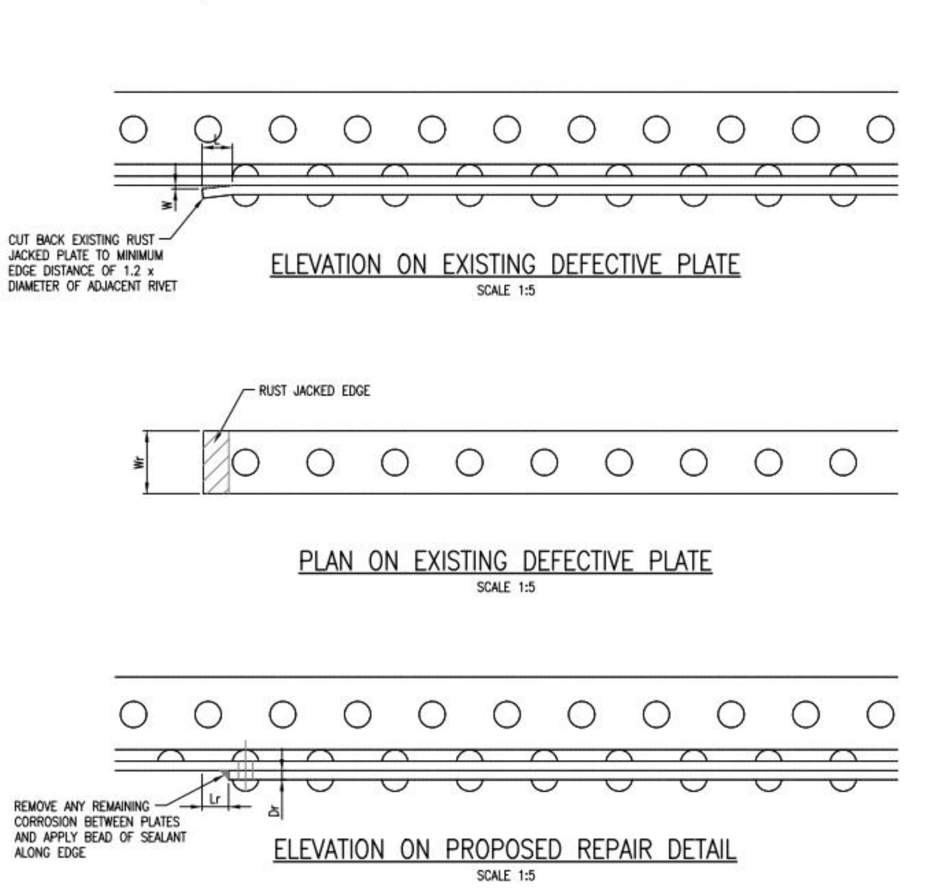
Status Stamp
NOT FOR CONSTRUCTION

F. Network Rail Standard Drawings

- NR/CIV/SD/828 – Flange Repair Details
- NR/CIV/SD/109 – Stitching of Shear Crack
- NR/CIV/SD/109 – Stitching of Longitudinal Cracks in Brickwork

DRAWING No. NR/CIV/SD/828

REPAIR TYPE 1



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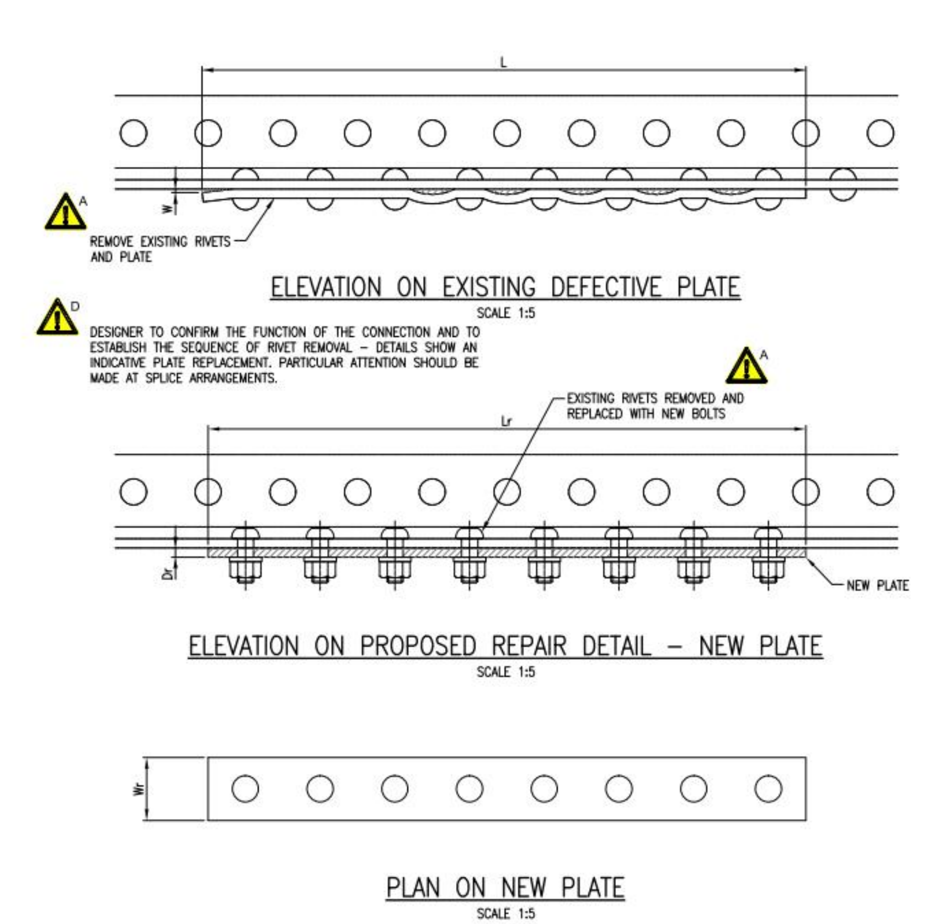
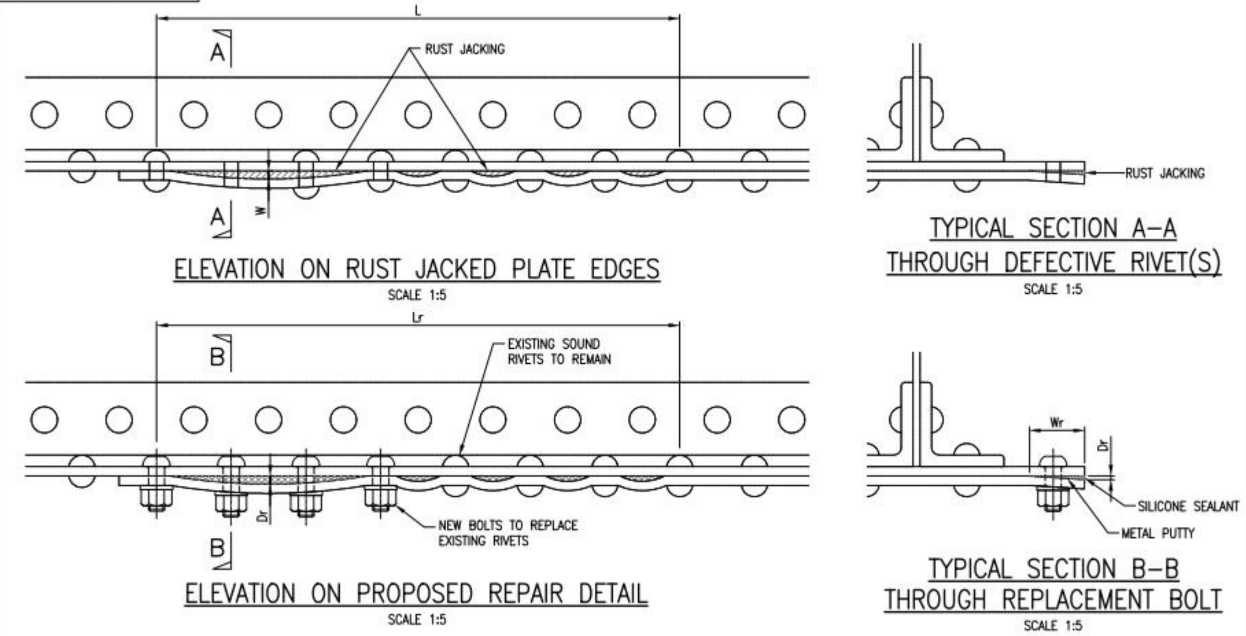
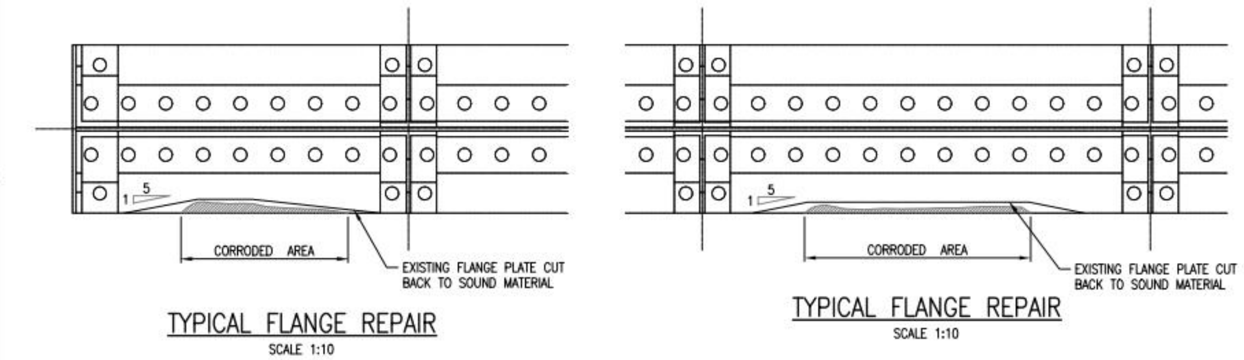


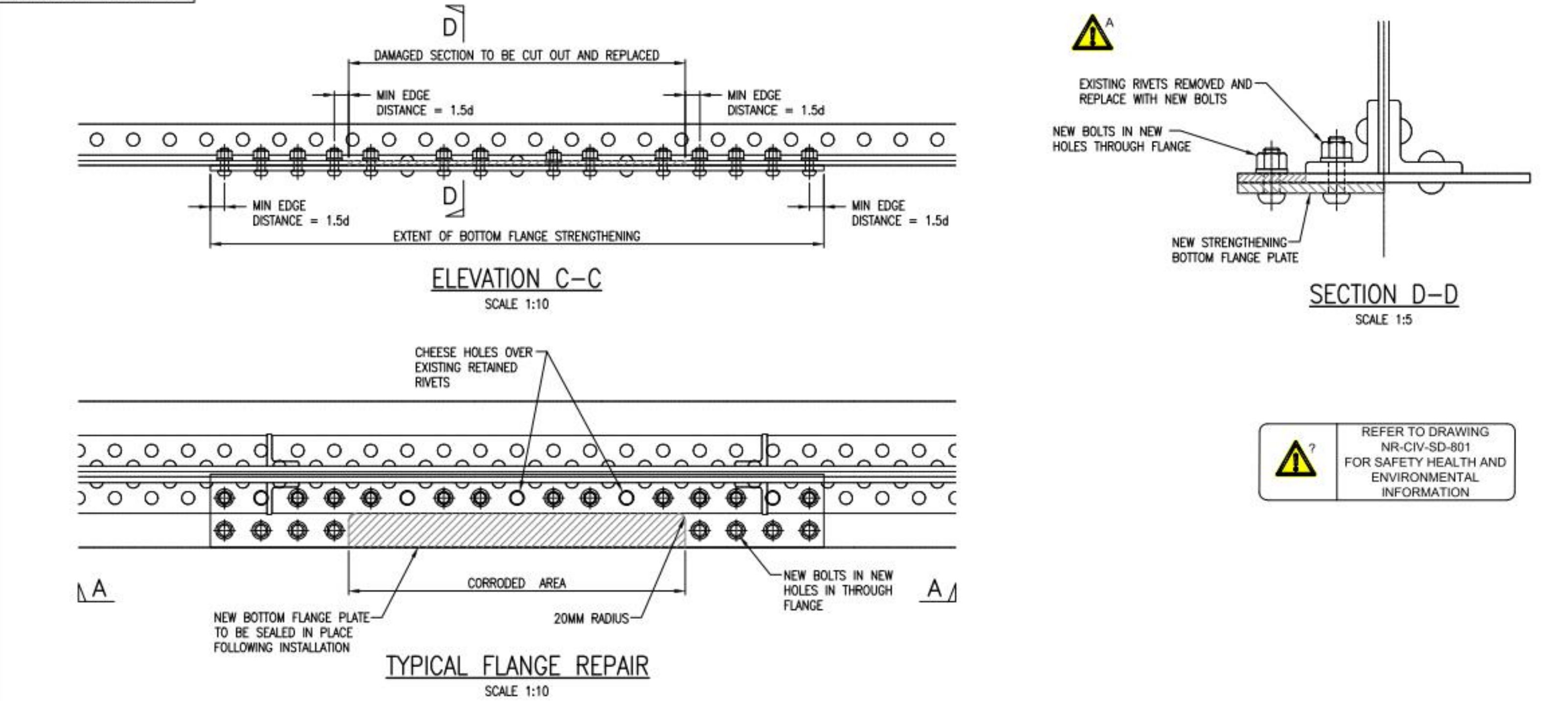
REPAIR TYPE 3



REPAIR TYPE 4



REPAIR TYPE 5



REFER TO DRAWING NR-CIV-SD-801 FOR SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

NOTES

GENERAL NOTES

1. THIS DRAWING SHOWS A TYPICAL EXAMPLE OF METALLIC REPAIRS.
2. THE SIZES AND DIMENSIONS SHOWN ON THIS DRAWING RELATE TO TYPICAL DETAILS. THE CONFIGURATION OF THE DETAILS IS THE RESPONSIBILITY OF THE DESIGNER.
3. ALL EXISTING PLATES, STIFFENERS AND CONFIGURATION OF THE GIRDER ARE TO BE CONFIRMED ON SITE BY THE DESIGNER.

SPECIFICATION

1. FOR SPECIFICATION REFER TO DRG. NR/CIV/SD/801.

NOTES:

1. THE DETAILS INDICATED ON THIS DRAWING ARE TYPICAL AND THE REPAIR MAY ALSO BE USED FOR OTHER DIFFERENT MEMBERS OR ELEMENTS AFFECTED BY A SIMILAR DEFECT.
2. WHERE APPLICABLE DIMENSIONS L,W AND D INDICATE THE EXPECTED EXTENT OF THE DEFECT TO BE REPAIRED. DIMENSION Lr, Dr. AND Wr INDICATE THE EXPECTED EXTENT OF THE REPAIR.
3. THE REPAIR SHALL COMPRISE PREPARING THE INTERNAL SURFACES BETWEEN RUST JACKED PLATES, REMOVING RIVETS WITHIN THE RUST–JACKED AREA AND REPLACING WITH BOLTS. THE PROTECTIVE SYSTEM SHALL BE IN ACCORDANCE WITH THE SPECIFICATION.
4. GAPS, VOIDS, EDGES OF REPAIRS AND SEALING AROUND BOLTS HOLES SHALL BE TREATED IN ACCORDANCE WITH THE SPECIFICATION 170 SERIES.

NOTE

DENOTES NEW BOLT IN EXISTING HOLE REAMED TO SUIT.

DENOTES NEW BOLT IN PRE DRILLED HOLE.

DENOTES EXISTING RIVET TO BE LEFT IN PLACE.

Rev	Date	Description of revision	Design'd	C'kd
B	NOV 16	AMENDED AGAINST CDM2015 & SbD	SD	IS
A	22.06.12	FIRST ISSUE	MK	AGW
P3	01.07.11	DRAFT PUBLICATION ISSUE	MK	AGW
P2	14.04.11	ISSUED FOR FORM A	MK	AGW
P2	24.02.11	ISSUED FOR COMMENT	MK	AGW
P1	24.01.11	DRAFT ISSUE	MK	AGW

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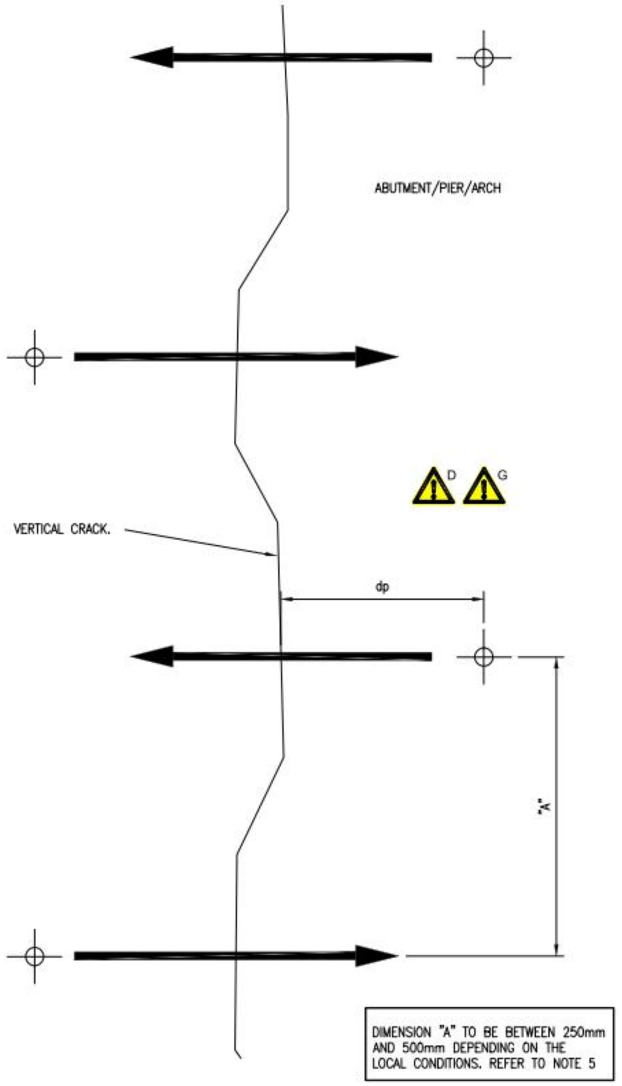
	Name	Position	Signature	Date
Approved	Paul Clark	Head of Engineering Infrastructure Projects Central Region	P.C.	June 12

METALLIC STRUCTURE REPAIRS STANDARD DRAWINGS

FLANGE REPAIR DETAILS

Scale: AS SHOWN

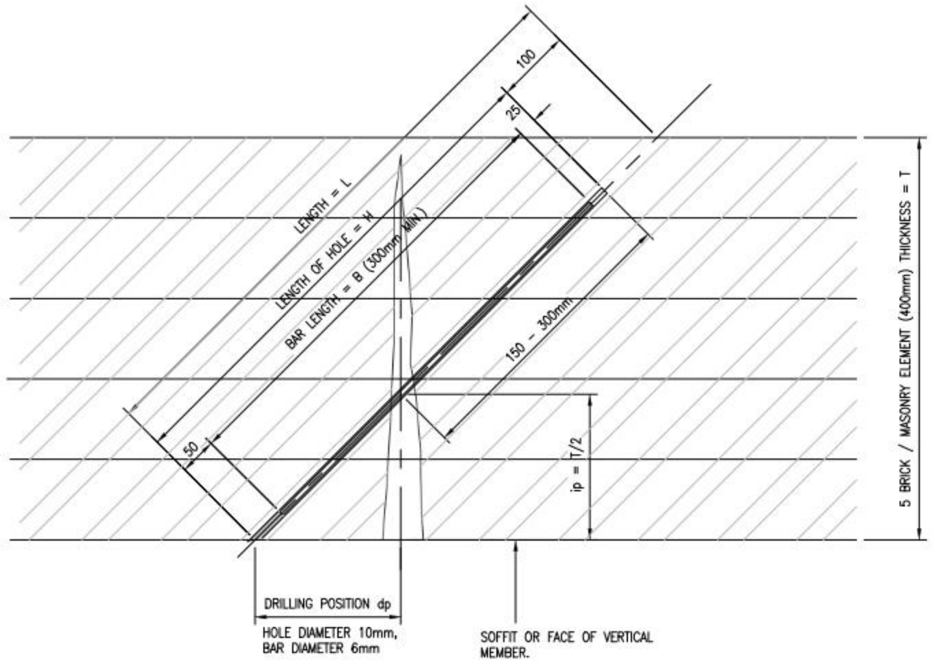
Drawing Number: NR/CIV/SD/828 | B



DIMENSION "A" TO BE BETWEEN 250mm AND 500mm DEPENDING ON THE LOCAL CONDITIONS. REFER TO NOTE 5

SPACING OF STITCHING BARS ALONG LENGTH OF TYPICAL CRACK

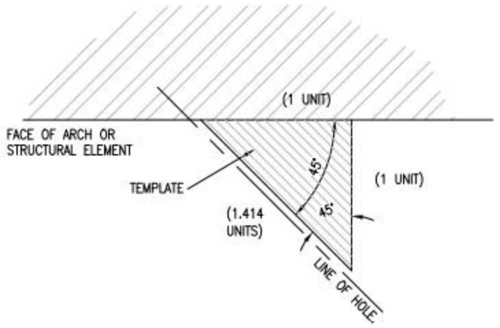
SCALE 1 : 5



TYPICAL SECTION AT 45° CROSS STITCHING OF SHEAR CRACK IN ARCH STRUCTURAL ELEMENT

SCALE 1 : 5

NOTE : TO ENSURE THE CORRECT DRILLING ANGLE IS MAINTAINED DURING INSTALLATION OF THE BARS A TEMPLATE SHOULD BE USED. THIS SHOULD BE CUT TO GIVE THE REQUIRED DRILLING ANGLE.



TYPICAL 45° TEMPLATE

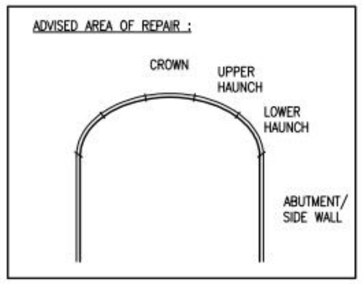
SCALE 1 : 10

TABLE 1

THICKNESS OF ELEMENT T	DRILLED LENGTH OF HOLES AND BARS INCLUDING POSITION AND INTERSECTION POINT.		
	45°		
RINGS	HOLE H mm	BAR B mm	dp T/2 mm
210 (2)	*197*	*122*	*105*
320 (3)	353	*278*	*160*
430 (4)	508	433	215
540 (5)	664	589	270
650 (6)	819	744	325

(SEE NOTE 3)

THE FIGURES IN ITALICS FAIL TO REACH DESIRED VALUES BUT MAY BE USED WITH EMPLOYERS REPRESENTATIVE'S AGREEMENT.



AREA APPROPRIATE FOR DETAILED REPAIR IS SHOWN BY HEAVY LINE.

DO NOT SCALE THIS DRAWING

DESIGN ASSUMPTIONS

a) TO DETERMINE THE FRACTURE STITCHING ARRANGEMENT A NUMBER OF FACTORS NEED TO BE ESTABLISHED.

b) LOCATION
TYPE OF FRACTURE, SHEAR (LONGITUDINAL / STEPPED).
THICKNESS OF STRUCTURAL ELEMENT TO BE DRILLED AND STITCHED.
DRILLING ANGLE OF 45° FROM THE FACE.
THICKNESS ('T') TO BE STITCHED .

c) THE PRESENCE OF WATERPROOFING TO ARCH BACKING THROUGH WHICH PENETRATION MUST BE AVOIDED WHERE POSSIBLE UNLESS DIRECTED BY THE EMPLOYERS REPRESENTATIVE. DRILLING ANGLE OF 45° FROM THE FACE. THICKNESS TO BE STITCHED; CHECK THAT WHEN THE BAR IS IN POSITION THAT IT EXTENDS A MINIMUM 150mm BEYOND THE FRACTURE, THE OPTIMUM LENGTH BEING 300mm. THIS DOES NOT PREVENT GREATER LENGTHS BEING INSTALLED IF REQUIRED AS DIRECTED BY THE EMPLOYERS REPRESENTATIVE. THE MINIMUM LENGTH IS 300mm.

d) LOCATION: REFER TO CONTRACT DRAWING OR INSPECTION REPORT.
TYPE: REFER TO INSPECTION REPORT. DRILLING ANGLE IS DEPENDANT ON THE LOCATION.

e) THICKNESS ('T') OF VERTICAL MEMBERS MUST BE ESTABLISHED BY TRIAL DRILLING. ARCH THICKNESS MUST BE ASSUMED BY MEASURING AGAINST THE NUMBER OF FACE RINGS TO AVOID DAMAGING ANY WATERPROOFING PRESENT. TRIAL DRILLING CAN ONLY BE USED IF DIRECTED BY THE EMPLOYERS REPRESENTATIVE.

f) CALCULATION OF BAR LENGTHS, HOLE DEPTHS AND DRILLING POSITIONS

DEPENDING ON THE TYPE OF FRACTURE UNDER REPAIR THE POSITION OF THE INTERSECTION POINT (IP) MUST BE CONSIDERED. FOR SHEAR FRACTURES THE MOST DESIRABLE POSITION FOR INTERSECTING THE CRACK IS MIDWAY THROUGH THE BREAK. THEREFORE THE ANGLE OF ENTRY MUST BE 45°.

g) SHEAR CRACKS = T/2; DESIRED REPAIR AT MIDWAY IN BREAK.

h) TO ENSURE THAT THE (IP) IS NO LESS THAN 125mm FROM THE FACE OF THE INTRADOS OR FACE OF A VERTICAL MEMBER IT MUST ANCHOR INTO AT LEAST THE SECOND RING OR COURSE.
HAVING DETERMINED THE DRILLING POSITION, THE MINIMUM BAR LENGTH MUST BE 300mm.

i) THE SPACING OR HALF PITCH OF BARS MEASURED LONGITUDINALLY ALONG THE CRACK SHALL BE UNIFORM THROUGHOUT THE LENGTH. THIS WILL BE PROPORTIONAL TO THE DISTANCE FROM (IP) NOMINALLY BETWEEN 250mm AND 500mm.

j) FOR BOTH BRICK & MASONRY APPROXIMATELY 500mm EACH SIDE OF THE CRACK MUST BE CLEANED USING A HIGH PRESSURE WATERJET.

k) THE CRACK AND ANY POOR MORTAR JOINTS WITHIN THE CLEANED AREA TO BE RAKED OUT TO A MIN DEPTH OF 25mm/SOUND MATERIAL AND RE-POINTED BY HAND OR AN APPROVED MECHANICAL METHOD. JOINTS TO BE FULLY MORTARED UP AND STRUCK FLUSH.

l) POINTING TO BE ALLOWED TO OBTAIN SUFFICIENT STRENGTH PRIOR TO THE GROUTING. THIS BEING CARRIED OUT AFTER THE STITCHING PROCESS.

INSTALLATION GUIDANCE

a) HOLES SHALL BE DRILLED, FLUSHED CLEAR OF ALL DUST AND DEBRIS AND WHEREVER REASONABLY PRACTICABLE, BE FORMED THROUGH BRICKS OR MASONRY UNITS AS APPLICABLE AND NOT THROUGH JOINTS.

b) DETAILS OF TOLERANCES WITH RESPECT TO HOLE DIAMETER, LENGTH AND DEVIATION, THE METHOD OF MONITORING HOLE ACCURACY AND ANY CORRECTIVE ACTION SHALL BE INCLUDED IN THE METHOD STATEMENT.

c) THE GROUT TO BE INJECTED AT A PRESSURE AND CONSISTENCY THAT WILL ENSURE THE GROUT TRAVELS AND PERMEATES INTO THE BRICKWORK WITHOUT IMMEDIATELY RUNNING OUT. MINIMISE EXCESSIVE LEAKAGE. GIVE DUE CONSIDERATION TO THE CONDITION OF THE BRICKWORK AND NOT CAUSE 'BLOW-OUT'. CLOSELY MONITOR GROUT 'TAKE' TO MINIMISE LEAKAGE.

d) WHILST GROUT IS STILL 'GREEN' RE-DRILL THE HOLES. INJECT THE ANCHOR GROUT INTO THE HOLE, INSERT THE STITCHING BARS IN THE SAME HOLES. SECURE WITH A TEMPORARY TIMBER BUNG TO PREVENT GROUT LOSS. REMOVE BUNG AFTER SET PERIOD AND POINT UP WITH MORTAR.

DRAWING No. NR/CIV/SD/109

NOTES

GENERAL

1. THIS DRAWING SHALL BE USED WHERE CROSS STITCHING & GROUTING IS TO BE UNDERTAKEN FOR SHEAR CRACKS THAT EXIST IN ALL ELEMENTS OF BRICKWORK.
2. WHERE BRICKWORK IN THE VICINITY OF THE CRACK REQUIRES REPLACING REFER TO DRAWING NR/CIV/SD/111.
3. TABLE 1 AT THE FOOT OF THE DRAWING IS A GUIDE FOR THE REQUIRED DEPTHS NEEDED TO ENSURE AN ADEQUATE REPAIR. ALTHOUGH THE VALUES IN ITALICS FOR 2 & 3 COURSES DEEP OR FOR BARREL RINGS, INDICATE INSUFFICIENT ANCHORAGE LENGTH. GENERALLY SUCH SMALL BARRELS WOULD NOT BE FOUND OTHER THAN IN CULVERTS AND DUE TO RESTRICTED ACCESS IT WOULD BE IMPRACTICABLE TO CARRY OUT SUCH REPAIRS.
4. ALL TERMINOLOGY IS BASED ON THAT TYPICALLY USED TO DESCRIBE BRIDGE DEFECTS.
5. THE DIMENSION BETWEEN BAR CENTRES SHALL BE SPECIFIED IN THE PROJECT SPECIFIC FORM 003 AND /OR AGREED WORK SCOPE.

SPECIFICATION

REFER TO DESIGN ASSUMPTIONS AND SPECIFICATION ON DRAWING NR/CIV/SD/101.

HAZARD IDENTIFICATION

REFER TO DRAWING NR/CIV/SD/101

REFER TO DRAWING NR-CIV-SD-101 FOR SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

Rev	Date	Description of revision	Design'd	C'kd
B	NOV 2016	AMENDED AGAINST CDM 2015 & SbD	SD	IS
A	22.06.06	FIRST ISSUE -NR APPROVED	RMA	NGAY
P3	17.03.06	REVISED FORM B.	RMA	NGAY
P2	31.01.06	FORM B ISSUE.	RMA	NGAY
P1	13.01.06	PRELIMINARY DRAFT	RMA	NGAY

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	Name	Position	Signature	Date
Approved	P. CLARK	Programme Eng. Manager Civils, MP & I	PC	25.05.06
Authorised	K. TEAGER	Director of Civil Engineering	KT	08.06.06

Master copy with original signatures held by Network Rail HQ
CIVIL ENGINEERING STANDARD DESIGN

BRICK AND MASONRY REPAIR STANDARD DRAWINGS

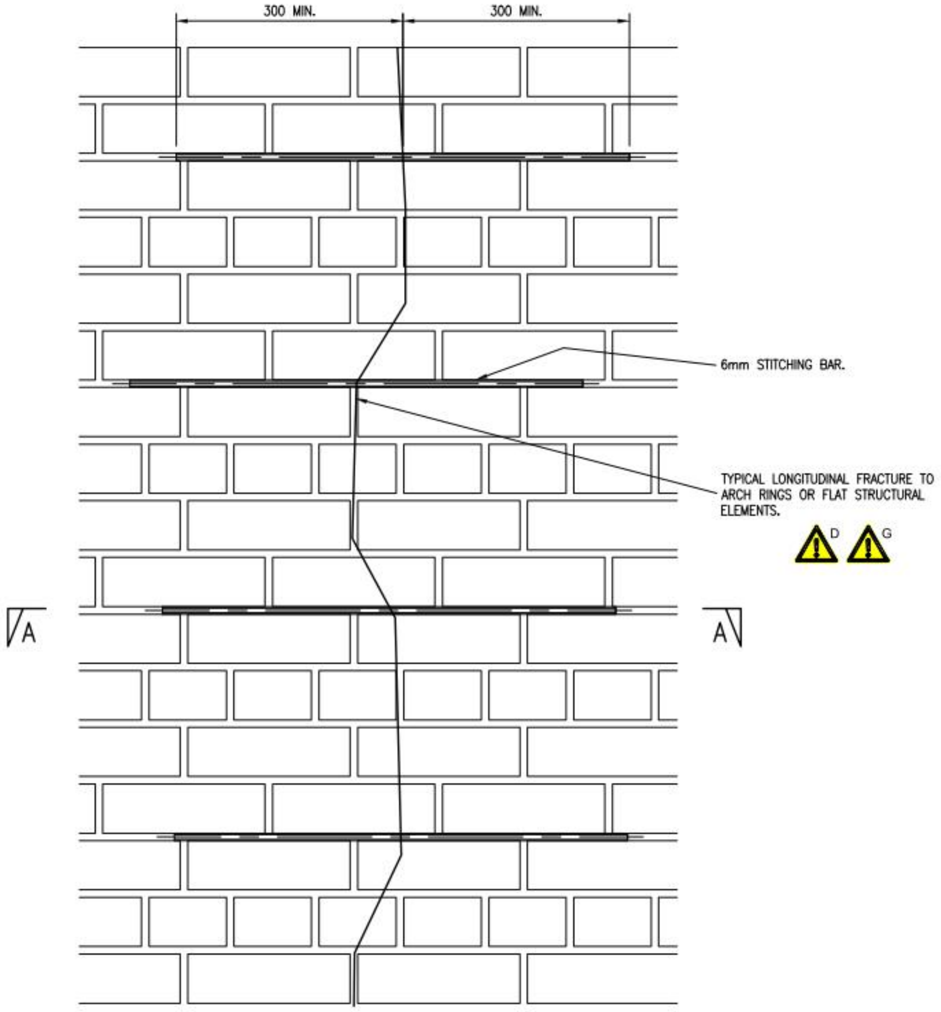
STITCHING OF SHEAR CRACKS

Scale: AS SHOWN

Drawing Number: NR/CIV/SD/109 REV. B

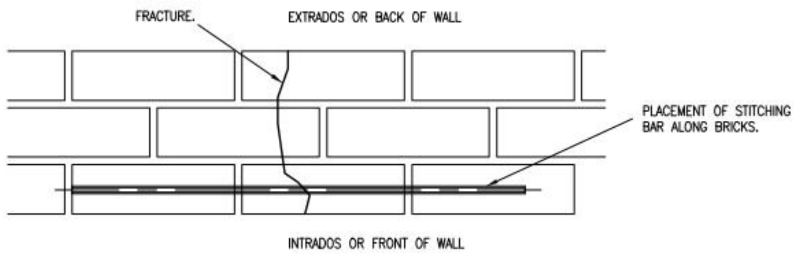
DO NOT SCALE THIS DRAWING

DRAWING No. NR/CIV/SD/110



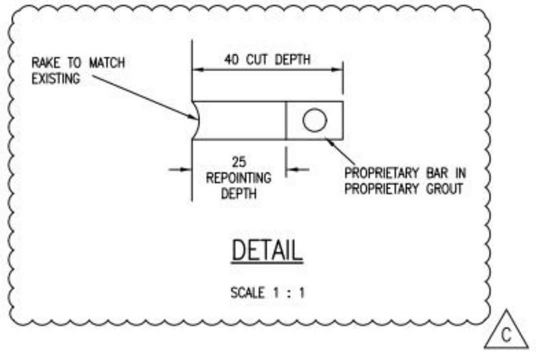
ELEVATION SPACING OF STITCHING BARS ALONG LENGTH OF CRACK

SCALE 1 : 5



SECTION A – A STITCHING BAR ALONG BRICKS

SCALE 1 : 5



DETAIL

SCALE 1 : 1

INSTALLATION GUIDANCE

a) WHERE WATER INGRESS OR OTHER DEFECTS PREVENT THE USE OF LIME MORTAR THEN PROPRIETARY PRODUCTS SHOULD BE USED. THESE SHOULD HAVE THE FOLLOWING PROPERTIES:
- ANTI-WASHOUT
- LOW STRENGTH, TYPICALLY 15-20N/mm^2
- HIGHLY THIXOTROPIC
- EARLY INITIAL SET
- SIMILAR MODULUS TO LIME MORTAR
- SHRINKAGE COMPENSATED
- EASY TO USE AND HANDLE ON SITE
- MINIMAL TOXICITY

b) ALONG EVERY FOURTH BED COURSE GRIND OUT THE EXISTING MORTAR TO A DEPTH OF 40mm ENSURING A MINIMUM ANCHOR LENGTH OF 300mm EITHER SIDE OF THE FRACTURE.

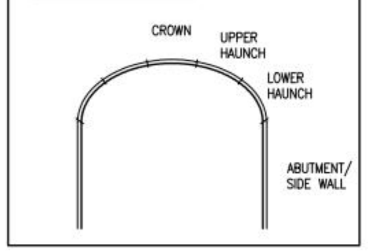
c) G AFTER APPLYING THE PROPRIETARY ANCHOR GROUT WITH AN INJECTION TOOL. INSERT THE STITCHING BAR INTO A FULLY GROUTED JOINT AND PRESS THE BARS FIRMLY INTO PLACE.

d) BRICKS TO BE REPLACED ALONG LENGTH OF CRACK WHEREVER A FULL BREAK HAS OCCURRED THROUGH THE BRICK, SEE DRAWING NR/CIV/SD/111 FOR DETAILS.

e) THE SURROUNDING BRICKWORK SHALL BE WETTED FIRSTLY BEFORE RE-POINTING IS CARRIED OUT. THE CRACK AND ANY POOR MORTAR JOINTS WITHIN THE CLEANED AREA TO BE RAKED OUT TO A MIN DEPTH OF 25mm/SOUND MATERIAL. ALL PREPARED JOINTS SHALL BE FREE OF VEGETATION AND OTHER MINERAL DEPOSITS.

f) POINTING SHALL BE CARRIED OUT WHILE THE MORTAR IS STILL GREEN EITHER BY HAND POINTING OR BY ANY APPROVED MECHANICAL METHOD. JOINTS TO BE FLUSH POINTED CUT AND STRUCK TO MATCH EXISTING DEPENDING ON LOCATION. ALL MORTAR TO MATCH THE EXISTING IN COLOUR. WHERE JOINTS OF NEGLIGIBLE MORTAR EXIST "PENCIL JOINTS", EVERY EFFORT MUST BE MADE TO MATCH THE EXISTING, COURSE FOR COURSE.

ADVISED AREA OF REPAIR :



AREA APPROPRIATE FOR DETAILED REPAIR IS SHOWN BY HEAVY LINE.

NOTES

GENERAL

1. INDIVIDUAL BRICKS ARE TO BE REPLACED DEPENDING ON THE CONDITION OF BRICKWORK AND THE LENGTH OF CRACK.

2. THE EXTENT OF REPAIR WILL BE DECIDED BY THE EMPLOYERS REPRESENTATIVE ON SITE.

3. GENERALLY SMALL ISOLATED AREAS OF REPAIR WOULD NOT NECESSITATE THE NEED FOR FORMWORK SUPPORT. SMALL WEDGES SECURING THE PERPENDICULAR AND BED JOINTS SHOULD SUFFICE UNTIL STRIKING UP OF THE JOINTS CAN BE ACHIEVED.

4. WHERE BRICKWORK IN THE VICINITY OF THE CRACK REQUIRES REPLACING REFER TO DRAWING NR/CIV/SD/111.

SPECIFICATION

REFER TO DRAWING NR/CIV/SD/101.

HAZARD IDENTIFICATION

REFER TO DRAWING NR/CIV/SD/101

? REFER TO DRAWING NR-CIV-SD-101 FOR SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

Rev	Date	Description of revision	Design'd	C'kd
C	SEP 18	SDC UPDATES	SF	MK
B	NOV 2016	AMENDED AGAINST CDM 2015 & SbD	SD	IS
A	22.06.06	FIRST ISSUE -NR APPROVED	RMA	NGAY
P3	17.03.06	REVISED FORM B.	RMA	NGAY
P2	31.01.06	FORM B ISSUE.	RMA	NGAY
P1	13.01.06	PRELIMINARY DRAFT	RMA	NGAY

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	Name	Position	Signature	Date
Approved	SW	Investment Projects Technical Head of Discipline Buildings and Civils	SW	01/12/18
	MK	CEM	MK	26/09/18

BRICK AND MASONRY REPAIR STANDARD DRAWINGS

STITCHING OF LONGITUDINAL CRACKS IN BRICKWORK

Scale AS SHOWN

Drawing Number NR/CIV/SD/110 REV. C

mottmac.com

N. March Station Track Options

Legend/Notes

Key
- Rail - proposed
- Rail - existing
- Rail - to be removed
- Existing Platform

Rev	Date	Description of Revisions	Drawn	Chkd	Appr

Status
working

Cambridgeshire County Council

Contractor(s)

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Website: www.mottmac.com

Project
March to Wisbech
Rail Reopening
GRIP 3

Drawing Title
March Station Layout
Option 2A
One New Through Platform

Designed	M. Urban	Signed	Date 30/07/19
Drawn	.	Signed	Date .
Checked	.	Signed	Date .
Approved	.	Signed	Date .
Scale(s) 1:1000 @ A1		ELR & Mileage ELR & Mileage	

Alternative Reference
Sheet 1 of 1
Drawing Number
MMD-348851-Working 11
Revision

Sheet Size A1 594 x 841

Legend/Notes

Key

- Rail - proposed
- Rail - existing
- Rail - to be removed
- Existing Platform

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
.	.	Working	.	.	.

Status

For Review

Cambridgeshire County Council

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Project

March to Wisbech
Rail Reopening
GRIP 3

Drawing Title

March Station Layout
Option 2B
One New Through Platform

Designed: M. Urban	Signed	Date: 31/07/19
Drawn: .	Signed	Date: .
Checked: .	Signed	Date: .
Approved: .	Signed	Date: .
Scale(s): 1:1000 @ A1	ELR & Mileage: ELR & Mileage	

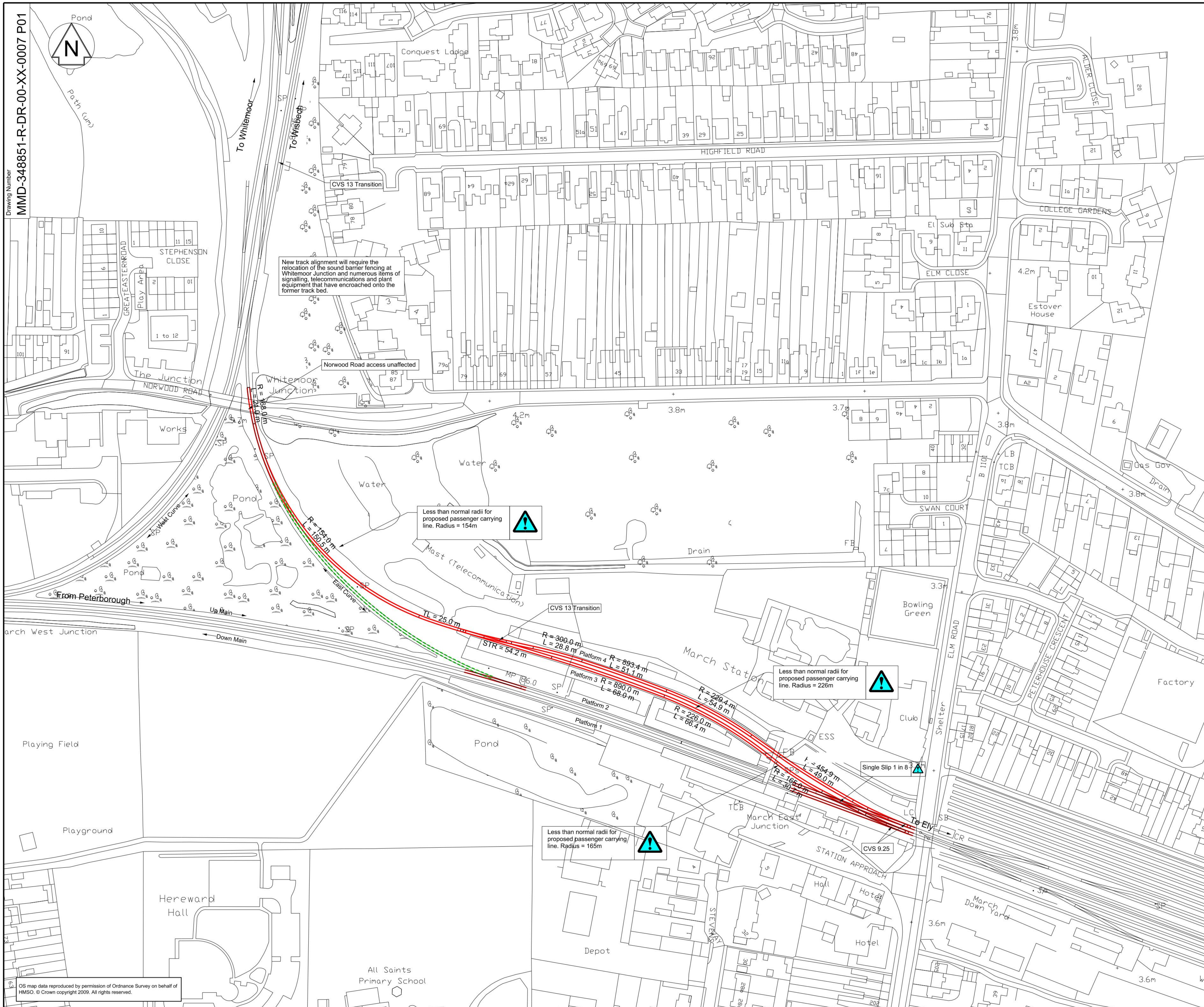
Alternative Reference

Sheet: 1 of 1

Drawing Number: MMD-348851-Working 15

Revision

Sheet Size A1 594 x 841



Legend/Notes

Key

- Rail - proposed
- Rail - existing
- Rail - to be removed
- Existing Platform

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
-	30/06/15	Working	-	-	-

Status

Working

Cambridgeshire County Council

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Project

March to Wisbech
Rail Reopening
GRIP 3

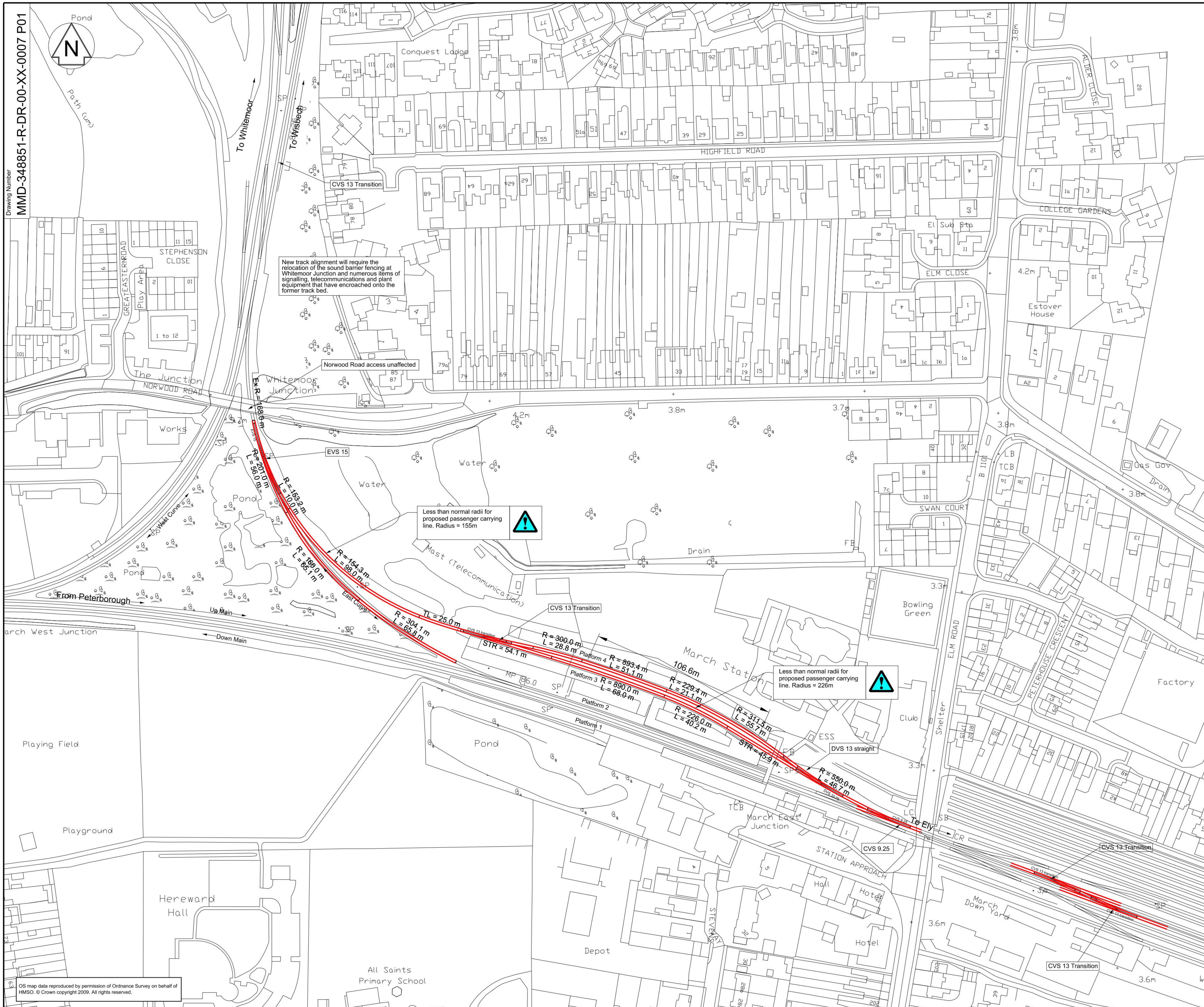
Drawing Title

March Station Layout
Option 4 A
Two New Through Platforms

Designed	M. Urban	Signed		Date	23/07/19
Drawn	-	Signed		Date	-
Checked	-	Signed		Date	-
Approved	-	Signed		Date	-
Scale(s)	1:1000 @ A1	ELR & Mileage	ELR & Mileage		
Alternative Reference				Sheet	1 of 1
Drawing Number	MMD-34885_Working 2			Revision	

Sheet Size A1 594 x 841

Drawing Number
MMD-348851-R-DR-00-XX-0007 P01



Legend/Notes

Key

- Rail - proposed
- Rail - existing
- Rail - to be removed
- Existing Platform

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
.	.	Working	.	.	.

Status

Working

Cambridgeshire County Council

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Project

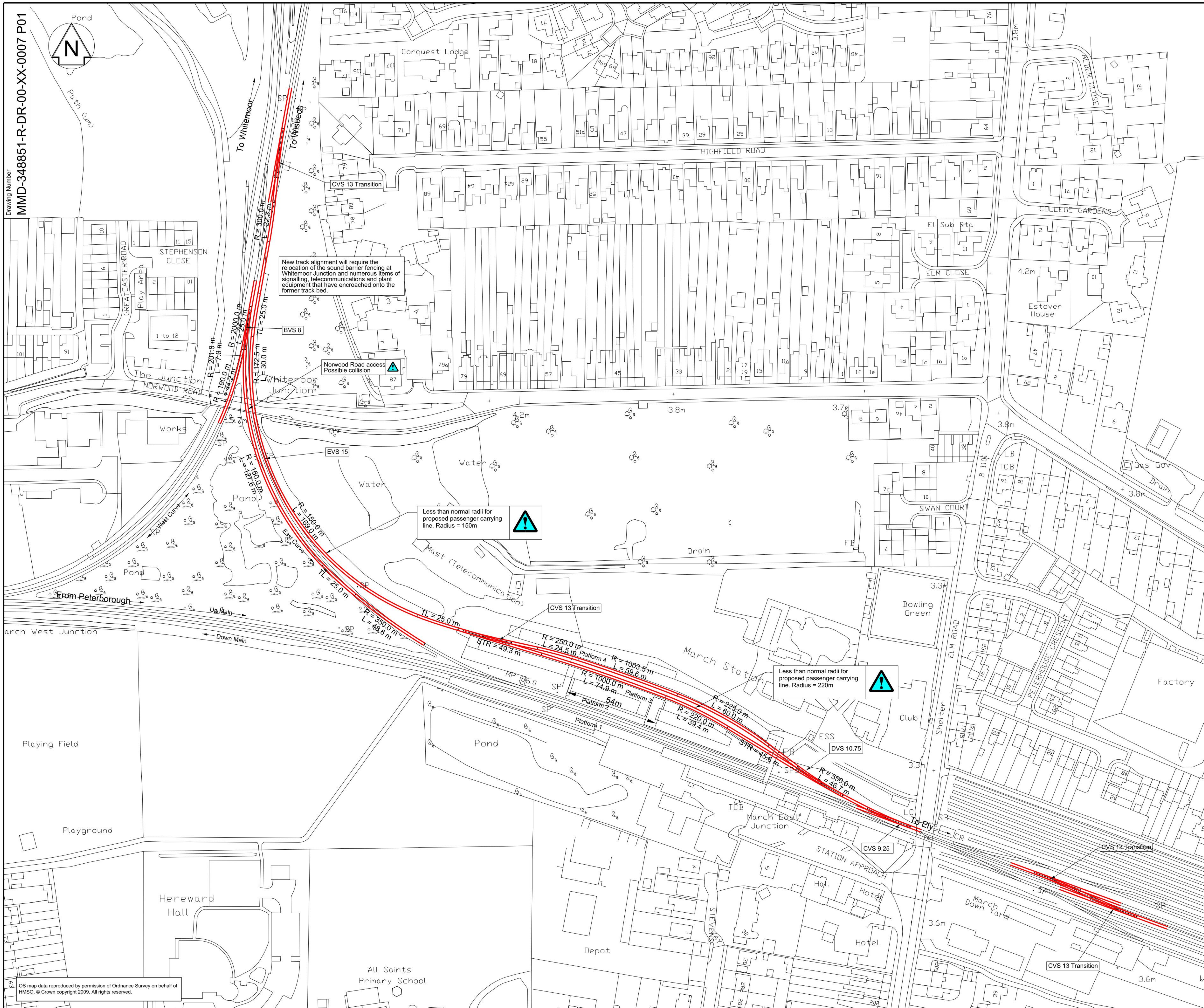
March to Wisbech
Rail Reopening
GRIP 3

Drawing Title

March Station Layout
Option 5 A
Two New Through Platforms

Designed M. Urban	Signed	Date 30/07/19	
Drawn .	Signed	Date .	
Checked .	Signed	Date .	
Approved .	Signed	Date .	
Scale(s) 1:1000 @ A1	ELR & Mileage ELR & Mileage		
Alternative Reference		Sheet 1 of 1	
Drawing Number MMD-34885_Working 13		Revision	

Sheet Size A1 594 x 841



Legend/Notes

Key

- Rail - proposed
- Rail - existing
- Rail - to be removed
- Existing Platform

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
-	-	Working	-	-	-

Status
Working

Cambridgeshire County Council

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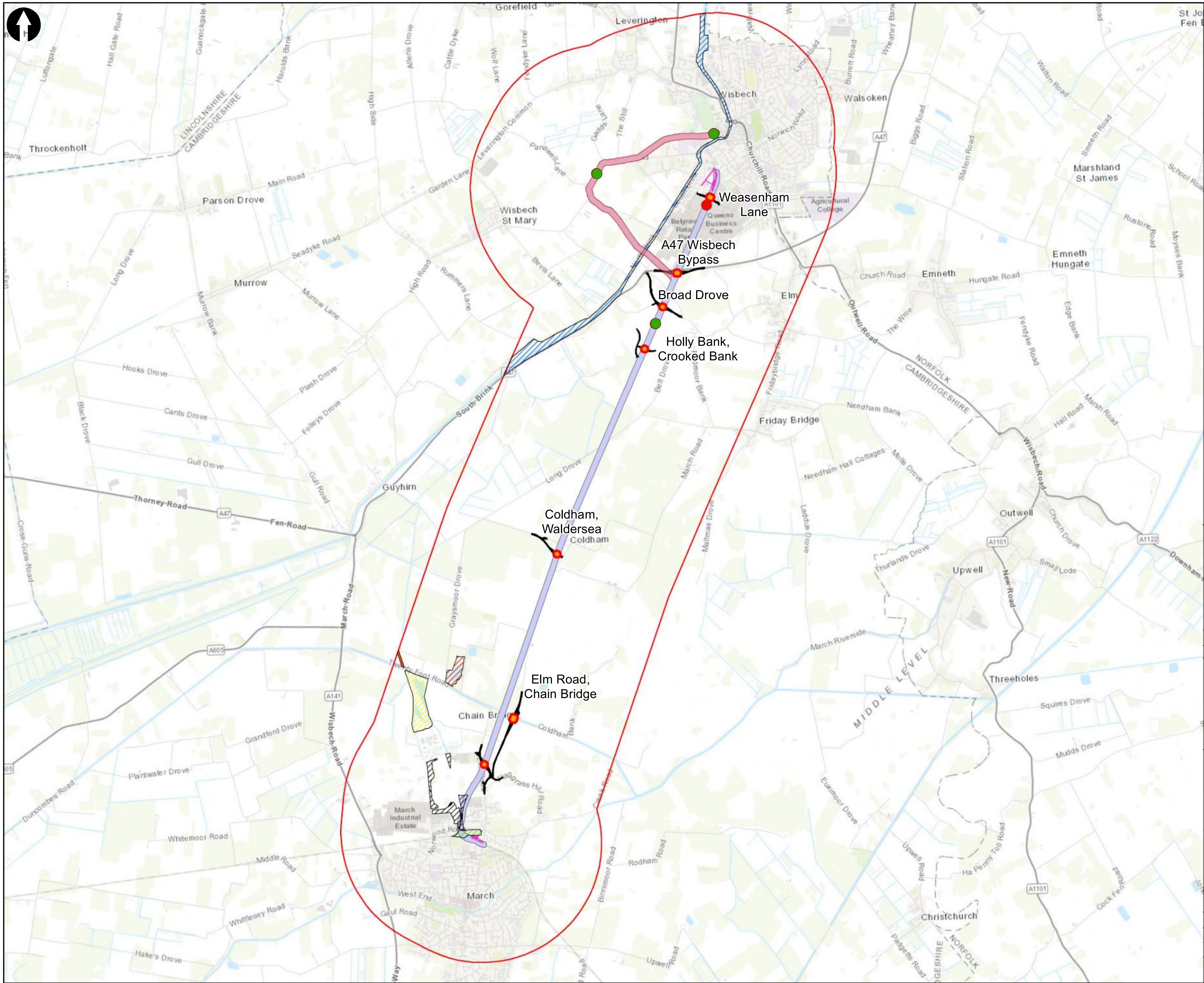
Project
March to Wisbech
Rail Reopening
GRIP 3

Drawing Title
March Station Layout
Option 5 B
Two New Through Platforms

Designed M. Urban	Signed	Date 01/08/19	
Drawn	Signed	Date	
Checked	Signed	Date	
Approved	Signed	Date	
Scale(s) 1:1000 @ A1	ELR & Mileage ELR & Mileage		
Alternative Reference		Sheet 1 of 1	
Drawing Number MMD-34885_Working 16		Revision	

Sheet Size A1 594 x 841

O. Environmental Constraints Mapping



Location Map

Key to Symbols

Legend

- Ring's End Local Nature Reserve
- Graysmoor Pit
- Norwood Nature Reserve
- River Nene
- Whitemoor Marshalling Yard
- Whitemoor Pit and Nature Reserve
- Proposed Rail Alignment (50m)
- Proposed station site
- Alternative Tram-Train Alignment (50m)
- Alternative station site
- Road Diversions and Bridges
- Bridge 50m
- Car Parks
- 2km Buffer

Notes

Rev	Date	Drawn	Description	Ch'k'd	App'd
02	06/03/20	KV	For information	NW	KG

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Client

CAMBRIDGESHIRE & PETERBOROUGH COMBINED AUTHORITY

Title

March to Wisbech
Ecological Constraints
Designated Sites of Nature Conservation

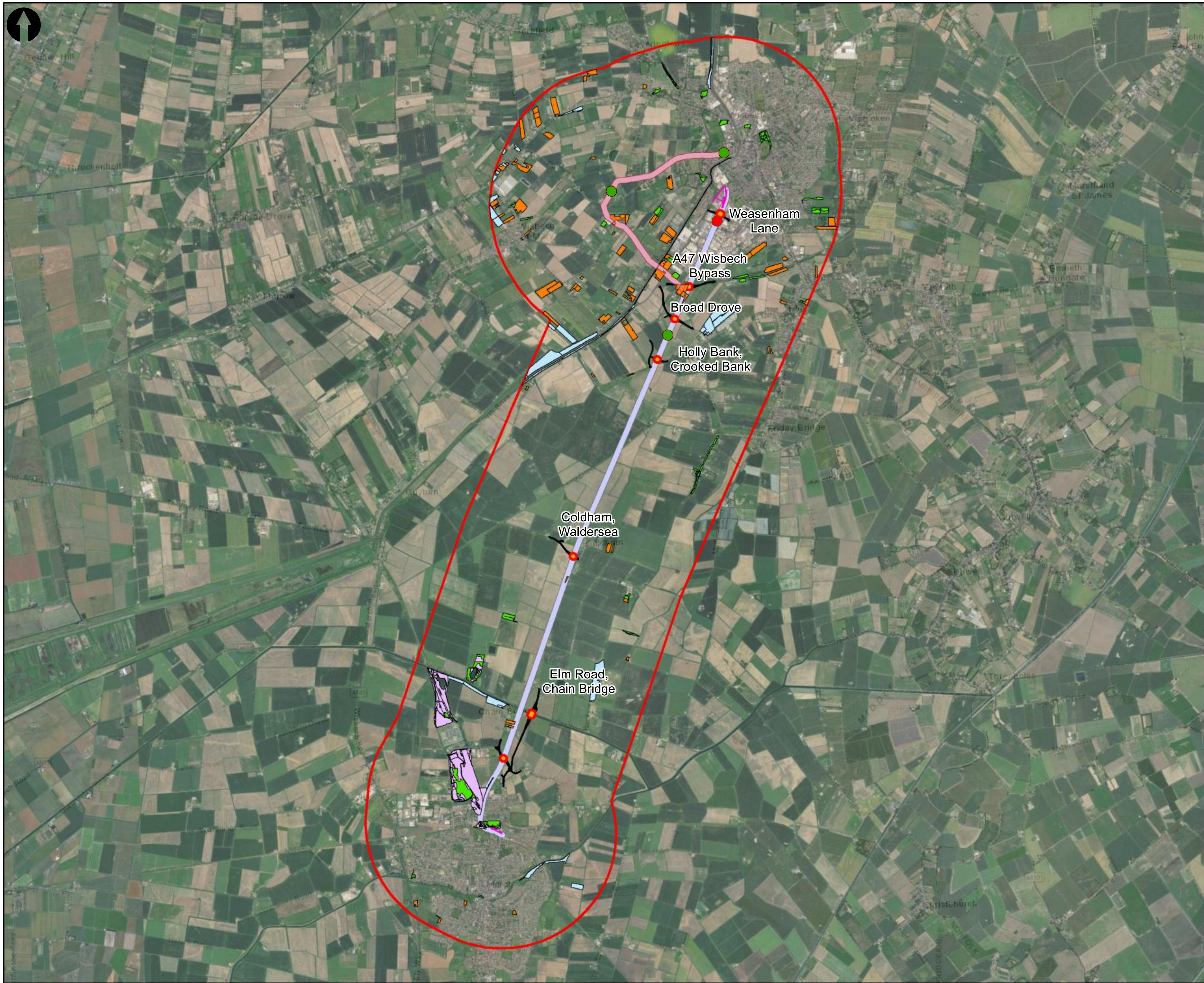
Designed	-	Eng Check	-
Drawn	K McConnell	Coordination	K Gareau
GIS Check	-	Approved	xx

Scale at A3	Status	Rev	Security
1:60,000	PRE	02	STD

0 1 2 4 Kilometres

Drawing Number
Appendix A

C:\Users\MCC86429\Desktop\Wisbech to March\MarchToWisbech_SchemeOverview 10.6.a - CWS and Stat Sites.mxd



Location Map

Key to Symbols

Legend

- Coastal and floodplain grazing marsh
- Deciduous woodland
- Lowland fens
- Traditional orchard
- Proposed Rail Alignment (50m)
- Proposed station site
- Alternative Tram-Train Alignment (50m)
- Alternative station site
- Road Diversions and Bridges
- Bridge 50m
- Car Parks
- 2km Buffer

Notes

Rev	Date	Drawn	Description	Ch'k'd	App'd
02	06/03/20	KMc	For information	BE	KG

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Client

CAMBRIDGESHIRE & PETERBOROUGH COMBINED AUTHORITY

Title

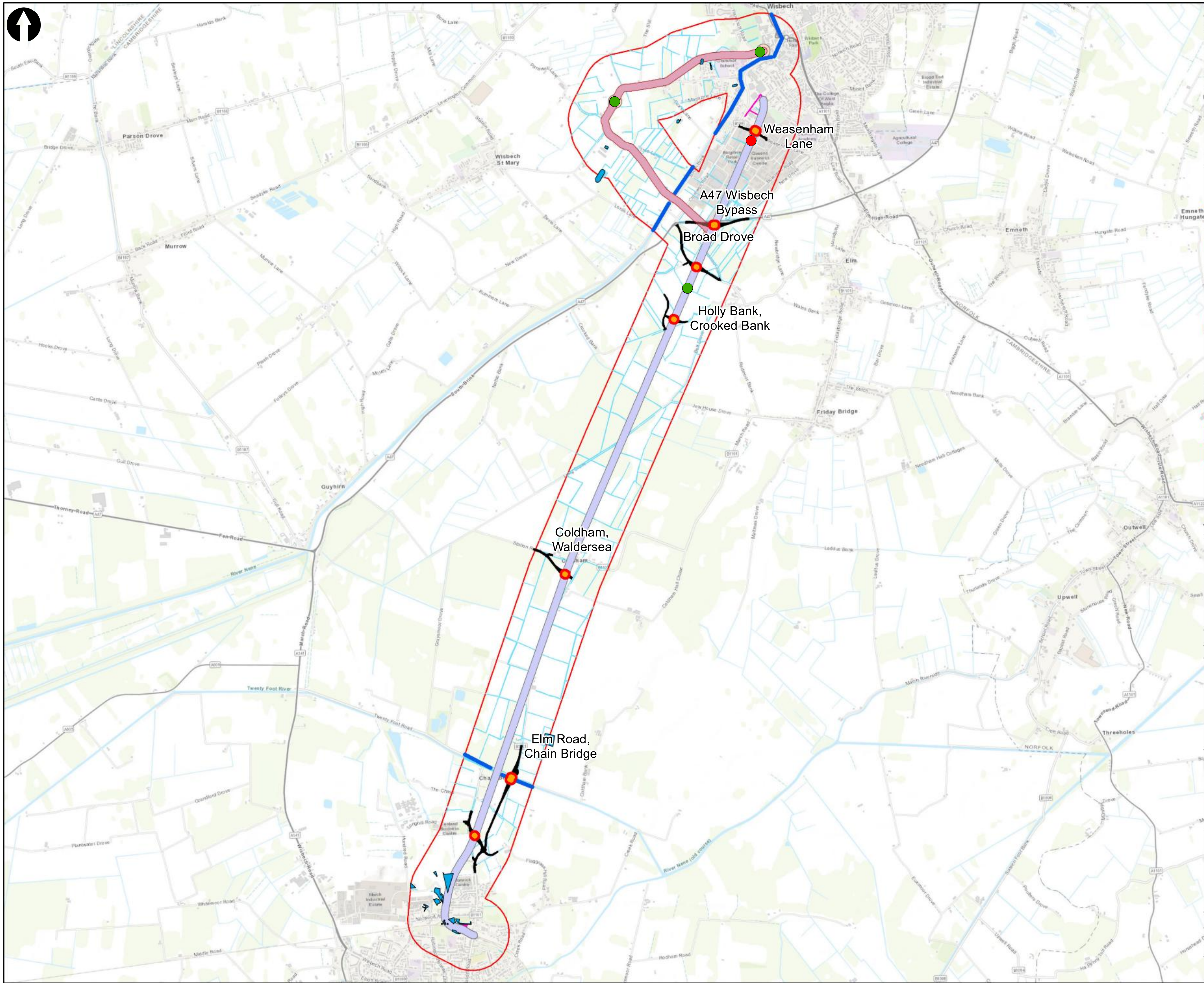
March to Wisbech
Environmental Constraints
Project Overview

Designed	-	Eng Check	-
Drawn	KMc	Coordination	
GIS Check	-	Approved	KG

Scale at A3	Status	Rev	Security
1:62,500	PRE	02	STD

Drawing Number
Appendix B

C:\Users\MCC86429\Desktop\Wisbech to March\MarchToWisbech_SchemeOverview 10.6 - Priority Habitats.mxd



Location Map

Key to Symbols

Legend

- Rivers
- Field Drains
- Ponds
- Proposed Rail Alignment (50m)
- Proposed station site
- Alternative Tram-Train Alignment (50m)
- Alternative station site
- Road Diversions and Bridges
- Car Parks
- Bridge 50m
- 500m Buffer

Notes

Rev	Date	Drawn	Description	Ch'k'd	App'd
02	06/03/20	KMc	For information	BE	KG

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Client

CAMBRIDGESHIRE & PETERBOROUGH COMBINED AUTHORITY

Title

March to Wisbech
Ecological Constraints
Waterbody Locations

Designed	-	Eng Check	-
Drawn	K McConnell	Coordination	-
GIS Check	B Ellis	Approved	xx

Scale at A3	Status	Rev	Security
1:48,287	PRE	02	STD

Drawing Number
Appendix C

C:\Users\MCC86429\Desktop\Wisbech to March\MarchToWisbech_SchemeOverview 10.6.a - Waterbody Location.mxd

P. Road Safety Audit

March to Wisbech Transport Corridor - Scheme 1

Elm Road, B1101, Flaggrass Hill Road

31 January 2020

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March to Wisbech Transport Corridor - Scheme 1

Elm Road, B1101, Flaggrass Hill Road

31 January 2020

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	31/01/2020	B A Pledge	M D Lewis	S A Finney	First Issue

Document reference: 406395CJ | TPN | ITD | 072 | A

Information class: Standard

Contents

1 Introduction

This report describes a Stage 1 Road Safety Audit undertaken on a proposal to provide grade separation between the highway and railway at Elm Road level crossing, north of March, in Cambridgeshire.

The Road Safety Audit has been carried out at the request of Mott MacDonald (the Design Organisation) on behalf of their client, Cambridgeshire County Council, who are the local highway authority (the Overseeing Organisation).

The Road Safety Audit Brief was provided by the Design Engineer, Naomi Ward, on 09/01/2020 (Document reference: 398128-MMD-00-XX-SP-H-0001). This was approved by James Eagle, Cambridgeshire County Council, representing the Overseeing Organisation.

The Audit Team Membership was as follows:

Matthew Lewis	BEng (Hons), CEng, MICE, FCIHT, MSoRSA Audit Team Leader, Mott MacDonald ITD *(Holder of a Certificate of Competency in Road Safety Audit)*
Barry Pledge	MCIHT, MSoRSA Audit Team Member, Mott MacDonald ITD *(Holder of a Certificate of Competency in Road Safety Audit)*
Tara Lowe	Audit Team Observer, Cambridgeshire County Council

It is confirmed that this Stage 1 Road Safety Audit has been undertaken upon completion of the preliminary design work. It is understood that no previous Road Safety Audits have been undertaken in connection with this scheme.

The Road Safety Audit took place at the Southampton office of Mott MacDonald during January 2020, and comprised an examination of the submitted documentation and drawings listed in **Appendix A**.

The Audit Team visited the site of the proposed works together on Tuesday 14th January 2020 between 14:00 and 15:00hrs. During the visits, the weather was overcast with intermittent rain showers, and the road surface was damp / wet. Traffic conditions on the B1101 Elm Road were light. There was little or no pedestrian / cycling activity.

The terms of reference for this Road Safety Audit are the Highways England departmental standard DMRB GG 119 Road Safety Audit. The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria.

The comments and suggestions for road safety improvements made in this report seek to address matters that might have an adverse effect on road safety in the context of the chosen design. No attempt has been made to comment on the justification of the scheme. Consequently, the auditors accept no responsibility for the design or construction of this scheme.

All of the issues raised in this report are considered to be required for action. The comments contained in the report are based on safety related concerns and as such the design engineer will need to consider carefully how to respond to each of the issues.

A Road Safety Audit Response Report should be produced collaboratively by the Design Organisation and the Overseeing Organisation and kept on file for future reference (refer to DMRB GG 119, Chapter 4.11 to 4.19 and Appendix F). The response report should be produced and finalised within one month of the issue of the RSA report. A copy of the final response report should be issued to the Audit Team for information.

Reference key plans showing the general scheme layout is provided in **Appendix B**.

General description

The March to Wisbech Rail Reopening project, commissioned by the Cambridgeshire & Peterborough Combined Authority, aims to re-open the 12km long rail line between March and Wisbech to improve connectivity and drive growth in the area.

As part of the works to re-open the rail line, all twenty-two existing level crossings are to be closed and replaced with six bridges over the railway line, divided into five highway scheme projects.

B1101 Re-alignment and Twenty Foot River Bridge

A new alignment for the B1101 is proposed between Manor Farm, on the north bank of Twenty Foot River, and the junction between Elm Road and Flaggrass Hill Road in March. The new highway alignment includes a new highway bridge over Twenty Foot River, to the east of the rail bridge over the river. The approach ramps to the bridge are formed from earthworks constructed from class 1 and lightweight fill with vertical band drains to a depth of 10m. The construction of swales and drainage ditches also form part of the works at this location.

South of the river, there is a junction between the B1101, Elm Road (de-classified from a B-road north of the roundabout) and Flaggrass Hill Road.

Elm Road and Flaggrass Hill Road

A new alignment is proposed for B1101 Elm Road, diverging from its current alignment at the junction with Flaggrass Hill Road and connecting into a roundabout. North of the roundabout, a new alignment is proposed for the B1101, so Elm Road is declassified from this point and a new highway bridge over the rail line is proposed to replace the existing Elm Road level crossing. The approach ramps to the bridge are formed from earthworks constructed from class 1 and lightweight fill with vertical band drains to a depth of 10m. The construction of swales and drainage ditches also form part of the works at this location.

Factors affecting road safety

The following Departures from Standard (Derogations) are listed in the March to Wisbech Transport Corridor GRIP 3 Heavy Rail Multi-Disciplinary Option Selection Report (Doc. ref. 398128 | 009 | A) for Scheme 1.

Scheme 1 - Section 2 On Elm Road (south) the SSD is One step below the desirable minimum. of 90m on the approach to the junction with Elm Road Spur, which is a departure from the standard. Scope to change the alignment within the existing design is limited by existing road geometry.

Scheme 1 - Section 2 On the proposed B1101, crest and sag K values and SSD are One step below the desirable minimum, which is a departure from standard.

Collision data analysis

The most recent five-year collision record has been provided by Cambridgeshire County Council. This is summarised as follows:

> *“There have been 9 recorded collisions in the most recent full five-year period (01/01/2014-31/12/2019), 8 slights and 1 serious.*
>
> *B1101 Elm Road Junction with Marwick Road: Two slight collisions. Both were during daylight in the afternoon when the weather was fine and the road surface was dry on 04/11/2016 and 13/06/2016.*
>
> *B1101 Elm Rd Junction Flagrass Hill March: one slight during daylight in the morning when the weather was fine and the road surface was dry on 26/09/2014*
>
> *Longhill Road - Near Junction with Elm Road (B1101): two slights: one was slight during daylight in the morning when the weather was fine but the road surface was wet on 22/10/2016. Another one was daylight in the morning when it was raining and road surface was wet road 11/06/2019,*
>
> *B1101 Elm Road at Jn with Twenty Foot Road: Three collisions: 2 slight and 1 serious. Both slight ones were in the daylight in the morning and the weather was fine one was in dry road surface while the other one was on wet road surface on 29/01/2016 and 30/09/2019, respectively. The serious one was daylight in the afternoon when the weather was fine and the road surface was dry on 17/06/2017.*
>
> *B1101 Coldham Road Coldham Bank: one slight collision which happened during darkness with no street lighting and when it was raining and the road surface was wet on 21/11/2016.”*

2 Items Raised at this Stage 1 Audit

This section describes the road safety related issues identified by the Audit Team during this Stage 1 Road Safety Audit. A reference key plan showing the locations of each identified issue is shown at **Appendix B**.

2.1 Problem 001

Location: *Elm Road Spur. Drawing Number: 398128-MMD-00-XX-DR-H-0103*

Summary: *Width of bellmouth across junction and difficultly for pedestrians crossing at this location.*

The Elm Road Spur connection onto the re-aligned B1101 Elm Road South results in a wide bellmouth junction, with footways provided on either side. It is likely that there will be a desire line across the widest part of the junction (in a general north-south alignment) that pedestrians will have to negotiate in one crossing movement. There are no pedestrian crossing facilities shown at this stage of the design.

Whilst it is acknowledged that this is at the end of the urban fringe, vulnerable road users, particularly the elderly, could experience difficulty in crossing at this location. This may result in an increased risk of collisions between pedestrians and vehicles.

Recommendation

It is recommended that a formalised crossing point is provided on the desire line with a traffic / pedestrian refuge island. This may aid both crossing movements across the junction, but also mitigate vehicle entry / exit speeds from the junction.

2.2 Problem 002

Location: *New Flaggrass Hill Road. Drawing Number: 398128-MMD-00-XX-DR-H-0102.*

Summary: *Lack of footway continuity, resulting in pedestrians walking in the verge or highway.*

There is a footway shown on the southern side of the new Flaggrass Hill Road between the Elm Road Roundabout and the western extents. The proposals do not indicate whether any new footways / footway connections will be provided beyond the scheme extents.

This may lead to pedestrians having to walk in the carriageway or along verges, where the footway terminates. There is a risk of pedestrian injury from collisions with vehicles and trips, slips and falls.

Recommendation

It is recommended that the tie-in for the footway extends westwards sufficiently along Flaggrass Hill Road to at least the next property (understood to be the Cambridgeshire Canine Creche).

2.3 Problem 003

Location: *Elm Road Roundabout, northern quadrant. Drawing Number: 398128-MMD-00-XX-DR-H-0102.*

Summary: *Closely spaced roundabout entry / exit arms.*

The Audit Team is of the opinion that the arms on the northern side of the roundabout (for Elm Road (North) and the B1101) are too closely spaced.

Drivers on Elm Road (North) waiting to enter the roundabout may be unclear as to the intention of other motorists exiting from the circulatory roundabout.

This may increase the risk of driver hesitation, late braking and manoeuvres causing subsequent side impact collisions on the roundabout.

Recommendation

It is recommended that the connecting arms for Elm Road (North) and the B1101 are realigned such that the entry / exit points are further away from each other.

2.4 Problem 004

Location: *Elm Road (to be stopped up), at existing railway level crossing. Drawing Number: 398128-MMD-00-XX-DR-H-0101.*

Summary: *Absence of turning facilities for vehicles.*

The proposals show the stopping up and closure of Elm Road on both sides of the existing Railway Level Crossing.

However, the proposals do not include any provision to enable vehicles to turn around safely at the terminations of Elm Road where it is stopped up. This is likely to result in collisions and conflict between vehicles and roadside items, particularly when larger vehicles undertake these manoeuvres.

Recommendation

It is recommended that turning heads are provided on either side of Elm Road, where it is proposed to be stopped up.

2.5 Problem 005

Location: *Elm Road Roundabout, various locations.*

Summary: *Provision of road lighting.*

It is understood that Elm Road Roundabout will be is subject to a 30mph speed limit and there is currently street lighting from its junction with Flaggrass Hill Road to the north. It is not clear from the proposals as to whether road lighting will be provided on the new sections of the scheme.

The Audit Team is of the opinion that the absence of road lighting may diminish the effectiveness of road users (drivers) to appreciate the presence of the roundabout junction, resulting in high approach speeds and an increase in collisions, particularly at night.

Recommendation

It is recommended that the roundabout is street lit, following a review of lighting requirements.

2.6 Problem 006

Location: *B1101, north of March. Drawing number: 398128-MMD-00-XX-DR-H-0106.*

Summary: *Alignment and vehicle speeds.*

On the proposed new alignment, north of March, the horizontal alignment of the B1101 is particularly straight between approximate Chainage 325m and Chainage 1200.

Given the sinuous rural alignment of the B1101, north of Twenty Foot River, the Audit Team is concerned that speeds on this straight section may be significantly higher, potentially leading to loss of control collisions.

Recommendation

It is recommended that the alignment is reviewed, and additional mitigating measures identified to reduce the risk of high-speed loss of control collisions.

2.7 Problem 007

Location: *B1101 – junction with Elm Tree Farm. Drawing number: 398128-MMD-00-XX-DR-H-0111.*

Summary: *Provision for right-turning vehicles.*

The proposals include a new access to Elm Tree Farm on the western side of the B1101, at approximate Chainage 540m.

Allied to **Problem 006** above, the Audit Team is concerned that vehicles waiting to turn right into Elm Tree Farm (albeit periodically) may be prone to shunt type accidents from traffic approaching, at speed, from the north. This is accentuated by the Departure from Standard where crest and sag K values and SSD are one-step below the desirable minimum. This limits the extent of forward visibility to stationary vehicles waiting to turn at this location

Recommendation

It is recommended that a right turn facility is provided for Elm Tree Farm.

2.8 Problem 008

Location: *B1101, north of March. Drawing number: 398128-MMD-00-XX-DR-H-0111.*

Summary: *Propensity for overtaking manoeuvres.*

The Audit Team consider that on the straight section of the B1101, north of March, there is likely to be a tendency for overtaking manoeuvres to occur.

The combination of crest and sag K values and SSD to one-step below desirable minimum is likely to make such manoeuvres particularly hazardous.

There is also the side road junction, located on the eastern side of the B1101, immediately north of Twenty Foot River.

Recommendation

It is recommended that the design is reviewed to amend the vertical profile such that appropriate forward visibility is provided.

2.9 Problem 009

Location: *Junction of Twenty Foot Road and B1101. Drawing number 398128-MMd-00-XX-DR-H-0112*

Summary: *Potential for drivers to fail to appreciate revised layout.*

The proposals show the tie in of Twenty Foot Road and the re-aligned B1101. The stopping up of the old B1101, east of the new alignment, may well lead to the drivers perceiving that the alignment continues to the east, particularly at night or in poor weather conditions. This has the potential to result in either loss of control collisions or vehicles overshooting.

Recommendation

It is recommended that additional measures are introduced to reduce vehicle speeds on the eastbound carriageway and to warn of the presence of the change in alignment ahead.

The stopped-up section of the B1101 should be sufficiently landscaped so as not to provide a visual cue to road users of the old alignment ahead.

3 Audit Team Statement

We certify that this audit has been carried out in accordance with Highway England standard DMRB GG 119.

Road Safety Audit Team Leader

M D Lewis BEng (Hons), CEng, MICE, FCIHT, MSoRSA Signed: [redacted]

Certificate of Competency in Road Safety Audit, gained in May 2011

Mott MacDonald - Integrated Transport Division Date: 31st January 2020
Technical Specialist
Integrated Transport Division (South and Wales)
Stoneham Place
Stoneham Lane
Southampton
SO50 9NW

Road Safety Audit Team Member

B A Pledge MCIHT, MSoRSA Signed: [redacted]

Certificate of Competency in Road Safety Audit, gained in Sep 2012

Mott MacDonald - Integrated Transport Division Date: 31st January 2020
Senior Road Safety Engineer
Integrated Transport Division (South and Wales)
Stoneham Place
Stoneham Lane
Southampton
SO50 9NW

Other Involved

(Such as an observer, Police/Network Management representative or specialist advisor)

Tara Lowe Audit Team Observer, Cambridgeshire County Council

Appendices

A. Drawings and Documents Examined

The following drawings and documents were provided and examined as part of this Road Safety Audit.

A.1 Drawings

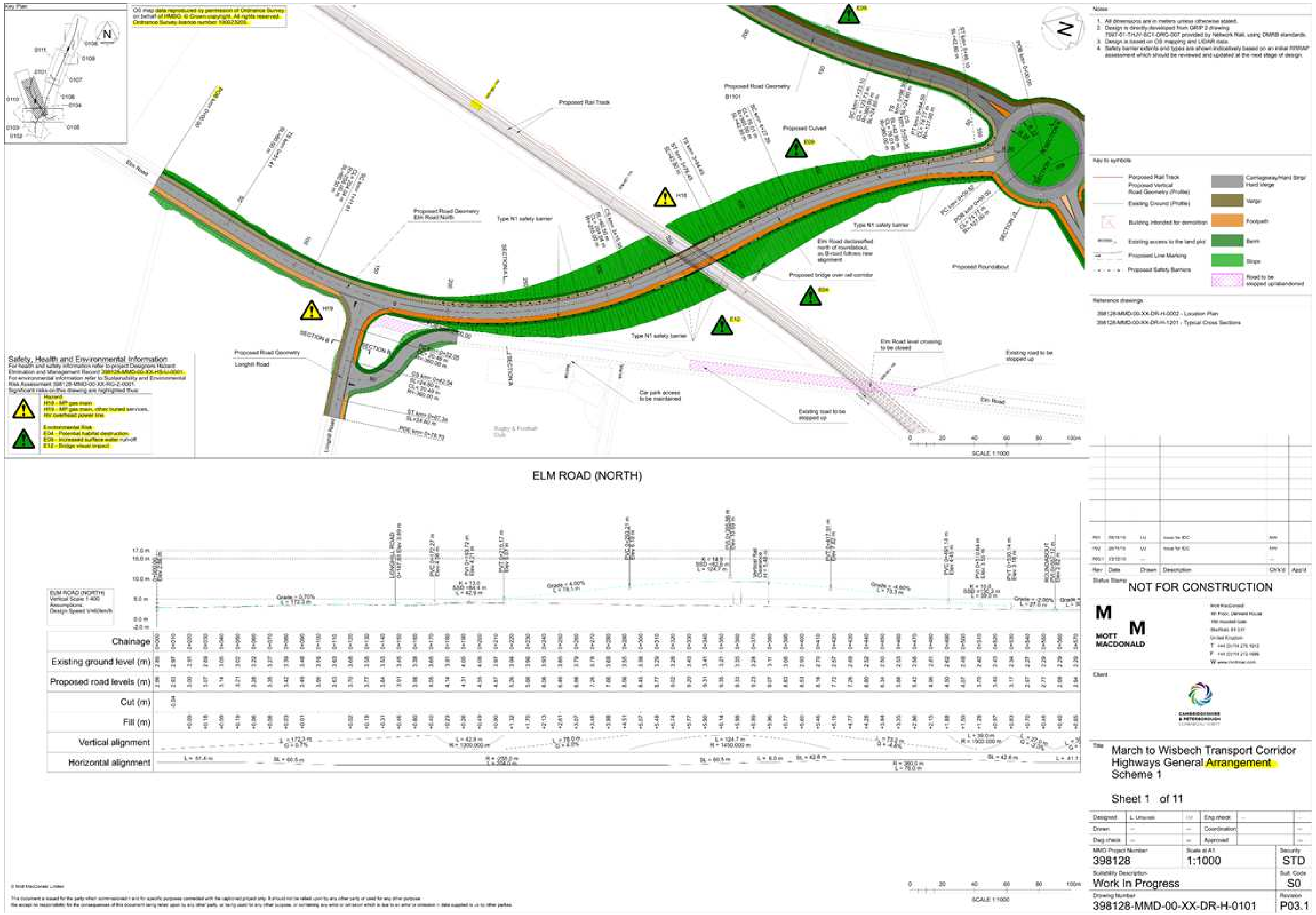
Drawing number	Rev	Drawing title
398128-MMD-00XX-DR-H-0101	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0102	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0103	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0104	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0105	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0106	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0107	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0108	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0109	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0110	P03	Highways General Arrangement – Scheme 1
398128-MMD-00XX-DR-H-0111	P03	Highways General Arrangement – Scheme 1
398128-MMD-00-XX-DR-H-1001	P02	March Station
398128-MMD-00XX-DR-H-1201	P03	Highways Typical Cross Sections
398128-MMD-00XX-DR-H-1202	P03	Highways Typical Cross Sections

A.2 Documents

Document number	Rev	Document title
398128-MMD-00-XX-SP-H-0001	-	Road Safety Audit Brief (09/01/2020)
-	-	Railway plan collision data (plan 072, 073, 074, 075 and 076)

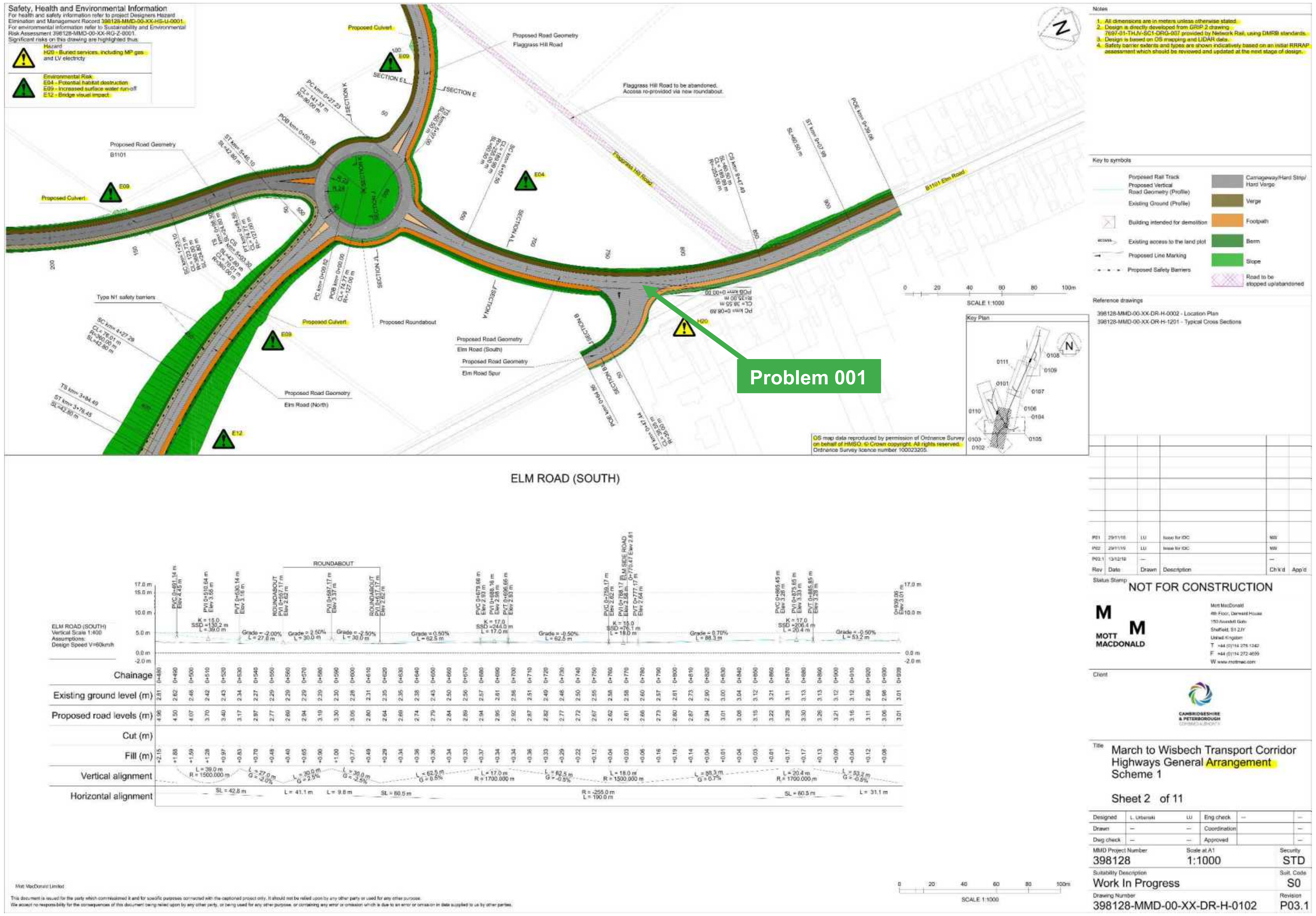
B. Reference Key Plans

B.1 Figure: Plan Sheet 1 of 11



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0101_P03 (Not to scale)

B.2 Figure: Key Plan Sheet 2 of 11



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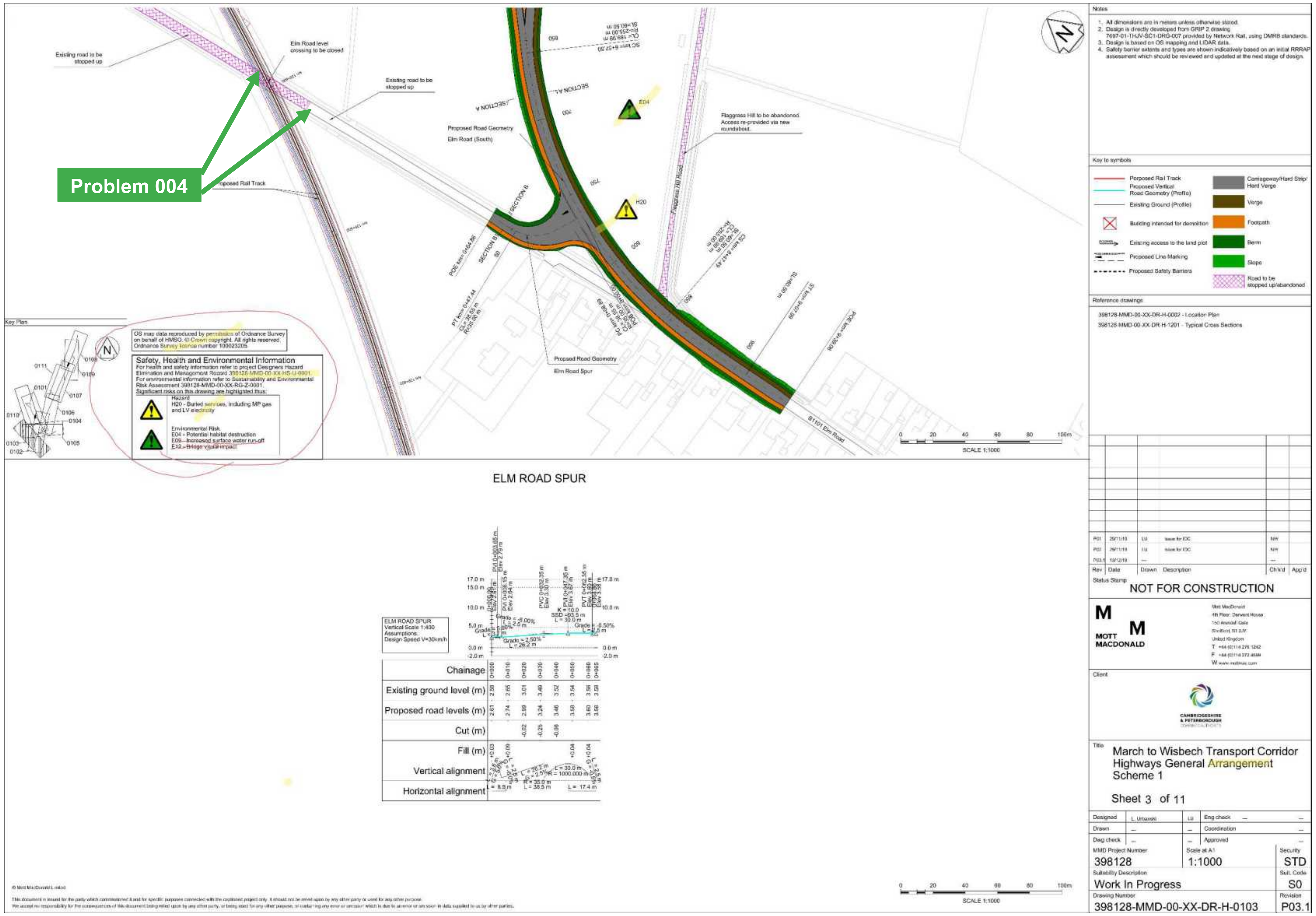
B.3 Figure: Plan Sheet 3 of 11



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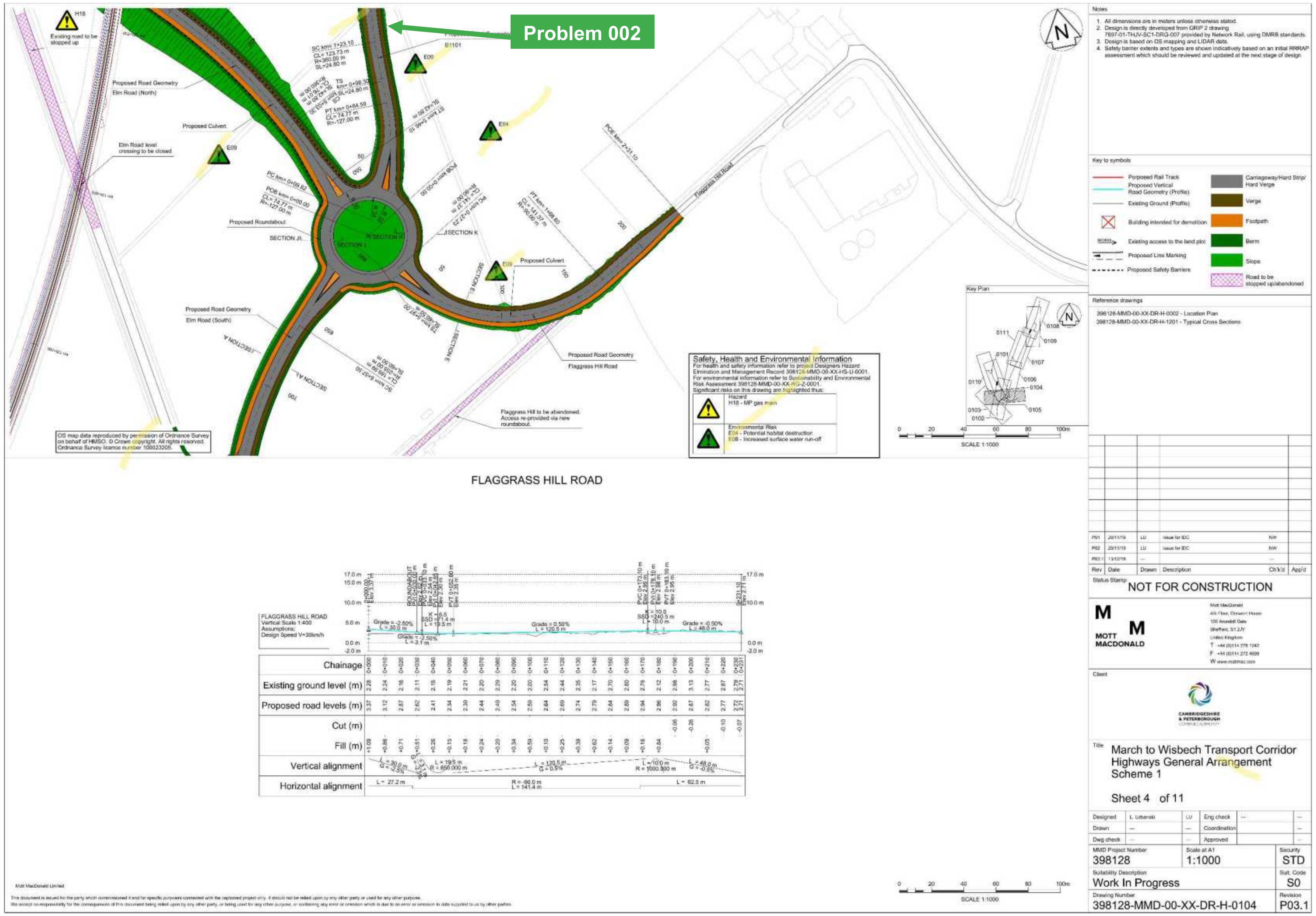
B.4 Figure: Sheet 4 of 11



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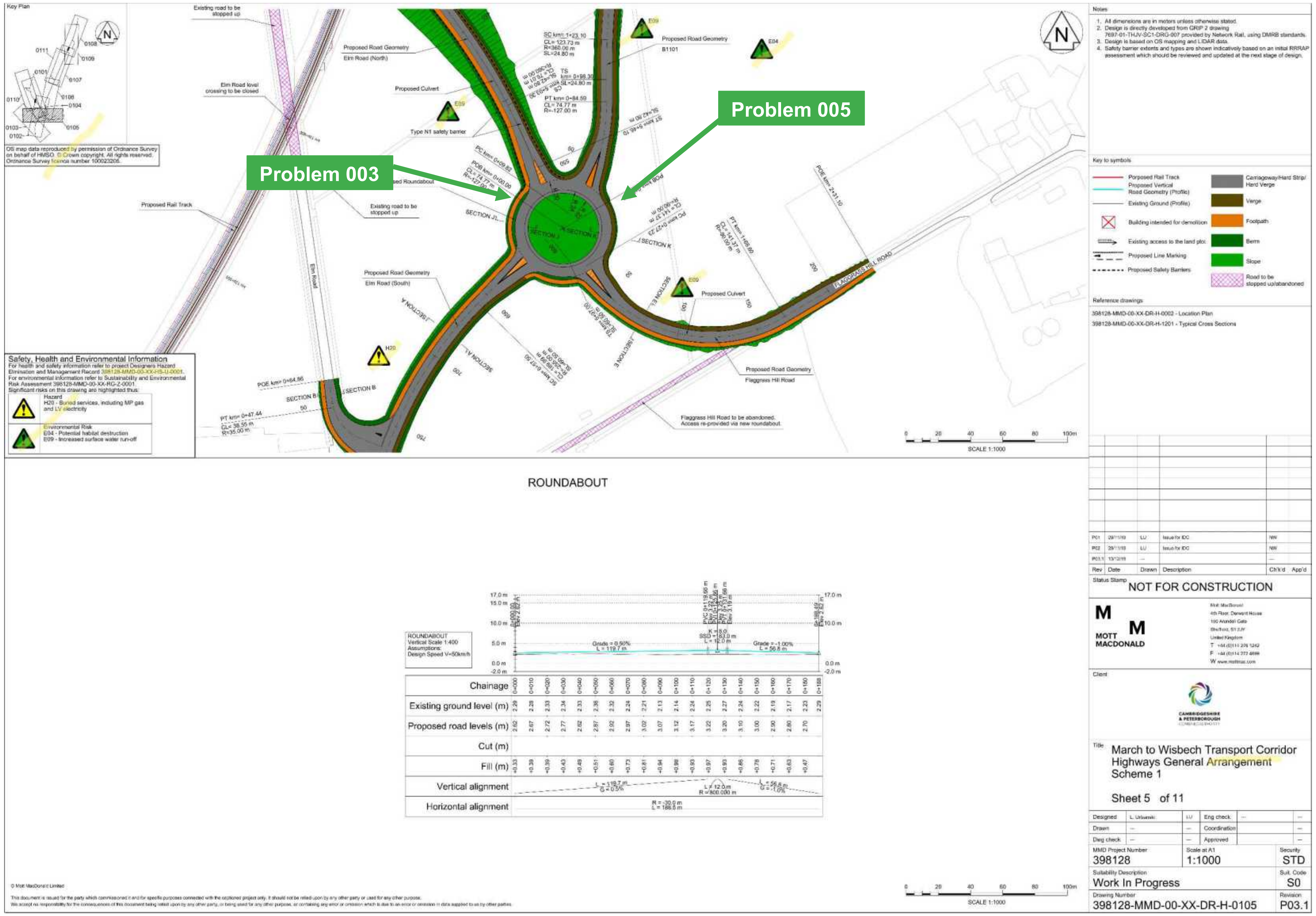
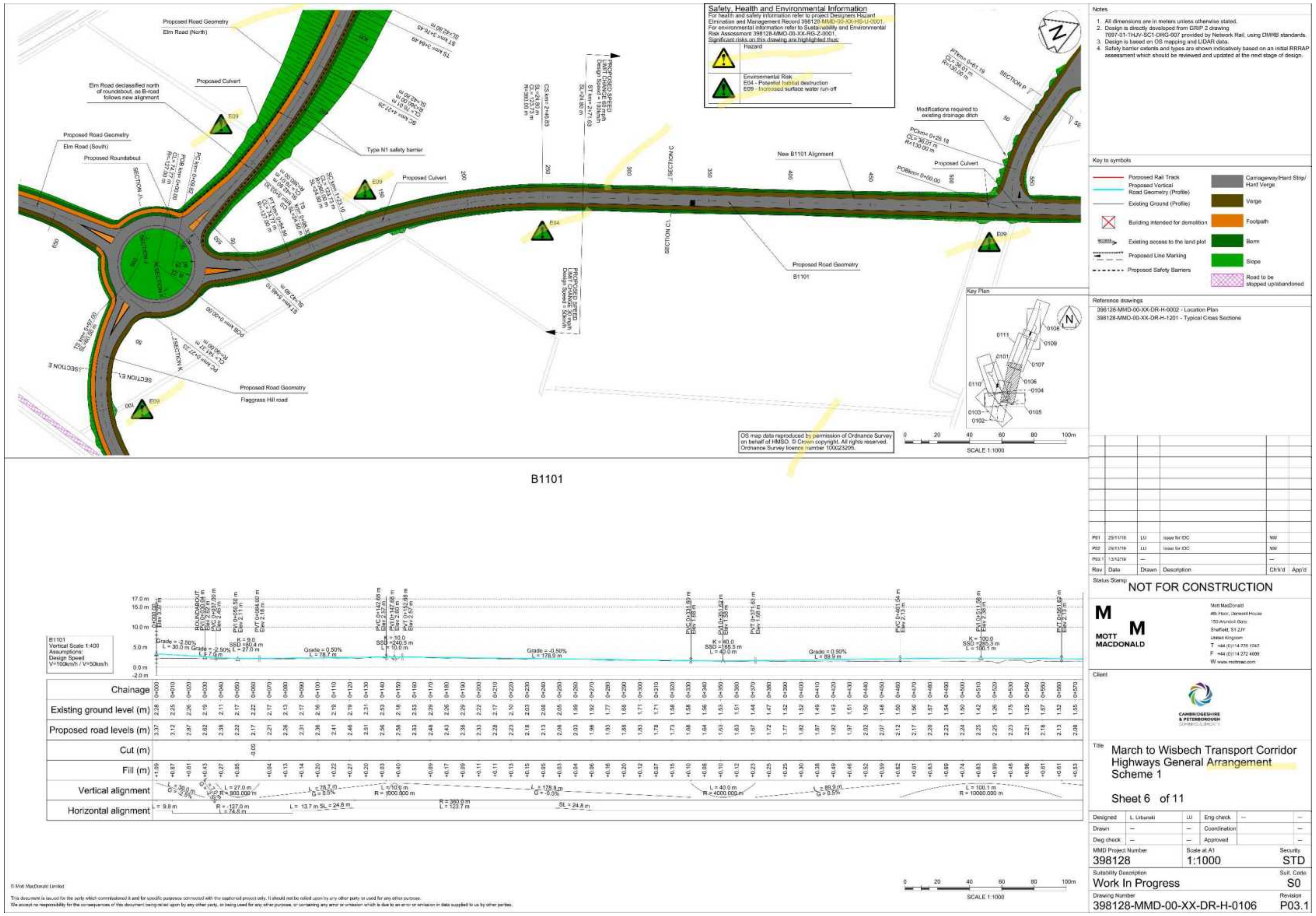
B.5 Figure: Sheet 5 of 11



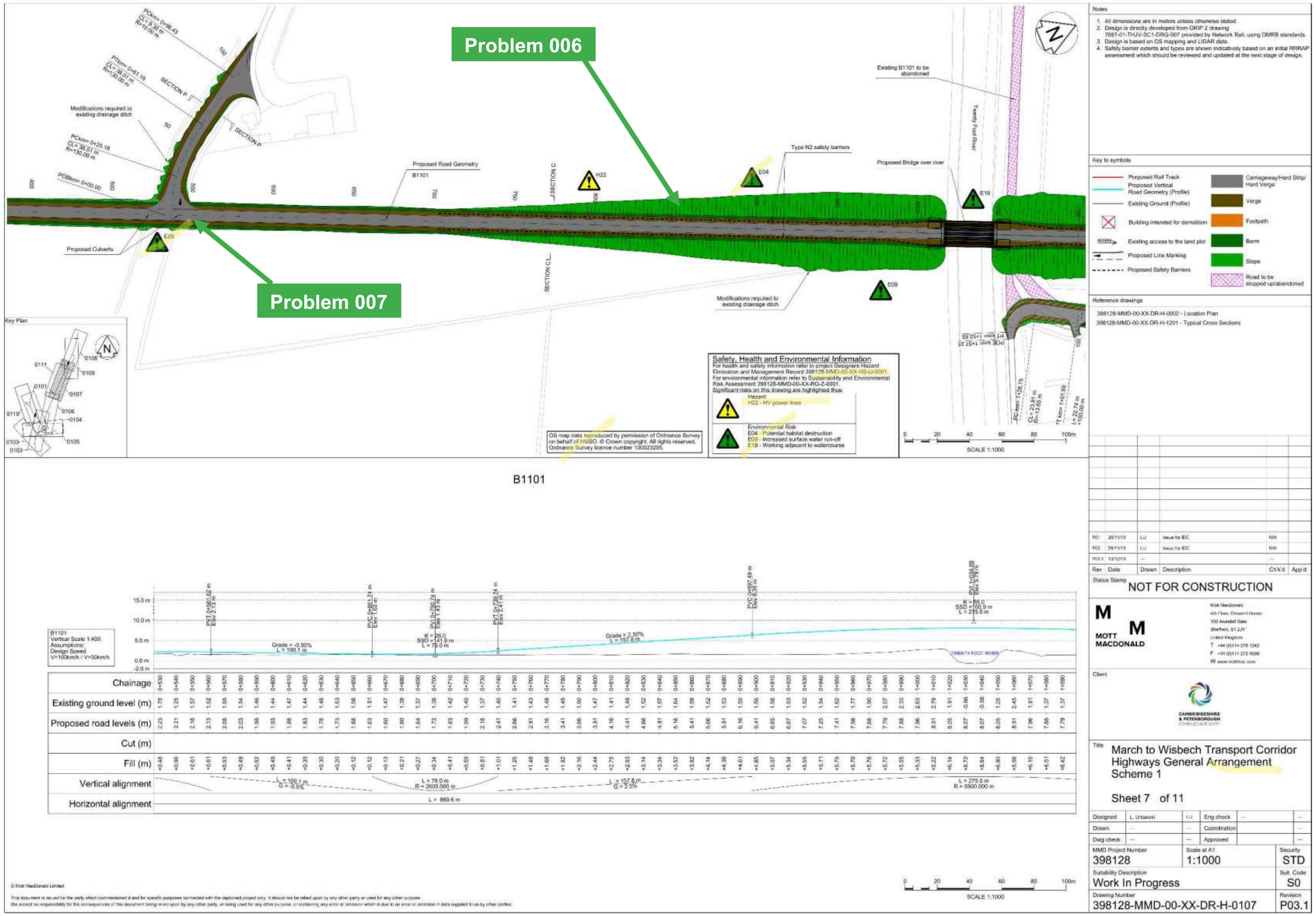
Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0105_P03 (Not to scale)

B.6 Figure: Sheet 6 of 11



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0106_P03 (Not to scale)

B.7 Figure: Sheet 7 of 11

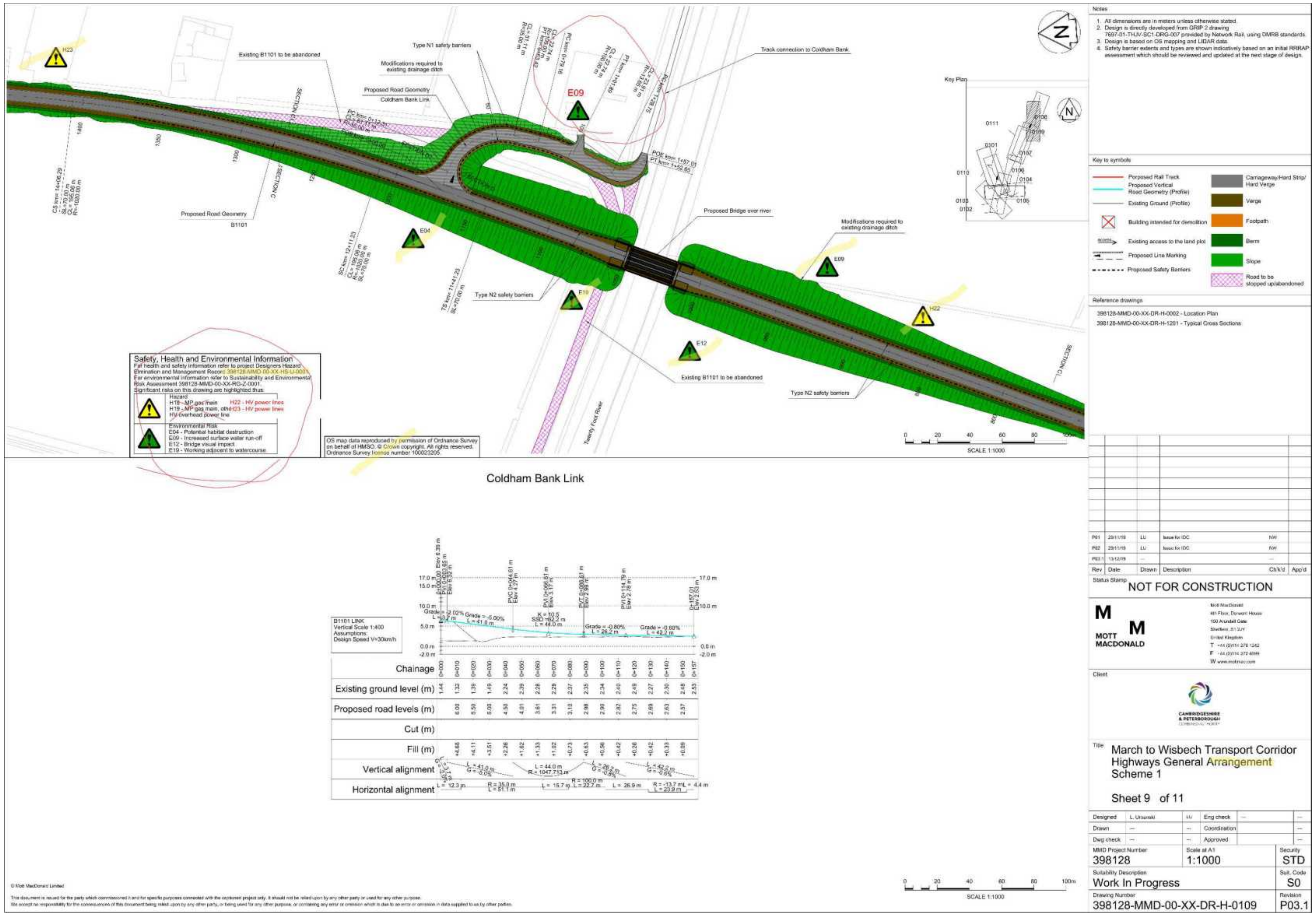


Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0107_P03 (Not to scale)

B.8 Figure: Sheet 8 of 11

Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0108_P03 (Not to scale)

B.9 Figure: Sheet 9 of 11



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0109_P03 (Not to scale)

B.10 Figure: Sheet 10 of 11

Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0109_P03 (Not to scale)

B.11 Figure: Sheet 11 of 11

Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0111_P03 (Not to scale)

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March to Wisbech Transport Corridor - Scheme 2

Coldham Grade Separation
Stage 1 Road Safety Audit

31 January 2020

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March to Wisbech Transport Corridor - Scheme 2

Coldham Grade Separation
Stage 1 Road Safety Audit

31 January 2020

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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	31/01/2020	B A Pledge	M D Lewis	S A Finney	First Issue

Document reference: 406395CJ | TPN | ITD | 073 | A

Information class: Standard

Contents

Introduction

This report describes a Stage 1 Road Safety Audit undertaken on a proposal to provide grade separation between the highway and railway at Coldham, north of March, in Cambridgeshire.

The Road Safety Audit has been carried out at the request of Mott MacDonald (the Design Organisation) on behalf of their client, Cambridgeshire County Council, who are the local highway authority (the Overseeing Organisation).

The Road Safety Audit Brief was provided by the Design Engineer, Naomi Ward, on 09/01/2020 (Document reference: 398128-MMD-00-XX-SP-H-0001). This was approved by Jack Eagle, Cambridgeshire County Council, representing the Overseeing Organisation.

The Audit Team Membership was as follows:

Matthew Lewis BEng (Hons), CEng, MICE, FCIHT, MSoRSA
Audit Team Leader, Mott MacDonald ITD
(Holder of a Certificate of Competency in Road Safety Audit)

Barry Pledge MCIHT, MSoRSA
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Tara Lowe Audit Team Observer, Cambridgeshire County Council

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The Road Safety Audit took place at the Southampton office of Mott MacDonald during January 2020, and comprised an examination of the submitted documentation and drawings listed in **Appendix A**.

The Audit Team visited the site of the proposed works together on Tuesday 14th January 2020 between 15:00 and 16:00hrs. During the visits, the weather was overcast with intermittent rain showers, and the road surface was damp / wet. Traffic conditions on the B1101 and Station Road were light. Little or no pedestrian and cycling activity was observed.

The terms of reference for this Road Safety Audit are the Highways England departmental standard DMRB GG 119 Road Safety Audit. The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria.

The comments and suggestions for road safety improvements made in this report seek to address matters that might have an adverse effect on road safety in the context of the chosen design. No attempt has been made to comment on the justification of the scheme. Consequently, the auditors accept no responsibility for the design or construction of this scheme.

All of the issues raised in this report are considered to be required for action. The comments contained in the report are based on safety related concerns and as such the design engineer will need to consider carefully how to respond to each of the issues.

A Road Safety Audit Response Report should be produced collaboratively by the Design Organisation and the Overseeing Organisation and kept on file for future reference (refer to DMRB GG 119, Chapter 4.11 to 4.19 and Appendix F). The response report should be produced and finalised within one month of the issue of the RSA report. A copy of the final response report should be issued to the Audit Team for information.

Reference key plans showing the general scheme layout is provided in **Appendix B**.

General description

The March to Wisbech Rail Reopening project (M2W), commissioned by the Cambridgeshire & Peterborough Combined Authority, aims to re-open the 12km long rail line between March and Wisbech to improve connectivity and drive growth in the area.

As part of the works to re-open the rail line, all twenty-two existing level crossings are to be closed and replaced with six bridges over the railway line, divided into five highway scheme projects.

Coldham Grade Separation

A new highway bridge over the rail line is proposed to replace the existing Coldham level crossing, connecting Station Road with B1101 March Road. The approach ramps to the bridge are formed from earthworks constructed from class 1 and lightweight fill with vertical band drains to a depth of 10m. The construction of swales and drainage ditches also form part of the works at this location.

Factors affecting road safety

The following Departures from Standard (Derogations) are listed in the March to Wisbech Transport Corridor GRIP 3 Heavy Rail Multi-Disciplinary Option Selection Report (Doc. ref. 398128 | 009 | A) for Scheme 2.

Scheme 2 - The location of Coldham Bridge selected at the previous stage of the design constrains the geometry such that the K value at the crest of the bridge is three steps below the desirable minimum required by the DMRB. Because of the close proximity of the rail line and parallel B1101, the SSD for the junction cannot be achieved. The junction between the Coldham Bridge alignment and the B1101 is also less than 200m from a sharp bend on the B1101.

Collision data analysis

The most recent five-year collision record has been provided by Cambridgeshire County Council. This is summarised as follows:

> *“There have been 5 recorded collisions in the most recent full five-year period (01/01/2014-31/12/2019), four slights and one fatal.*
>
> *Station Road B1101: one slight during darkness with no street lighting available when it was raining and the road surface was wet on 15/12/2017*

March Road B1101 at Bend: one fatal and three slight. Collision causing a fatal was during daylight in the evening when the weather was fine but the road surface was wet on 20/08/2016.

One slight collision was during daylight in the evening when the road surface was wet on 18/08/2015. Another slight collision was during daylight in the afternoon when it was raining and the road surface was wet on 18/03/2017.

B1101 March Rd North of Coldham Hall Chase at Bend: one slight during daylight on the morning when the weather was fine but the road surface was wet on 19/09/2014."

Items Raised at this Stage 1 Audit

This section describes the road safety related issues identified by the Audit Team during this Stage 1 Road Safety Audit. A reference key plan showing the locations of each identified issue is shown at **Appendix B**.

Problem 001

Location: *Approach to B1101 – new connection to Station Road.*

Summary: *Stopping sight distance (SSD) to junction.*

The location of Coldham Bridge (selected at the previous stage of the design) constrains the geometry such that the K value at the crest of the bridge is three steps below the desirable minimum required by the DMRB.

Because of the close proximity of the rail line and parallel B1101, the SSD for the junction cannot be achieved. The junction between the Coldham Bridge alignment and the B1101 is also less than 200m from a sharp bend on the B1101.

The Audit Team is of the opinion that drivers proceeding eastbound, in particular, will not be able to readily anticipate / perceive the presence of the junction ahead and allied with the vertical geometry, this has the potential to result in overshoot collisions at the junction.

Recommendation

It is recommended that the proposed alignment of Station Road is pushed further south, such that the junction between Station Road and the B1101 is then formed further north.

Whilst this locates the junction closer to the sharp bend in Coldham, it is considered that this has the potential to mitigate the occurrence of vehicles overshooting the junction.

Problem 002

Location: *Station Road, junction with Coldham Bridge.*

Summary: *Wide bellmouth across junction causing difficulty to pedestrians crossing at this location.*

The Station Road junction with Coldham Bridge results in a wide bellmouth with footways provided on either side. It is likely that there will be a desire line across the widest part of the junction (in a general east-west alignment) that pedestrians will have to negotiate in one crossing movement. There are no pedestrian crossing facilities shown at this stage of the design.

Whilst it is acknowledged that this is within a rural environment, vulnerable road users, particularly the elderly, could experience difficulty in crossing at this location. This may result in an increased risk of collisions between pedestrians and vehicles.

Recommendation
It is recommended that a formalised crossing point is provided on the desire line with a traffic / pedestrian refuge island. This may aid both crossing movements across the junction, but also mitigate vehicle entry / exit speeds from the junction.

Problem 003

Location: *Station Road, junction with Coldham Bridge.*

Summary: *Visual cue of old alignment causing vehicles to leave the carriageway in error.*

The proposed stopping up of Station Road at Coldham Bridge may result in eastbound motorists failing to appreciate the change in alignment and hence follow the visual cue of the old alignment on Station Road.

This may lead to instances of collisions resulting from vehicles leaving the carriageway or loss of control at this location.

Recommendation

It is recommended that additional measures are introduced to reduce vehicle speeds on the eastbound carriageway and to warn of the presence of the change in alignment ahead.

The stopped-up section of Station Road should be sufficiently landscaped so as not to provide a visual cue to road users of the old alignment ahead.

Problem 004

Location: *Station Road, junction with Coldham Bridge.*

Summary: *Absence of turning facilities for vehicles.*

The proposals show the stopping up and closure of Station Road at the existing Railway Level Crossing.

However, the proposals do not include any provision to enable vehicles to turn around safely at the eastern end of Station Road where it is stopped up. This is likely to result in collisions and conflict between vehicles and roadside items, particularly when larger vehicles undertake these manoeuvres.

Recommendation

It is recommended that a turning head(s) is (are) provided along Station Road where it is stopped up adjacent to the railway.

Problem 005

Location: *Station Road, west of B1101.*

Summary: *Provision for pedestrians and access to residential properties.*

Station Road, to the west of the B1101 has a number of residential properties on both its northern and southern sides. The proposed footway on the northern side of the new Station Road is discontinued where it ties-in with the old alignment.

This will result in pedestrians having to walk in the highway, at risk of collisions with motor traffic.

Recommendation

It is recommended that the tie-in for the footway extends westwards sufficiently to serve the properties on Station Road.

Problem 006

Location: *Station Road, west of B1101.*

Summary: *Appropriateness / continuity of highway cross-section.*

It is understood that Station Road, to the west of the B1101, has a number of residential properties on both its northern and southern sides. As a local road, it is understood to be subject to a 30mph speed limit.

The Audit Team is of the opinion that the provision of a new connection at a significantly higher standard than the current provision, particularly in terms of cross-section, is likely to result in higher vehicle speeds through this part of Coldham.

This has the potential to result in increased conflicts with pedestrians, particularly at its western end where it reverts to the existing alignment.

Recommendation

It is recommended that the proposed cross-section is reviewed, with a potential transition to a narrower carriageway in order to deter higher speeds of vehicle movements to the west of Station Road.

Audit Team Statement

We certify that this audit has been carried out in accordance with Highway England standard DMRB GG 119.

Road Safety Audit Team Leader

M D Lewis BEng (Hons), CEng, MICE, FCIHT, MSoRSA Signed: [redacted]

Certificate of Competency in Road Safety Audit, gained in May 2011

Mott MacDonald - Integrated Transport Division Date: 31st January 2020
Technical Specialist
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Road Safety Audit Team Member

B A Pledge MCIHT, MSoRSA Signed: [redacted]

Certificate of Competency in Road Safety Audit, gained in Sep 2012

Mott MacDonald - Integrated Transport Division Date: 31st January 2020
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Other Involved

(Such as an observer, Police/Network Management representative or specialist advisor)

Tara Lowe **Audit Team Observer, Cambridgeshire County Council**

Appendices

Drawings and Documents Examined

The following drawings and documents were provided and examined as part of this Road Safety Audit.

Drawings

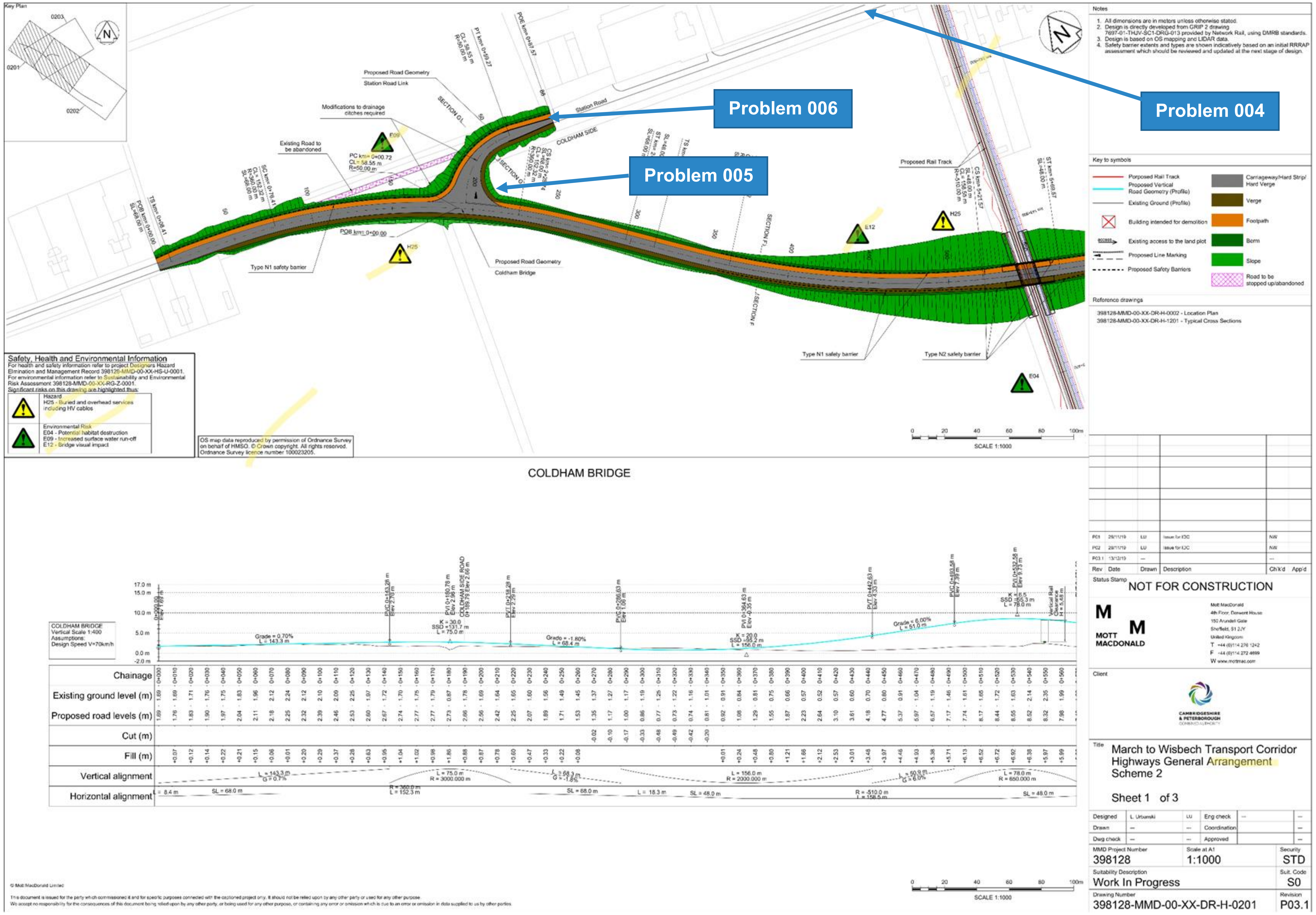
Drawing number	Rev	Drawing title
398128-MMD-00XX-DR-H-0201	P03	Highways General Arrangement – Scheme 2
398128-MMD-00XX-DR-H-0202	P03	Highways General Arrangement – Scheme 2
398128-MMD-00XX-DR-H-0203	P03	Highways General Arrangement – Scheme 2
398128-MMD-00XX-DR-H-1201	P03	Highways Typical Cross Sections
398128-MMD-00XX-DR-H-1202	P03	Highways Typical Cross Sections

Documents

Document number	Rev	Document title
398128-MMD-00-XX-SP-H-0002	-	Road Safety Audit Brief (09/01/2020)
-	-	Railway plan collision data (plan 072, 073, 074, 075 and 076)

Reference Key Plans

Figure 0.1: Key plan – Sheet 1 of 3



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0201_P03 (Not to scale)

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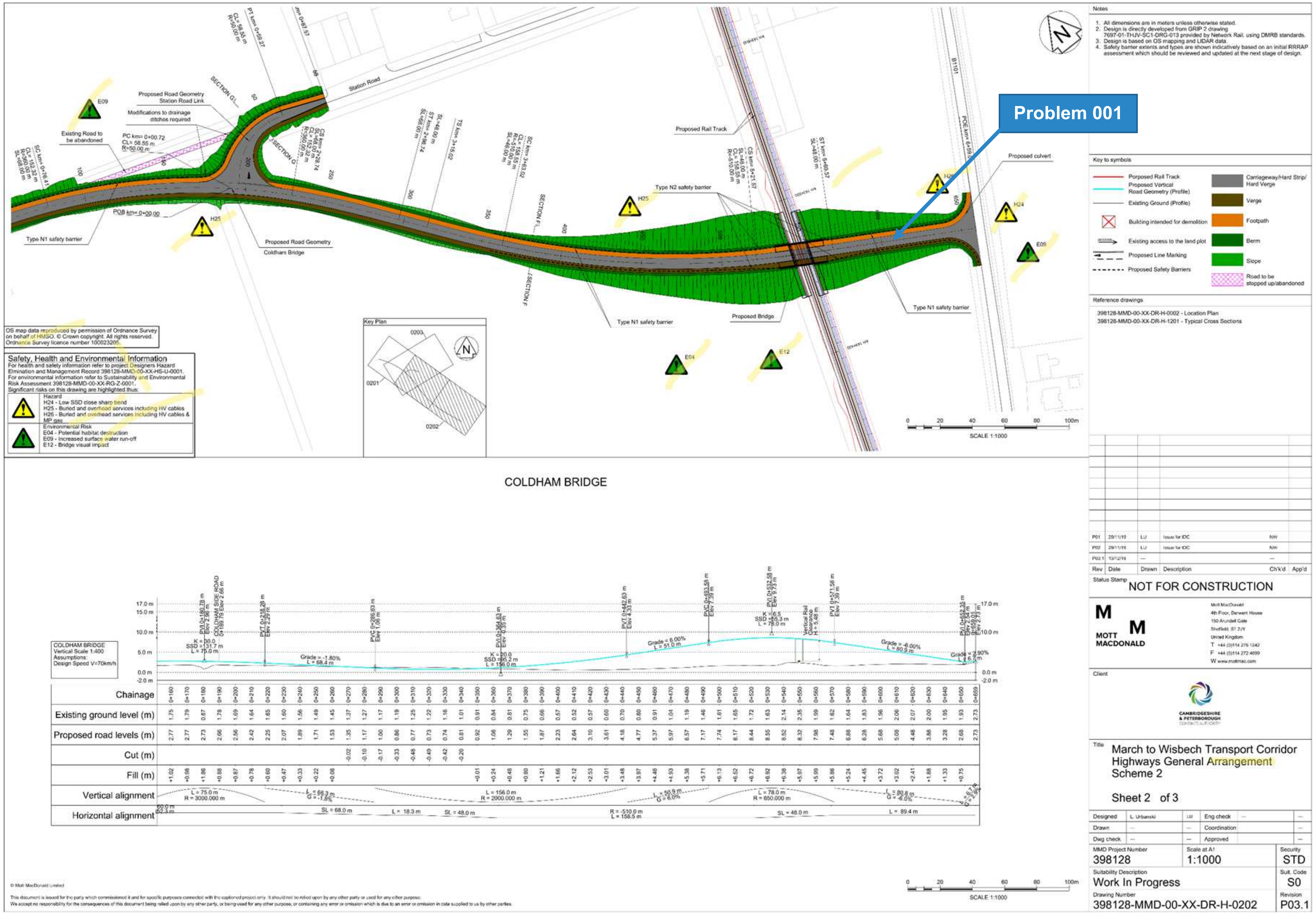
Figure 0.2: Key plan – Sheet 2 of 3



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0202_P03 (Not to scale)

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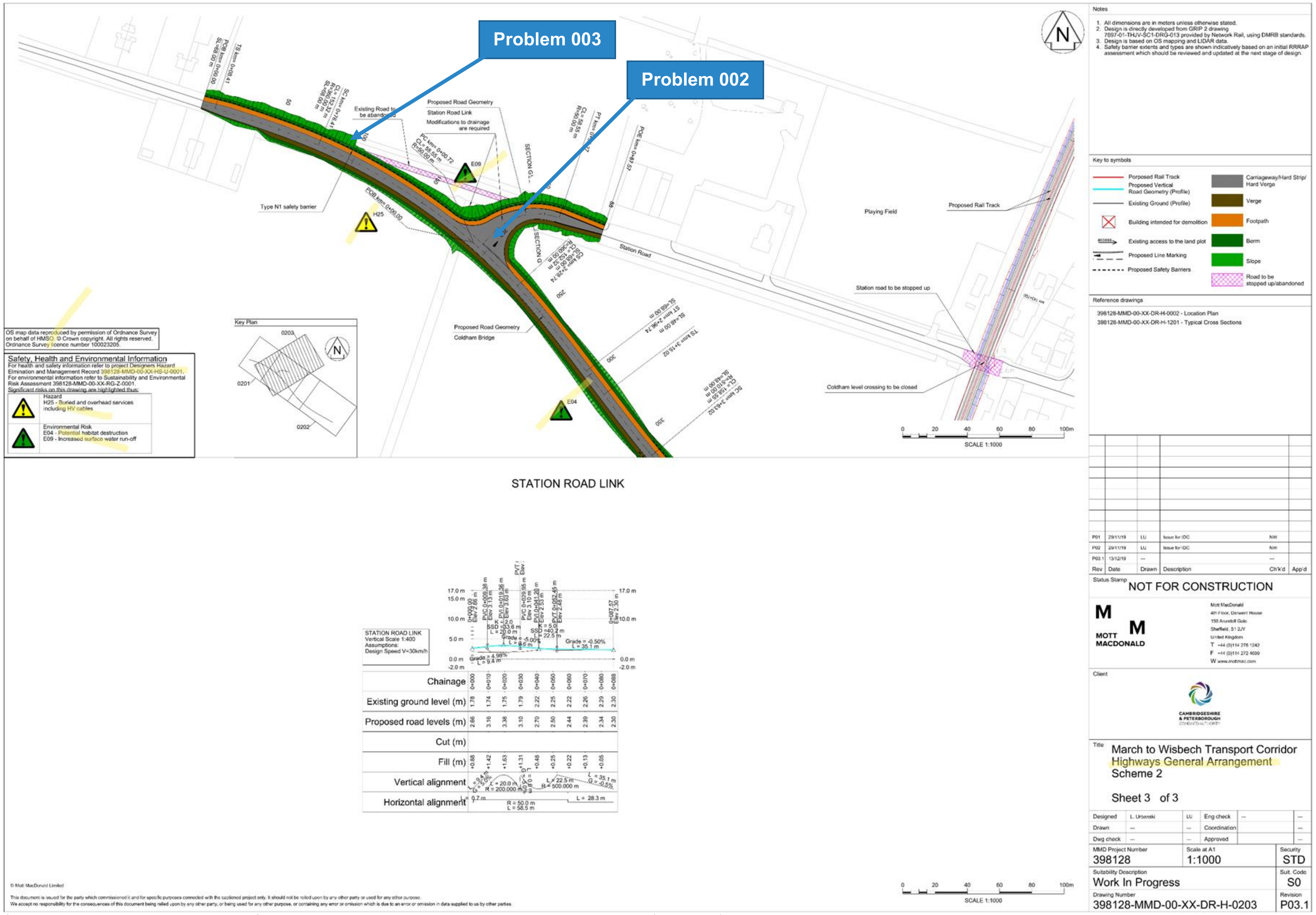
Figure 0.3: Key plan – Sheet 3 of 3



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0203_P03 (Not to scale)

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March to Wisbech Transport Corridor - Scheme 3

Holly Bank / Crooked Bank Accommodation Bridge, Broad Drove
Stage 1 Road Safety Audit

31 January 2020

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March to Wisbech Transport Corridor - Scheme 3

Holly Bank / Crooked Bank Accommodation Bridge, Broad Drove
Stage 1 Road Safety Audit

31 January 2020

Mott MacDonald Limited. Registered in England and Wales no. 1243967. Registered office: Mott MacDonald House, 8-10 Sydenham Road, Croydon CR0 2EE, United Kingdom

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	31/01/2020	B A Pledge	M D Lewis	S A Finney	First Issue

Document reference: 406395CJ | TPN | ITD | 074 | A

Information class: Standard

Contents

1 Introduction

This report describes a Stage 1 Road Safety Audit undertaken on a proposal to provide grade separation between the highway and railway south of the A47, at Wisbech, in Cambridgeshire.

The Road Safety Audit has been carried out at the request of Mott MacDonald (the Design Organisation) on behalf of their client, Cambridgeshire County Council, who are the local highway authority (the Overseeing Organisation).

The Road Safety Audit Brief was provided by the Design Engineer, Naomi Ward, on 09/01/2020 (Document reference: 398128-MMD-00-XX-SP-H-0001). This was approved by Jack Eagle, Cambridgeshire County Council, representing the Overseeing Organisation.

The Audit Team Membership was as follows:

Matthew Lewis	BEng (Hons), CEng, MICE, FCIHT, MSoRSA Audit Team Leader, Mott MacDonald ITD *(Holder of a Certificate of Competency in Road Safety Audit)*
Barry Pledge	MCIHT, MSoRSA Audit Team Member, Mott MacDonald ITD *(Holder of a Certificate of Competency in Road Safety Audit)*
Peter Taylor	BA (Hons), MSc, MCIHT, MRTPI, MSoRSA Audit Team Observer, Cambridgeshire County Council

It is confirmed that this Stage 1 Road Safety Audit has been undertaken upon completion of the preliminary design work. It is understood that no previous Road Safety Audits have been undertaken in connection with this scheme.

The Road Safety Audit took place at the Southampton office of Mott MacDonald during January 2020, and comprised an examination of the submitted documentation and drawings listed in **Appendix A**.

The Audit Team visited the site of the proposed works together on Wednesday 15th January 2020 between 09:15 and 10:00hrs. During the visits, the weather was overcast with intermittent rain showers, and the road surface was damp / wet. Traffic conditions on Redmoor Lane (and surrounds) were light. There was no observed pedestrian and cycling activity.

The terms of reference for this Road Safety Audit are the Highways England departmental standard DMRB GG 119 Road Safety Audit. The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria.

The comments and suggestions for road safety improvements made in this report seek to address matters that might have an adverse effect on road safety in the context of the chosen design. No attempt has been made to comment on the justification of the scheme. Consequently, the auditors accept no responsibility for the design or construction of this scheme.

All of the issues raised in this report are considered to be required for action. The comments contained in the report are based on safety related concerns and as such the design engineer will need to consider carefully how to respond to each of the issues.

A Road Safety Audit Response Report should be produced collaboratively by the Design Organisation and the Overseeing Organisation and kept on file for future reference (refer to DMRB GG 119, Chapter 4.11 to 4.19 and Appendix F). The response report should be produced and finalised within one month of the issue of the RSA report. A copy of the final response report should be issued to the Audit Team for information.

Reference key plans showing the general scheme layout is provided in **Appendix B**.

General description

The March to Wisbech Rail Reopening project (M2W), commissioned by the Cambridgeshire & Peterborough Combined Authority, aims to re-open the 12km long rail line between March and Wisbech to improve connectivity and drive growth in the area.

As part of the works to re-open the rail line, all twenty-two existing level crossings are to be closed and replaced with six bridges over the railway line, divided into five highway scheme projects.

New Broad Drove Road and Grade Separation

A new highway is proposed between the A47/B198/Redmoor Lane roundabout and Begdale. This also includes a new highway bridge over the rail line to replace the Broad Drove track level crossing. The approach ramps to the bridge are formed from earthworks constructed from class 1 and lightweight fill with vertical band drains to a depth of 10m. The construction of swales and drainage ditches also form part of the works at this location.

Crooked Bank Accommodation Bridge

A new accommodation bridge over the rail line is proposed to replace the Crooked Bank and Holly Bank level crossings, as well as a new alignment to connect these two byways to the new bridge. The approach ramps to the bridge are formed from earthworks constructed from class 1 and lightweight fill with vertical band drains to a depth of 10m. The construction of swales and drainage ditches also form part of the works at this location.

Factors affecting road safety

The following Departures from Standard (Derogations) are listed in the March to Wisbech Transport Corridor GRIP 3 Heavy Rail Multi-Disciplinary Option Selection Report (Doc. ref. 398128 | 009 | A) for Scheme 3.

Section 2 - The crest K-value on Holly Bank/Crooked Bank bridge is two steps below the desirable minimum. However, this is an accommodation bridge for a byway so an application for a departure is not appropriate.

Section 2 - On Broad Drove Road, the K value is one step below the desirable minimum in combination with a side road, which is a departure from standard.

Collision data analysis

The most recent five-year collision record has been provided by Cambridgeshire County Council. This is summarised as follows:

> *"There have been 4 recorded collisions in the most recent full five-year period (01/01/2014-31/12/2019), three of them were slight and one serious.*
>
> *Redmoor Lane Junction Broad Dr and Elm Rd Wisbech: one serious during daylight in the afternoon when the weather was fine but the surface was wet on 02/08/2014.*
>
> *Outside Cobra Engineering Redmoor Lane: one slight during daylight in the evening when the weather was fine but the surface was wet on 17/04/2016.*
>
> *Fenland Livery and Equestrian Redmoor Lane Track Entrance: one slight during daylight in the morning when the weather was fine but the surface was wet on 17/10/2016.*
>
> *PE14 Redmoor lane: one slight during darkness with no street lights in the evening when the weather was fine but the surface was wet on 08/02/2018."*

2 Items Raised at this Stage 1 Audit

This section describes the road safety related issues identified by the Audit Team during this Stage 1 Road Safety Audit. A reference key plan showing the locations of each identified issue is shown at **Appendix B**.

2.1 Problem 001

Location: *Broad Drove Road.*

Summary: *Connectivity of pedestrian link.*

The proposals include the provision of a 2.6m wide footway on the southern side of Broad Drove Road. At its western end, there is no similar provision for pedestrians to link up to Redmoor Lane, other than walking in the verge.

Whilst traffic flows on this link are expected to be low, the Audit Team is of the opinion that pedestrians may be required to walk in the carriageway/verge, potentially putting them in conflict with vehicles.

Likewise, there is a link from the new Broad Drove Road, south into Broad Drove. Again, there is no footway provision (on at least one side).

Recommendation

It is recommended that a footway link is provided on at least one side of the link between Broad Drove Road and the old Redmoor Lane.

2.2 Problem 002

Location: *Broad Drove junction with Redmoor Lane.*

Summary: *Priority Junction.*

Drawing Number 398128-MMD-00-XX-DR-H-0322 shows the connection, at the eastern end of the scheme, back into Redmoor Lane. It is understood that traffic travelling the eastern extents of Redmoor Lane will be required to turn onto the new link (Broad Drove Road) in order to access the A47. As this is the principal destination, the Audit Team consider that the priorities at this junction are incorrect.

This has the potential for vehicles to overshoot at the junction, or result in shunt type collisions, as drivers fail to appreciate the layout of the junction.

Recommendation

It is recommended that the properties at this junction are reviewed, such that the new Broad Drove Road has priority over Redmoor Lane (at its eastern end).

2.3 Problem 003

Location: *Broad Drove Road.*

Summary: *Selection of design and posted speed.*

Appendix F.6.1 (Highways design Table with Departure Comments) shows the new Broad Drove Road link as having a 60kph design speed and a posted speed limit of 30mph.

The Audit Team is of the opinion that the selection of both design and hence posted speed is inappropriate and that road users are considered likely to travel at speeds above this limit, resulting in loss of control collisions.

Recommendation

It is recommended that both the design and posted speed limits are reviewed.

2.4 Problem 004

Location: *New Broad Drove Road - junction with Broad Drove.*

Summary: *Junction situated west of railway – conflicts at junction.*

On the western side of the new grade-separated crossing over the railway line, there is a junction on the southern side, which connects to Broad Drove.

The Audit Team is of the opinion that the proposed K value, which is one step below the desirable minimum in combination with a side road, may lead to vehicles, travelling westbound, failing to appreciate the presence of the side road, resulting in side impact collisions.

Recommendation

It is recommended that the alignment and the proximity of the junction to the grade-separation of the railway is reviewed.

2.5 Problem 005

Location: *Holly Bank / Crooked Bank – eastern side of railway line.*

Summary: *Interface with existing highway network.*

Drawing Number 332128-MMD-00-XX-DR-H-0301 shows the connection of the new link over the railway into the Holly Bank / Crooked Bank Link. Crooked Bank is of a very low standard within the CCC highway hierarchy. The proposed cross-section is for a 3.5m wide carriageway with a 0.75m wide hardened verge on either side and a 2.0m wide passing bay on the western side.

The Audit Team is of the opinion that the remainder of Crooked Bank is unsuitable for general traffic emerging from this link and will necessitate in vehicles having to reverse or pull onto adjacent verges in order to connect through to Redmoor Lane.

Recommendation

It is recommended that the provision on Holly Bank / Crooked Bank (as outlined above) is continued through to its junction with Redmoor Lane.

3 Audit Team Statement

We certify that this audit has been carried out in accordance with Highway England standard DMRB GG 119.

Road Safety Audit Team Leader

M D Lewis BEng (Hons), CEng, MICE, FCIHT, MSoRSA Signed: [redacted]

Certificate of Competency in Road Safety Audit, gained in May 2011

Mott MacDonald - Integrated Transport Division Date: 31st January 2020
Technical Specialist
Integrated Transport Division (South and Wales)
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Road Safety Audit Team Member

B A Pledge MCIHT, MSoRSA Signed: [redacted]

Certificate of Competency in Road Safety Audit, gained in Sep 2012

Mott MacDonald - Integrated Transport Division Date: 31st January 2020
Senior Road Safety Engineer
Integrated Transport Division (South and Wales)
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Others Involved

(Such as an observer, Police/Network Management representative or specialist advisor)

Peter Taylor BA (Hons), MSc, MCIHT, MRTPI, MSoRSA

Road Safety Audit Team Observer, Cambridgeshire County Council

Appendices

A. Drawings and Documents Examined

The following drawings and documents were provided and examined as part of this Road Safety Audit.

A.1 Drawings

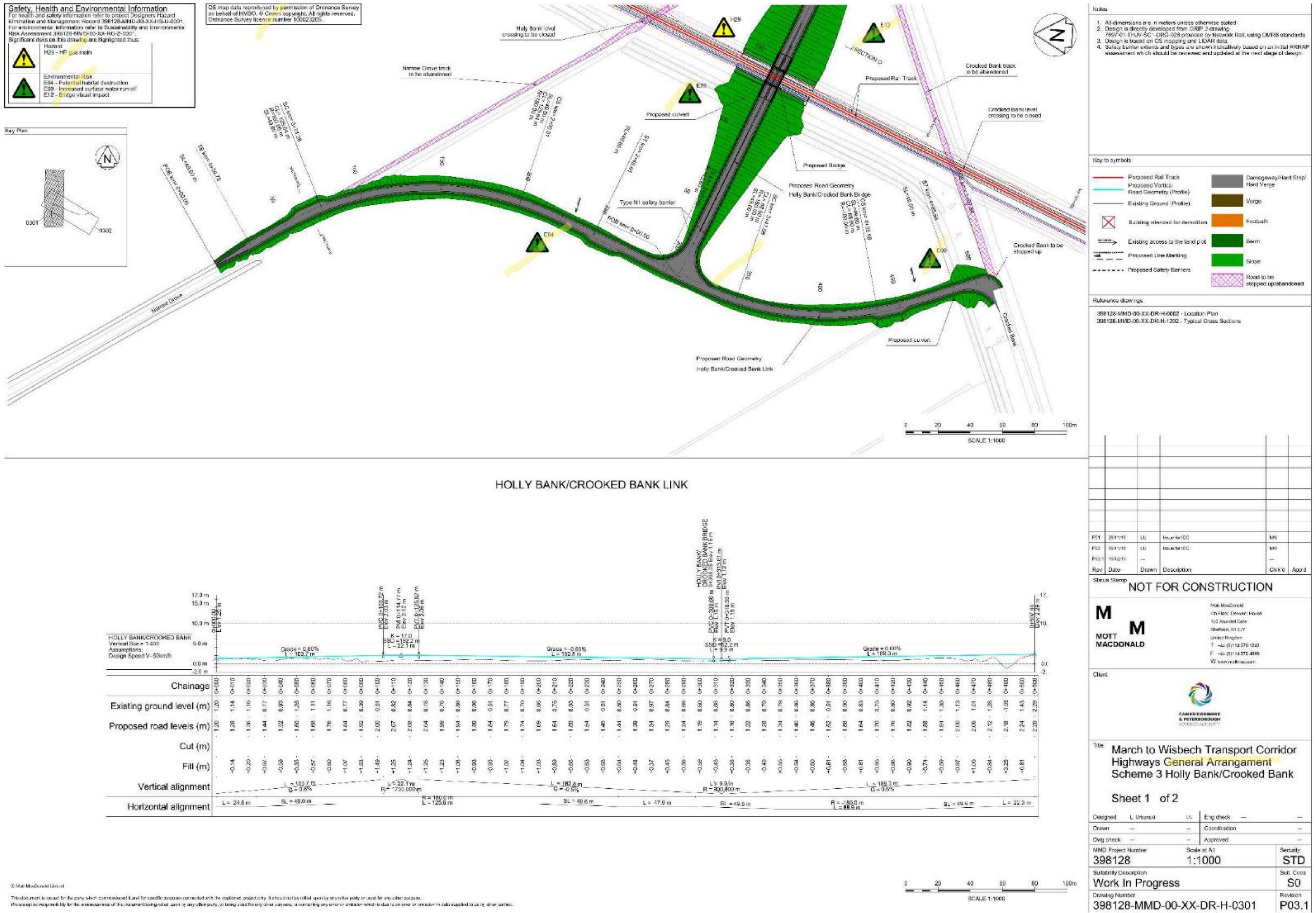
Drawing number	Rev	Drawing title
398128-MMD-00XX-DR-H-0301	P03	Highways General Arrangement – Scheme 3 Holly Bank / Crooked Bank
398128-MMD-00XX-DR-H-0302	P03	Highways General Arrangement – Scheme 3 Holly Bank / Crooked Bank
398128-MMD-00XX-DR-H-0321	P03	Highways General Arrangement – Broad Drove
398128-MMD-00XX-DR-H-0322	P03	Highways General Arrangement – Broad Drove
398128-MMD-00XX-DR-H-0323	P03	Highways General Arrangement – Broad Drove
398128-MMD-00XX-DR-H-0324	P03	Highways General Arrangement – Broad Drove
398128-MMD-00XX-DR-H-1201	P03	Highways Typical Cross Sections
398128-MMD-00XX-DR-H-1202	P03	Highways Typical Cross Sections

A.2 Documents

Document number	Rev	Document title
398128-MMD-00-XX-SP-H-0003	-	Road Safety Audit Brief (09/01/2020)

B. Reference Key Plans

Figure B.1: Key plan - sheet 1 of 6



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0301_P03 (Not to scale)

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Figure B.2: Key plan - sheet 2 of 6

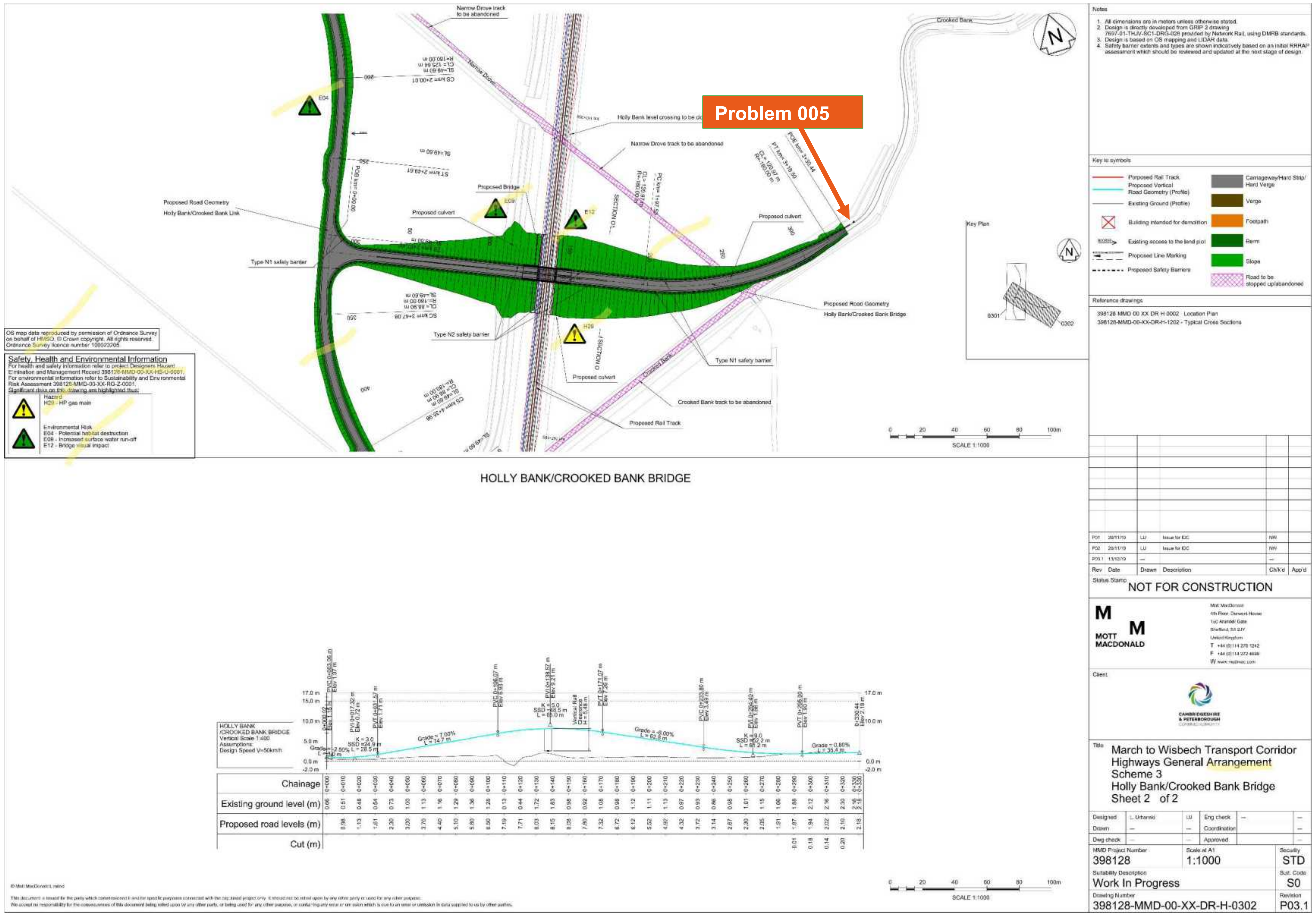

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Figure B.3: Key plan - sheet 3 of 6

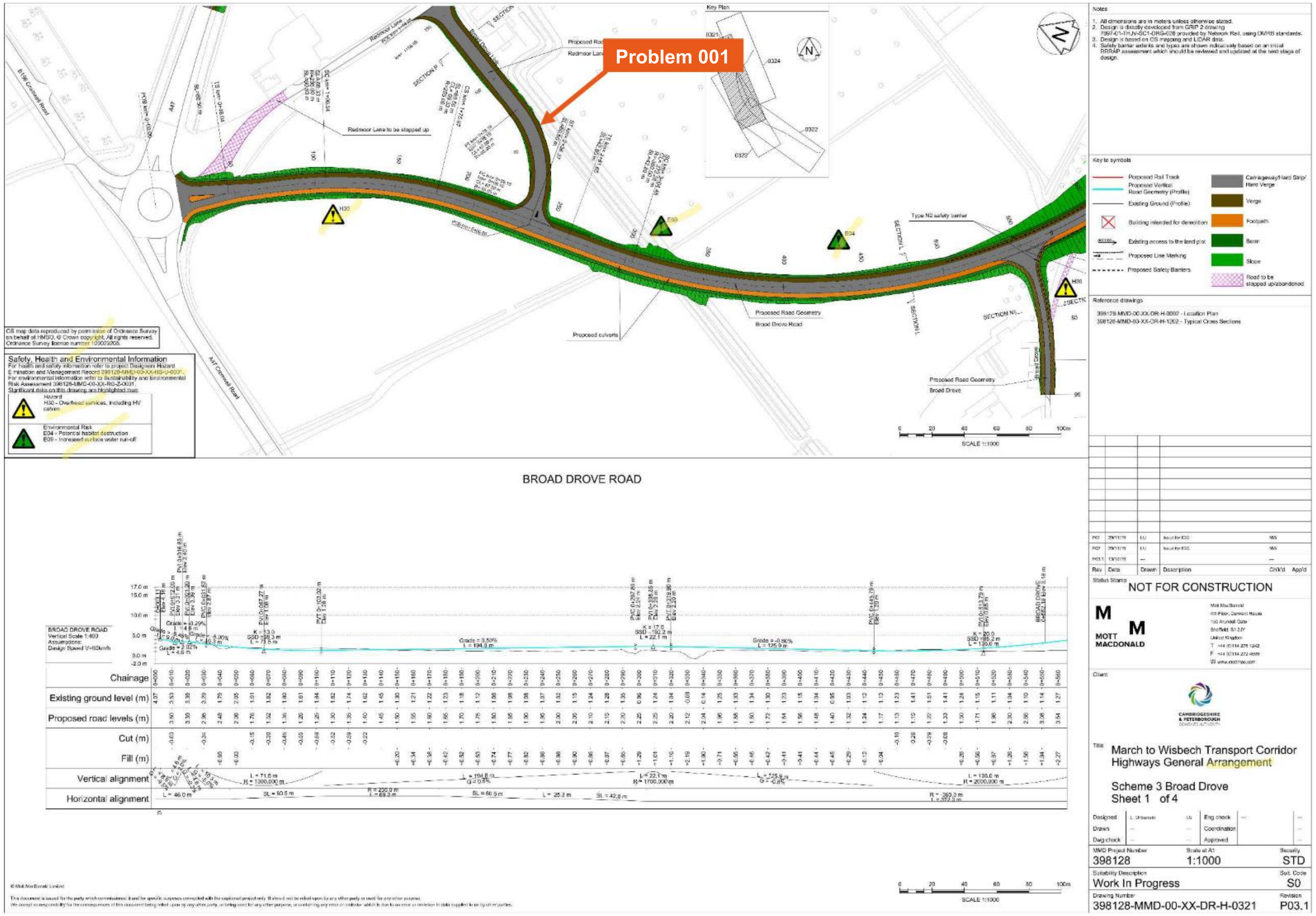

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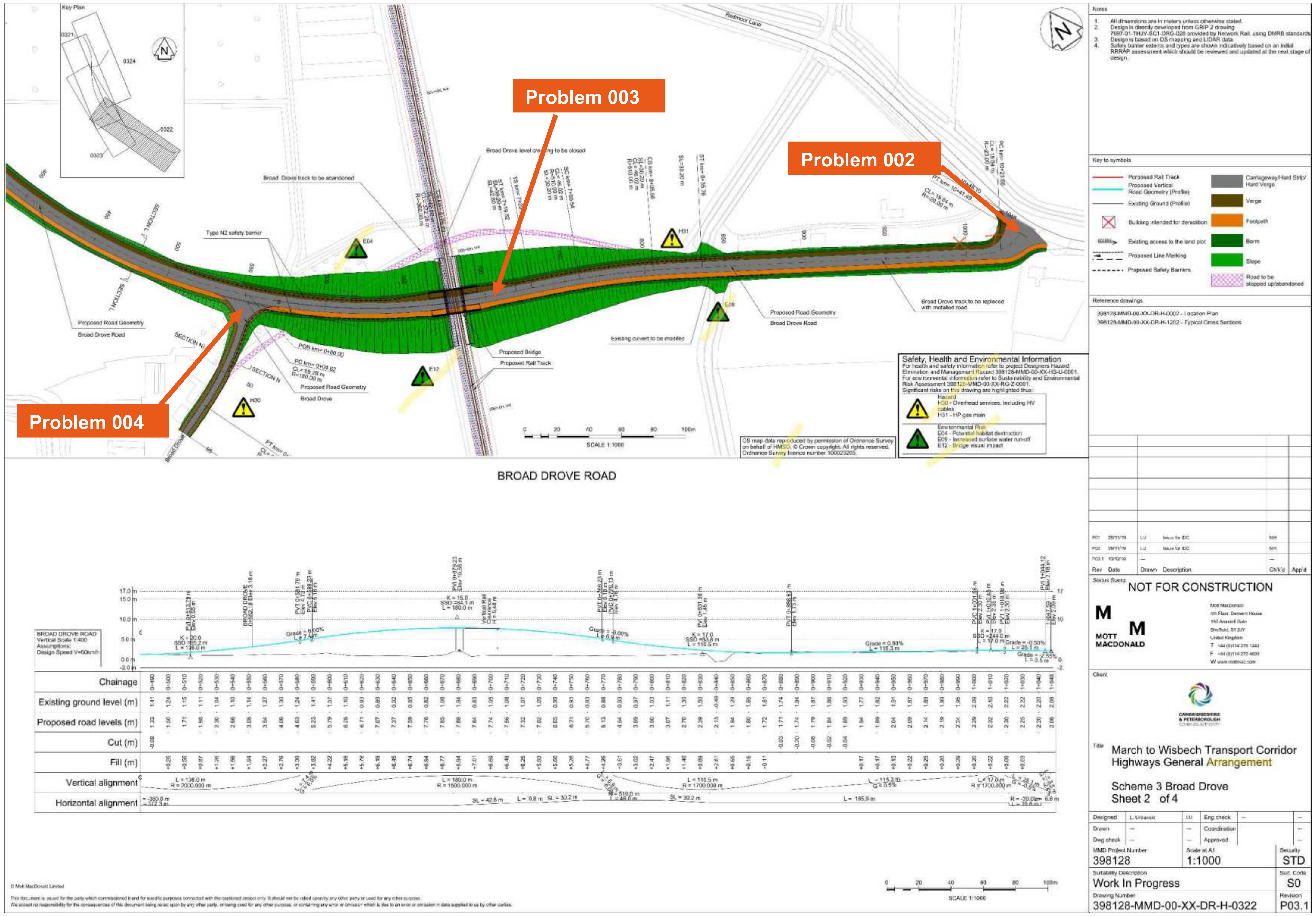
Figure B.4: Key plan - sheet 4 of 6



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0322_P03 (Not to scale)

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Figure B.5: Key plan - sheet 5 of 6

Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0323_P03 (Not to scale)

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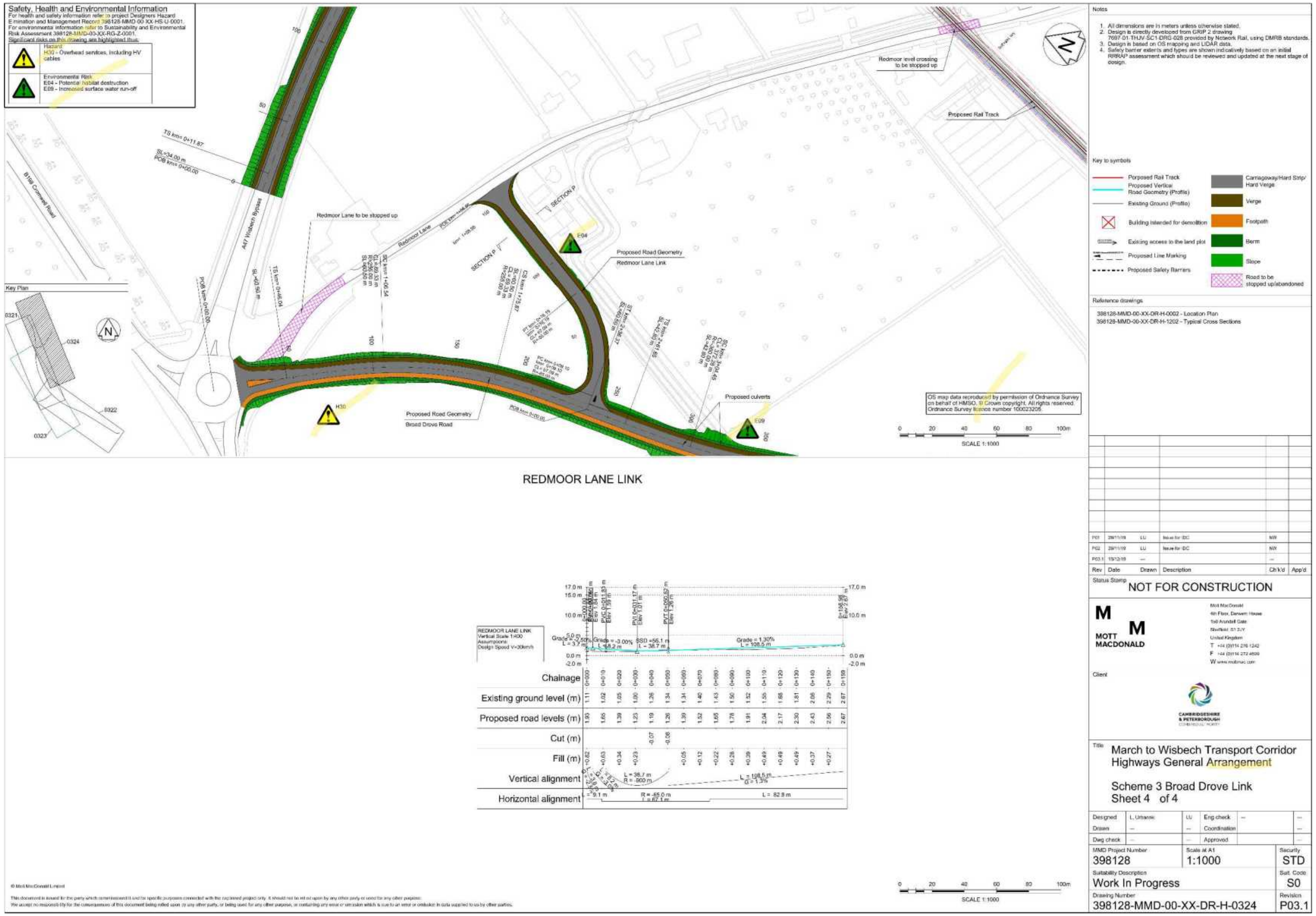
Figure B.6: Key plan - sheet 6 of 6



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0324_P03 (Not to scale)

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March to Wisbech Transport Corridor - Scheme 4

A47 Wisbech Bypass
Stage 1 Road Safety Audit

31 January 2020

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March to Wisbech Transport Corridor - Scheme 4

A47 Wisbech Bypass
Stage 1 Road Safety Audit

31 January 2020

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	31/01/2020	B A Pledge	M D Lewis	S A Finney	First Issue

Document reference: 406395CJ | TPN | ITD | 075 | A

Information class: Standard

Contents

1 Introduction

This report describes a Stage 1 Road Safety Audit undertaken on a proposal to provide grade separation between the highway and railway at the A47 Wisbech Bypass, south of Wisbech, in Cambridgeshire.

The Road Safety Audit has been carried out at the request of Mott MacDonald (the Design Organisation) on behalf of their client, Cambridgeshire County Council, who are the local highway authority (the Overseeing Organisation).

The Road Safety Audit Brief was provided by the Design Engineer, Naomi Ward, on 09/01/2020 (Document reference: 398128-MMD-00-XX-SP-H-0001). This was approved by Jack Eagle, Cambridgeshire County Council, representing the Overseeing Organisation.

The Audit Team Membership was as follows:

Matthew Lewis	BEng (Hons), CEng, MICE, FCIHT, MSoRSA Audit Team Leader, Mott MacDonald ITD *(Holder of a Certificate of Competency in Road Safety Audit)*
Barry Pledge	MCIHT, MSoRSA Audit Team Member, Mott MacDonald ITD *(Holder of a Certificate of Competency in Road Safety Audit)*
Peter Taylor	BA (Hons), MSc, MCIHT, MRTPI, MSoRSA Audit Team Observer, Cambridgeshire County Council

It is confirmed that this Stage 1 Road Safety Audit has been undertaken upon completion of the preliminary design work. It is understood that no previous Road Safety Audits have been undertaken in connection with this scheme.

The Road Safety Audit took place at the Southampton office of Mott MacDonald during January 2020, and comprised an examination of the submitted documentation and drawings listed in **Appendix A**.

The Audit Team visited the site of the proposed works together on Wednesday 15th January 2002 between 09:45hrs and 10:30hrs. During the visits, the weather was overcast with intermittent rain showers, and the road surface was damp / wet. Traffic conditions on the A47 Wisbech Bypass were moderate but free flowing. There was no pedestrian or cycling activity observed along the A47.

The terms of reference for this Road Safety Audit are the Highways England departmental standard DMRB GG 119 Road Safety Audit. The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria.

The comments and suggestions for road safety improvements made in this report seek to address matters that might have an adverse effect on road safety in the context of the chosen design. No attempt has been made to comment on the justification of the scheme. Consequently, the auditors accept no responsibility for the design or construction of this scheme.

All of the issues raised in this report are considered to be required for action. The comments contained in the report are based on safety related concerns and as such the design engineer will need to consider carefully how to respond to each of the issues.

A Road Safety Audit Response Report should be produced collaboratively by the Design Organisation and the Overseeing Organisation and kept on file for future reference (refer to DMRB GG 119, Chapter 4.11 to 4.19 and Appendix F). The response report should be produced and finalised within one month of the issue of the RSA report. A copy of the final response report should be issued to the Audit Team for information.

Reference key plans showing the general scheme layout is provided in **Appendix B**.

General description

The March to Wisbech Rail Reopening project (M2W), commissioned by the Cambridgeshire & Peterborough Combined Authority, aims to re-open the 12km long rail line between March and Wisbech to improve connectivity and drive growth in the area.

As part of the works to re-open the rail line, all twenty-two existing level crossings are to be closed and replaced with six bridges over the railway line, divided into five highway scheme projects.

A47 Grade Separation

A new highway bridge over the rail line is proposed to replace the existing A47 level crossing. The approach ramps to the bridge are formed from earthworks constructed from class 1 and lightweight fill with vertical band drains to a depth of 10m. The construction of swales and drainage ditches also form part of the works at this location.

Factors affecting road safety

The following Departures from Standard (Derogations) are listed in the March to Wisbech Transport Corridor GRIP 3 Heavy Rail Multi-Disciplinary Option Selection Report (Doc. ref. 398128 | 009 | A) for Scheme 1.

<u>Section 2</u> - On A47 Wisbech Bypass, a horizontal curve of 720m radius is present, which is not recommended for FOSD. This is followed by a K value and SSD which are one step below the desirable minimum.

Collision data analysis

> *"The most recent five-year collision record has been provided by Cambridgeshire County Council. This is summarised as follows:*
>
> *There have been 5 slight collisions recorded in the most recent full five year period (01/01/2014-31/12/2019).*
>
> *Wisbech Bypass (A47) near Jn with New Bridge Lane: two collisions, one slight and one serious. Slight collision was during daylight in the afternoon when the weather was fine and the surface was dry on 25/06/2019. The serious collision was during daylight when the weather was fine and the surface was dry on 15/04/2015.*
>
> *A47 Wisbech: one slight during daylight in the morning when the weather was fine and the surface was dry on 12/11/2015.*
>
> *Wisbech Bypass A47 at Jn with Oakdale Place: three slight collisions in the morning when the weather was fine and the surface was dry on 04/07/2015, 02/04/2018, and 14/07/2018."*

2 Items Raised at this Stage 1 Audit

This section describes the road safety related issues identified by the Audit Team during this Stage 1 Road Safety Audit. A reference key plan showing the locations of each identified issue is shown at **Appendix B**.

2.1 Problem 001

Location: *A47 Wisbech Bypass.*

Summary: *Choice of design speed.*

Appendix F.6.1 (M2W Highways Design Table with Departure Comments) shows the design speed for the A47 Wisbech Bypass link as 70kph with a posted speed limit of 40mph. It is understood that this link currently operates under National Speed Limit (NSL) for a single carriageway (S2).

The Audit Team is concerned as to the choice of design parameters (design speed) and how a potential reduction in speed limit of 40mph would be enforced.

A reduction in speed limit is considered likely to result in an increase in overtaking manoeuvres on this link, increasing the risk of head on collisions.

Recommendation

It is recommended that the design is reviewed and a more appropriate design and posted speed limit, commensurate with the current configuration of this link, is applied.

2.2 Problem 002

Location: *A47 Wisbech Bypass – at proposed grade -separation.*

Summary: *Combination of DfS for horizontal and vertical alignment.*

Allied to **Problem 001**, the proposed horizontal and vertical alignment has a Departure from Standard (DfS) with respect to the presence of a horizontal curve of 720m radius, which is not recommended for FOSD. This is followed by a K value and SSD which are one step below the desirable minimum.

The Audit Team is of the opinion that this combination of horizontal and vertical alignment may result in inappropriate overtaking manoeuvres, resulting in head-on collisions.

Recommendation

It is recommended that the horizontal and vertical geometry is reviewed such that FOSD requirements can be achieved. This may be achieved by utilising the existing A47 alignment (which potentially provides greater distance between the roundabout to the west and the railway line) in which to achieve the desired vertical geometric requirements.

2.3 Problem 003

Location: *A47 Wisbech Bypass – link wide.*

Summary: *Spacing of lay-bys.*

The proposals include the closing of the eastbound lay-by on the existing A47 carriageway (at approximate Chainage 600m). There is no further lay-by, eastbound, on this link.

This potentially presents a hazard to road users in the event of an enforced need to stop on this link and changes the spacing between lay-bys.

Recommendation

It is recommended that the provision of lay-bys and their spacing to adjacent rest areas is reviewed, such that maximum spacings are retained.

2.4 Problem 004

Location: *A47 Wisbech Bypass – proposed grade-separation.*

Summary: *Future widening of A47 south of Wisbech.*

The proposals include the construction of a new 7.3m wide carriageway and Typical Cross-Sections drawing (328128-MMD-00-XX-DR-H-1202) shows the associated provision for hard-strip, verge, berm and slope. The Audit Team understands that there are future proposals under the Road Investment Strategy (RIS) to upgrade this section (along with other sections of the A47) to D2AP.

The absence of future proofing of the design is likely to result in significant diversion or construction phasing increasing the duration of traffic management in place in order to enable widening. This has the potential to increase conflicts under such arrangements.

Recommendation

It is recommended that the design is reviewed such that reasonably foreseeable future works can be accommodated within the proposals. This may include the selection of a retaining structure, as a widened earthworks embankment is likely to have a significant footprint.

3 Audit Team Statement

We certify that this audit has been carried out in accordance with Highway England standard DMRB GG 119.

Road Safety Audit Team Leader

M D Lewis BEng (Hons), CEng, MICE, FCIHT, MSoRSA

Signed: [redacted]

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Road Safety Audit Team Member

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Date: 31st January 2020

Others Involved

(Such as an observer, Police/Network Management representative or specialist advisor)

Peter Taylor BA (Hons), MSc, MCIHT, MRTPI, MSoRSA

Road Safety Audit Team Observer, Cambridgeshire County Council

Appendices

A. Drawings and Documents Examined

The following drawings and documents were provided and examined as part of this Road Safety Audit.

A.1 Drawings

Drawing number	Rev	Drawing title
398128-MMD-00XX-DR-H-0401	P03	Highways General Arrangement – Scheme 4 A47 Wisbech Bypass
398128-MMD-00XX-DR-H-0402	P03	Highways General Arrangement – Scheme 4 A47 Wisbech Bypass
398128-MMD-00XX-DR-H-1201	P03	Highways Typical Cross Sections
398128-MMD-00XX-DR-H-1202	P03	Highways Typical Cross Sections

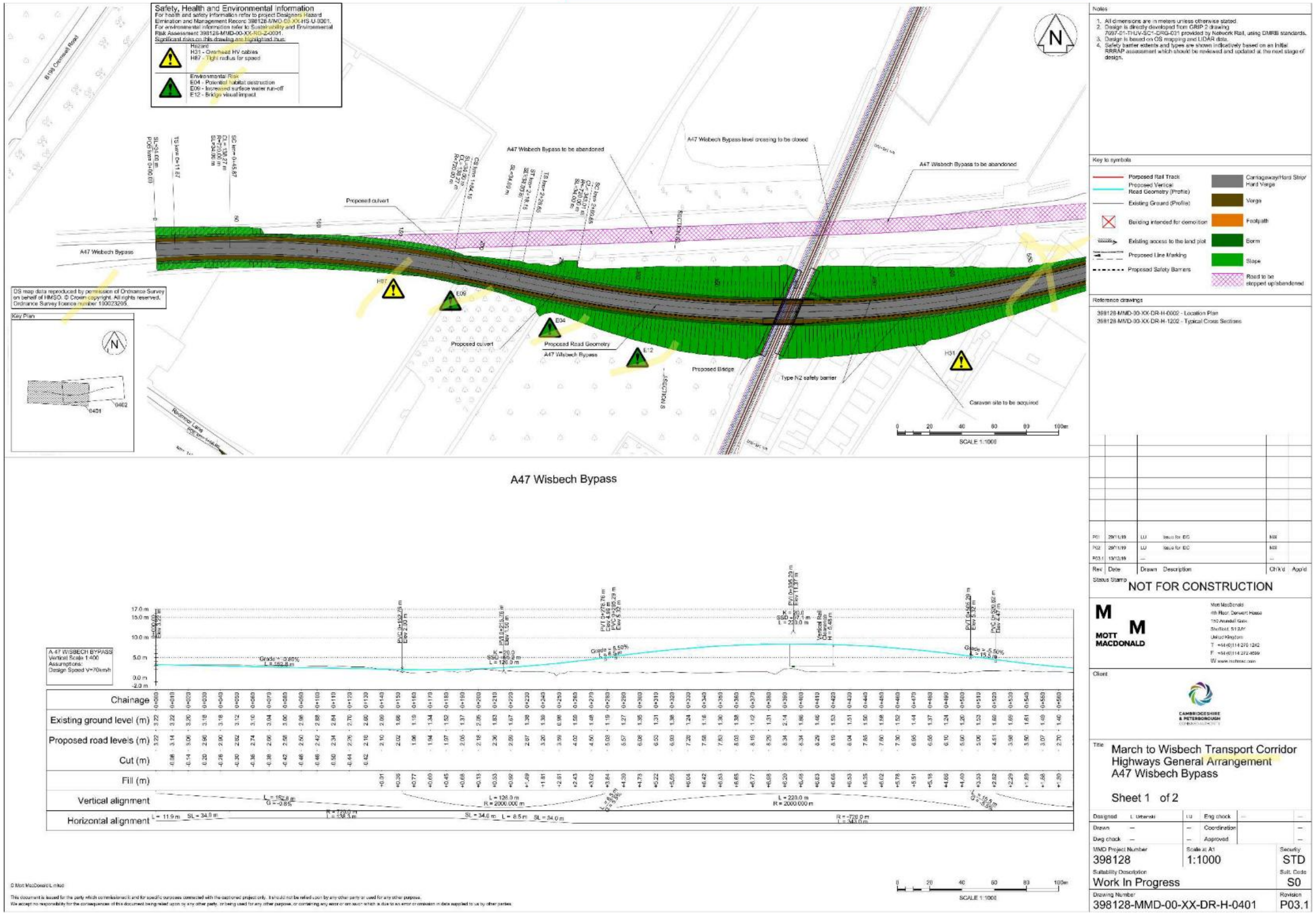
A.2 Documents

Document number	Rev	Document title
398128-MMD-00-XX-SP-H-00034	-	Road Safety Audit Brief (09/01/2020)
-	-	Railway plan collision data (plan 072, 073, 074, 075 and 076)

B. Reference Key Plans

B.1 Key plan – Sheet 1 of 2

Problem 001, 002, 003 & 004 – within scheme extents



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0401 (not to scale)

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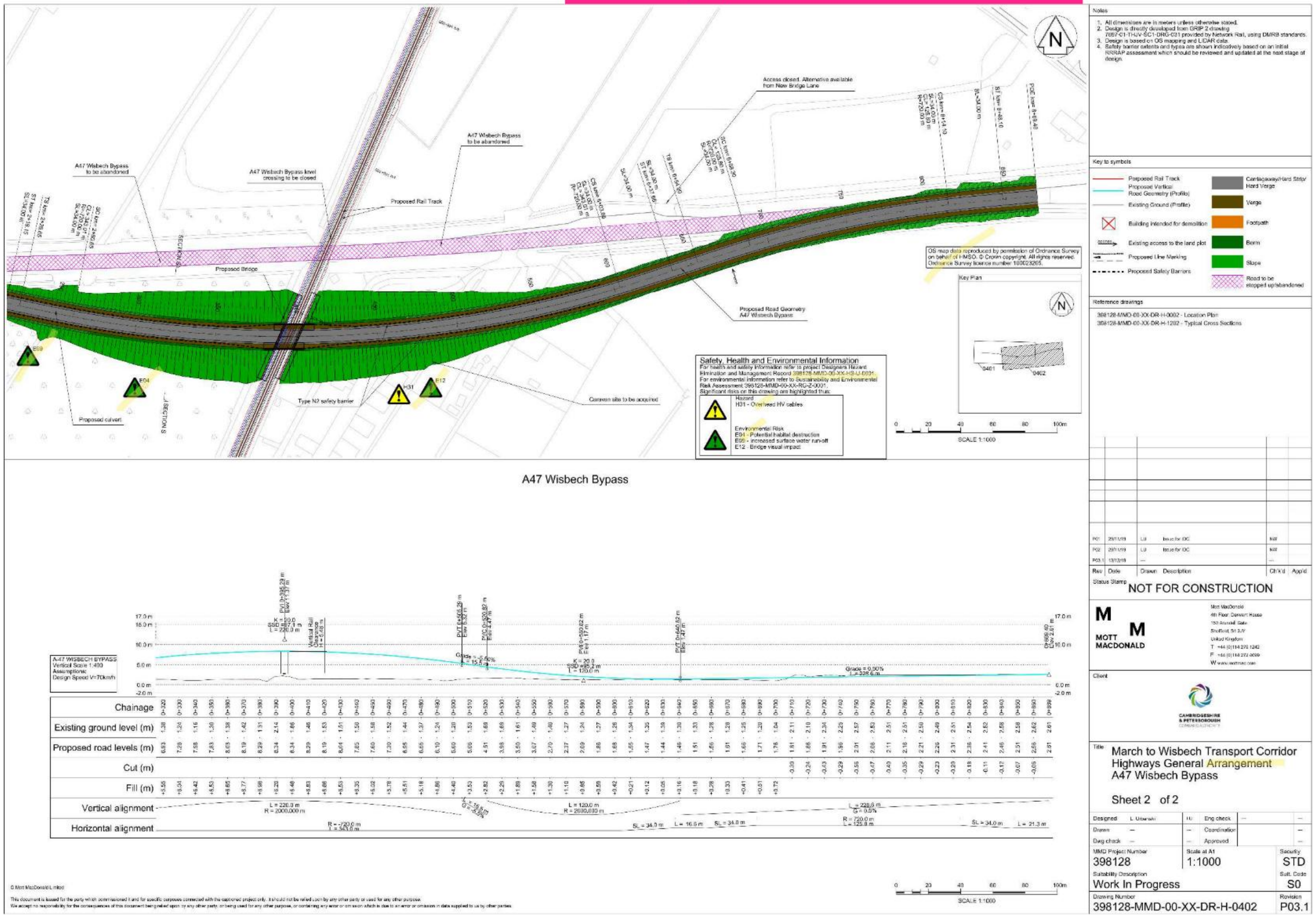
B.2 Key Plan – Sheet 2 of 3

Problem 001, 002, 003 & 004 – within scheme extents



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0402 (not to scale)

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March to Wisbech Transport Corridor - Scheme 5

Weasenham Lane
Stage 1 Road Safety Audit

31 January 2020

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March to Wisbech Transport Corridor - Scheme 5

Weasenham Lane
Stage 1 Road Safety Audit

31 January 2020

Mott MacDonald Limited. Registered in
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Registered office: Mott MacDonald House,
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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	31/01/2020	B A Pledge	M D Lewis	S A Finney	First Issue

Document reference: 406395CJ | TPN | ITD | 076 | A

Information class: Standard

Contents

1 Introduction

This report describes a Stage 1 Road Safety Audit undertaken on a proposal to provide grade separation between the highway and railway at Weasenham Lane, Wisbech, in Cambridgeshire.

The Road Safety Audit has been carried out at the request of Mott MacDonald (the Design Organisation) on behalf of their client, Cambridgeshire County Council, who are the local highway authority (the Overseeing Organisation).

The Road Safety Audit Brief was provided by the Design Engineer, Naomi Ward, on 09/01/2020 (Document reference: 398128-MMD-00-XX-SP-H-0001). This was approved by Jack Eagle, Cambridgeshire County Council, representing the Overseeing Organisation.

The Audit Team Membership was as follows:

Matthew Lewis	BEng (Hons), CEng, MICE, FCIHT, MSoRSA Audit Team Leader, Mott MacDonald ITD *(Holder of a Certificate of Competency in Road Safety Audit)*
Barry Pledge	MCIHT, MSoRSA Audit Team Member, Mott MacDonald ITD *(Holder of a Certificate of Competency in Road Safety Audit)*
Peter Taylor	BA (Hons), MSc, MCIHT, MRTPI, MSoRSA Audit Team Observer, Cambridgeshire County Council

It is confirmed that this Stage 1 Road Safety Audit has been undertaken upon completion of the preliminary design work. It is understood that no previous Road Safety Audits have been undertaken in connection with this scheme.

The Road Safety Audit took place at the Southampton office of Mott MacDonald during January 2020, and comprised an examination of the submitted documentation and drawings listed in **Appendix A**.

The Audit Team visited the site of the proposed works together on Wednesday 15/01/2020 between 10:30hrs and 11:00hrs. During the visits, the weather was overcast with intermittent rain showers, and the road surface was damp / wet. Traffic conditions on Weasenham Lane were light and free flowing. There was a low level of pedestrian / cycle activity along Weasenham Lane.

The terms of reference for this Road Safety Audit are the Highways England departmental standard DMRB GG 119 Road Safety Audit. The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria.

The comments and suggestions for road safety improvements made in this report seek to address matters that might have an adverse effect on road safety in the context of the chosen design. No attempt has been made to comment on the justification of the scheme. Consequently, the auditors accept no responsibility for the design or construction of this scheme.

All of the issues raised in this report are considered to be required for action. The comments contained in the report are based on safety related concerns and as such the design engineer will need to consider carefully how to respond to each of the issues.

A Road Safety Audit Response Report should be produced collaboratively by the Design Organisation and the Overseeing Organisation and kept on file for future reference (refer to DMRB GG 119, Chapter 4.11 to 4.19 and Appendix F). The response report should be produced and finalised within one month of the issue of the RSA report. A copy of the final response report should be issued to the Audit Team for information.

Reference key plans showing the general scheme layout is provided in **Appendix B**.

General description

The March to Wisbech Rail Reopening project (M2W), commissioned by the Cambridgeshire & Peterborough Combined Authority, aims to re-open the 12km long rail line between March and Wisbech to improve connectivity and drive growth in the area.

As part of the works to re-open the rail line, all twenty-two existing level crossings are to be closed and replaced with six bridges over the railway line, divided into five highway scheme projects.

Weasenham Lane Grade Separation

A new highway bridge over the rail line is proposed to replace the existing Weasenham Lane level crossing. The approach ramps to the bridge are formed from reinforced earth retaining walls.

Factors affecting road safety

The following Departures from Standard (Derogations) are listed in the March to Wisbech Transport Corridor GRIP 3 Heavy Rail Multi-Disciplinary Option Selection Report (Doc. ref. 398128 | 009 | A) for Scheme 1.

Scheme 5 – None.

Collision data analysis

The most recent five-year collision record has been provided by Cambridgeshire County Council. This is summarised as follows:

> *“There are no currently recorded collisions in the location of the proposed planned in the most recent full five year period (01/01/2014-31/12/2019). However, there are two collisions that have been recorded just outside the extents of the proposed scheme:*
>
> *Cromwell Road B198 at Jn with Weasenham Lane: one serious during darkness when the weather was fine and the surface was dry on 31/05/2017.*
>
> *Weasenham Lane near Jn with Cromwell Road: one fatal during daylight in the morning when the weather was fine and the surface was dry on 16/07/2018.”*

2 Items Raised at this Stage 1 Audit

This section describes the road safety related issues identified by the Audit Team during this Stage 1 Road Safety Audit. A reference key plan showing the locations of each identified issue is shown at **Appendix B**.

2.1 Problem 001

Location: *Weasenham Lane – west of railway line. Drawing number 398128-MMD-00-XX-DR-H-0105*

Summary: *Proposed future vehicle frontage access to existing premises.*

The proposals for Weasenham Lane take the route north of its current alignment and over the railway line. No earthworks profile is shown on the General Arrangement, so it is presumed that a retaining structure is to be constructed.

An existing section of Weasenham Lane is to be stopped up.

It is not clear from the proposals how access between the industrial premises, directly east and west of the structure, is to be provided. This has the potential to result in confusion to road users, particularly drivers seeking to access the adjoining premises.

Recommendation

It is recommended that the provision of a service road (stopped up either side of the railway line) is investigated.

2.2 Problem 002

Location: *Weasenham Lane – obsolete elevated north – south walkway.*

Summary: *Height clearance to new alignment.*

There is an elevated walkway (now disused) which formerly provided a north / south link over Weasenham Lane in order to provide access between the two industrial premises. The northern site is now clear; however, the walkway remains.

It is not evident from the proposals as to whether this walkway is to be removed, however, in its current guise, it is likely to impede the vertical profile for the proposed Weasenham Lane alignment and become a collision risk to high sided vehicles.

Recommendation

It is recommended that this elevated walkway is removed.

2.3 Problem 003

Location: *Weasenham Lane – overbridge.*

Summary: *Height of parapet.*

Drawing Number 398128-MMD-00-XX-DR-H-1202 shows the Weasenham Lane Ramp cross-section. It is not clear form the proposals as to the height of the parapet.

The adjacent section of highway is designated as footway (not shared-use, cycleway or equestrian route). Therefore, the height requirements of the parapet may vary.

Nonetheless, low parapet heights may present a falling from height hazard to non-motorised users - pedestrians in particular.

Recommendation

It is recommended that an appropriate parapet height is specified.

3 Audit Team Statement

We certify that this audit has been carried out in accordance with Highway England standard DMRB GG 119.

Road Safety Audit Team Leader

M D Lewis BEng (Hons), CEng, MICE, FCIHT, MSoRSA Signed: [redacted]

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Other Involved

(Such as an observer, Police/Network Management representative or specialist advisor)

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Appendices

A. Drawings and Documents Examined

The following drawings and documents were provided and examined as part of this Road Safety Audit.

A.1 Drawings

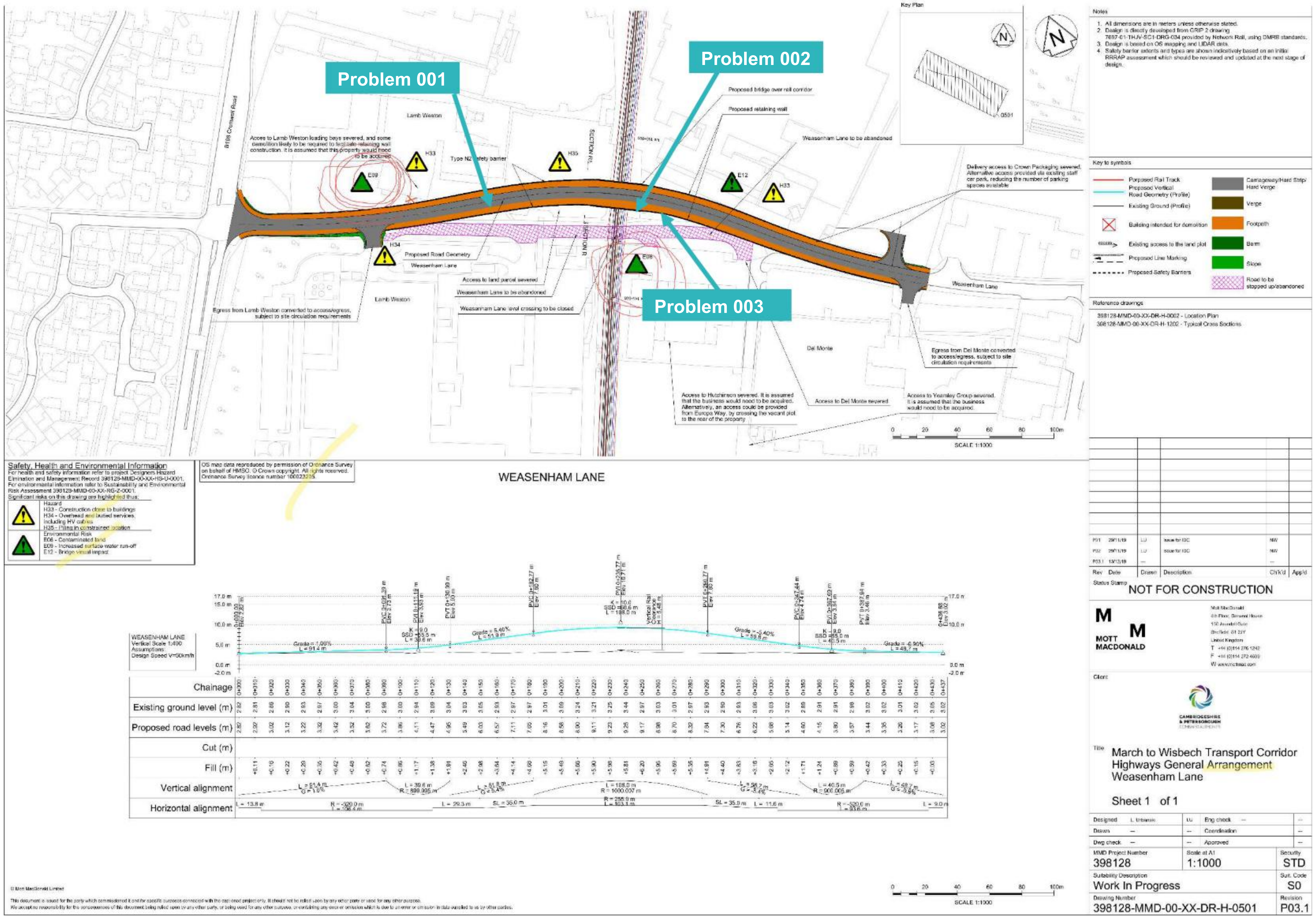
Drawing number	Rev	Drawing title
398128-MMD-00XX-DR-H-0501	P03	Highways General Arrangement – Scheme 5 Weasenham Lane
398128-MMD-00-XX-DR-H-1000	P02	Wisbech Station
398128-MMD-00XX-DR-H-1201	P03	Highways Typical Cross Sections
398128-MMD-00XX-DR-H-1202	P03	Highways Typical Cross Sections
398128-MMD-00XX-DR-H-0501	P03	Highways General Arrangement – Scheme 5 Weasenham Lane

A.2 Documents

Document number	Rev	Document title
398128-MMD-00-XX-SP-H-0005	-	Road Safety Audit Brief (09/01/2020)
-	-	Railway plan collision data (plan 072, 073, 074, 075 and 076)

B. Reference Key Plans

B.1 Key plan - Highways General Arrangement Weasenham Lane



Source: Mott MacDonald, based on Highway General Arrangement Drawing no.: 398128-MMD-00-XX-DR-H-0501 (not to scale)

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Q. Desktop Flood Risk Appraisal

March Wisbech Transport Corridor
Wisbech Station

Flood Risk and Runoff Assessment

4 March 2020

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March Wisbech Transport Corridor
Wisbech Station

Flood Risk and Runoff Assessment

4 March 2020

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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
0001	04/03/2020	M Jones	K Bagnall	A Precious	Issue for Client Review

Document reference: 398128 | 0001 | A398128-MMD-00-XX-RP-D-0001-A

Information class: Standard

Contents

Tables

Figures

Executive summary

Mott MacDonald (MM) was commissioned to carry out a Flood Risk and Runoff Assessment for a proposed train station located on land to the south of Wisbech town centre, Cambridgeshire. The proposed works are part of the Governance for Railway Investment Projects (GRIP) 3 March – Wisbech Transport Corridor Study.

This report has been produced to support a Full Business Case (FBC) for a single-option design of the reopening of the existing railway line between March and Wisbech, in accordance with Transport Appraisal Guidance documents. The report predominantly covers the proposed new Wisbech station site, as March Station and the majority rail alignment are pre-existing infrastructure, however, key flood risks that are identified for the whole scheme will be briefly discussed. The report will also look at the incorporation of a SuDS based storm water management scheme for Wisbech Station.

A station location study has previously been carried out by Mott MacDonald during the GRIP 2 phase of work. As part of these GRIP 3 works, a 'long list' of options has been sifted down and Site 1 – Wisbech South (Town) selected as the preferred location for Wisbech Station, due to its proximity to the town centre.

The site has been assessed with regard to the requirements of the Planning Practice Guidance (PPG) and the associated Technical Guidance to determine the suitability of the proposed development on the site.

As well as fluvial flood risk the report also assesses the risk posed locally by the development itself and the runoff it may generate.

Mitigation measures and recommendations are made that will enable the site to be suitably developed while actively seeking to reduce flood risk locally.

The following guidelines and references have been used in the preparation of this report:

- National Planning Policy Framework (NPPF) Planning Practice Guidance (PPG) for **Flood Risk and Coastal Change**[1] and **Climate Change**[2]
- Department for Food and Rural Affairs (DEFRA) and Environment Agency (EA) Flood Risk Standing Advice for England[3]
- The SuDS Manual – CIRIA report C753
- Cambridgeshire County Council (CCC) Surface Water Guidance[4] and Flood and Water Supplementary Planning Document[5]
- JacksonHyder Tidal Nene Modelling Improvements 2015
- Open Source (OS) LIDAR data from DEFRA Platform

[1] https://www.gov.uk/guidance/flood-risk-and-coastal-change
[2] https://www.gov.uk/guidance/climate-change
[3] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice
[4] https://www.fenland.gov.uk/media/11611/Surface-Water-Guidance/pdf/Surface_Water_Guidance_(3).pdf
[5] https://www.cambridge.gov.uk/media/7107/cambridgeshire-flood-and-water-spd.pdf

- Wisbech Level 2 Strategic Flood Risk Assessment (SFRA)[6] and supplementary Site Specific FRA Toolkit[7]
- Fenland District Council Level 1 SFRA[8] and supplementary Flood Risk Sequential and Exception Tests Evidence Report[9]
- Mott MacDonald Geotechnical and Geo-Environmental Report, found in Appendix G of the GRIP 3 report reference 398128-009-A.

The report concludes that the development may be suitable for this location depending on passing the Exception Test, as discussed in Section 6, according to PPG and the guidance provided by Fenland District Council.

It is recommended that topographic and drainage surveys are carried out at the next GRIP stage, in addition to ascertaining water levels from relevant bodies in the area (MLC, IDB), to ensure flows from the development can be safely managed and discharged from the site. Site specific hydraulic modelling is also recommended to be undertaken to ensure that the site can be safely designed to manage and control all identified long-term residual flood risks in this area and provide safe access and egress from the site in the event of a flood.

A Flood Warning and Evacuation Plan should be implemented both during and post-construction to ensure the safety of all personnel during a flooding event.

The provision of a positive drainage system on the site may also contribute to a reduction in flood risk locally. It is demonstrated that the layout may be developed to incorporate a SuDS based system that will not only provide adequate runoff protection but will also provide an improvement in runoff quality and biodiversity.

[6] https://www.fenland.gov.uk/media/6600/Wisbech-Level-2-SFRA/pdf/120619_-_Wisbech_Level_2_SFRA_(Final_for_PDF)_Double_Sided.pdf

[7] https://www.fenland.gov.uk/media/6630/Toolkit-All/pdf/Toolkit_All.pdf

[8] https://www.fenland.gov.uk/media/3771/District-Wide-Strategic-Flood-Risk-Assessment/pdf/FDC_FINAL_Level_1_SFRA_July2011.pdf

[9] https://www.fenland.gov.uk/media/6769/Flood-Risk-Sequential-and-Exception-Tests/pdf/Flood_Risk_Sequential_Test_-_web.pdf

1 Introduction

It is proposed to develop an area of land toward the south of Wisbech town centre, Cambridgeshire, as part of the proposed reopening works for the March to Wisbech railway line. The development includes the construction of a new train station, incorporating 2 platforms, a station building and associated hardstanding including a new car park.

Several proposed station locations were previously considered, prior to this location being selected as the preferred option due to its proximity to Wisbech town centre.

The Government has placed increasing priority on the need to take full account of the risks associated with flooding at all stages of the planning and development process, to reduce future damage to property and loss of life. The National Planning Policy Framework (NPPF) Planning Practice Guidance (PPG) documents for **Flood Risk and Coastal Change** and **Climate Change** identify how the issue of flooding is dealt with in the drafting of planning policy and the consideration of planning applications.

The purpose of this report is to advise our Client and the Local Planning Authority regarding the existing flood risks associated with the development of the site and is not intended for use in planning.

Local Planning Authorities have the powers to control development in accordance with the guidelines contained in PPG, and they are expected to apply a risk-based approach regarding the location of developments with the Sequential Test, cited in Table 1. The Sequential Test sets out a sequential characterisation of flood risk, which considers the annual probability of river, tidal and coastal flooding, with the aim to keep developments out of high and medium flood risk areas.

In accordance with PPG, development sites are to be classified as follows[10]:

Table 1: Flood Zones and Appropriate Uses

Flood Zone	Appropriate Users
Flood Zone 1 - Low Probability This zone comprises land having less than 1 in 1000 annual probability of river or sea flooding (<0.1%).	All uses of land are appropriate in this zone.
Flood Zone 2 - Medium Probability This zone comprises land assessed as having between 1 in 100 and 1 in 1000 annual probability of river flooding (1%-0.1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%- 0.1%) in any year.	The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table 3 of PPG are appropriate in this Zone, subject to the Sequential Test being applied. The highly vulnerable uses in Table 3 are only appropriate in this zone if the Exception Test is passed.
Flood Zone 3a - High Probability This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.	The water-compatible and less vulnerable uses of land in Table 3 area appropriate in this zone. The highly vulnerable uses in Table 3 should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table 3 should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this should be designed and constructed to remain operational and safe for users in time of flood.

10 https://www.gov.uk/guidance/flood-risk-and-coastal-change

Flood Zone 3b - Functional Floodplain This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).	Only the water-compatible uses and the essential infrastructure listed in Table 3 that has to be there should be permitted in this zone. It should be designed and constructed to: Remain operational and safe for users in times of flood; Result in no net loss of floodplain storage; Not impede water flows; and Not increase flood risk elsewhere. Essential infrastructure in this zone should pass the Exception Test.

Source: Table 1: Flood Zones; Table 3: Flood risk vulnerability and flood zone compatibility.

Mott MacDonald has followed accepted procedure in providing the services but given the residual risk associated with any prediction and the variability which can be experienced in flood conditions, we take no liability for and give no warranty against actual flooding of any property (client’s or third party) or the consequences of flooding in relation to the performance of the service. This report has been prepared to support the Full Business Case (FBC) as part of the Governance for Railway Investment Projects (GRIP) 3 March – Wisbech Transport Corridor Study only, and is to assist our client to make an informed decision on the flood risks associated with the site development.

Allowance for the effects of climate change will be made in accordance with government recommendations in place and statistical data available at the time of writing this report. These recommendations may become more onerous and the statistical data may be revised in the future; we will not make any estimate of what changes may result from this. Please be aware that this, and other issues over which the Mott MacDonald has no control, may affect future flood risk at the development and require further work to be undertaken for which we accept no liability.

2 Existing Site

2.1 Site Location and Description

The site is located close to the town centre of Wisbech, Cambridgeshire, approximately 2.8km north-east of Peterborough. The site lies within the Fenland District Council.

The approximate National Grid Reference (NGR) for the site is E545881 N308996 and the site is approximately 1.25 hectares (ha) in area. The nearest postcode is PE13 2RJ which relates to a mixed-use business park, comprised of a used-car dealership, an auto-parts shop, and a car scrap yard. A site location plan is included in Appendix A.

Aerial imagery suggests that currently located within the proposed site boundary are a tarmac ready-mix plant, an existing access road, part of the adjacent used-car dealership and a vegetated area. The site is bound by a factory and associated car parking to the north, a strip of vegetation to the east, beyond which is a residential area, a car scrap heap to the south and the mixed-use development to the west.

Open Source (OS) LIDAR data indicates that the site generally slopes from east to west. Levels across the site vary from approximately 2.9mAOD in the south-western corner to 4.3mAOD along the north-eastern boundary.

2.2 Existing Site Drainage

The site comprises both developed and greenfield land. It is unclear from the available information how the various developments on the site are drained at present, however, it is assumed that they discharge into the Internal Drainage Board (IDB) watercourse crossing the site, discussed in more detail below in Section 2.3.

2.3 Existing Watercourses

The site lies within the Middle Level river system, the largest catchment area in the Fenlands. It is noted that virtually all of the Middle Level area lies below mean sea level, however the Fenland Strategic Flood Risk Assessment (SFRA) for the area states that Wisbech is located on an 'island' of higher ground above the fens.

A network of defended rivers and drains are present in the Middle Level area, the majority of which are privately owned and maintained. Three statutory bodies – the Environment Agency (EA), the Middle Level Council (MLC) and the Hundred of Wisbech Internal Drainage Board (IDB) – are active in the area and are each responsible for the remaining watercourses.

An IDB District Drain, as identified on the IDB map in Appendix B flows around and is assumed to be culverted under the site at various points – once to the west and again in the south. The assumed direction of flow is from north to south, as indicated on the Wisbech Station Car Park Proposed Drainage Strategy drawing in Appendix C. At the time of writing, no further information about this watercourse, including water levels, is available and levels have been inferred from topographical data.

The site is approximately 240m from the right bank of the tidal River Nene. The River Nene is tidal for approximately 56km, flowing eastwards for around 22km from the Dog in a Doublet lock no. 38 to Wisbech, before flowing north toward the mouth of the river at The Wash.

3 Sources and Extents of Flood Risk

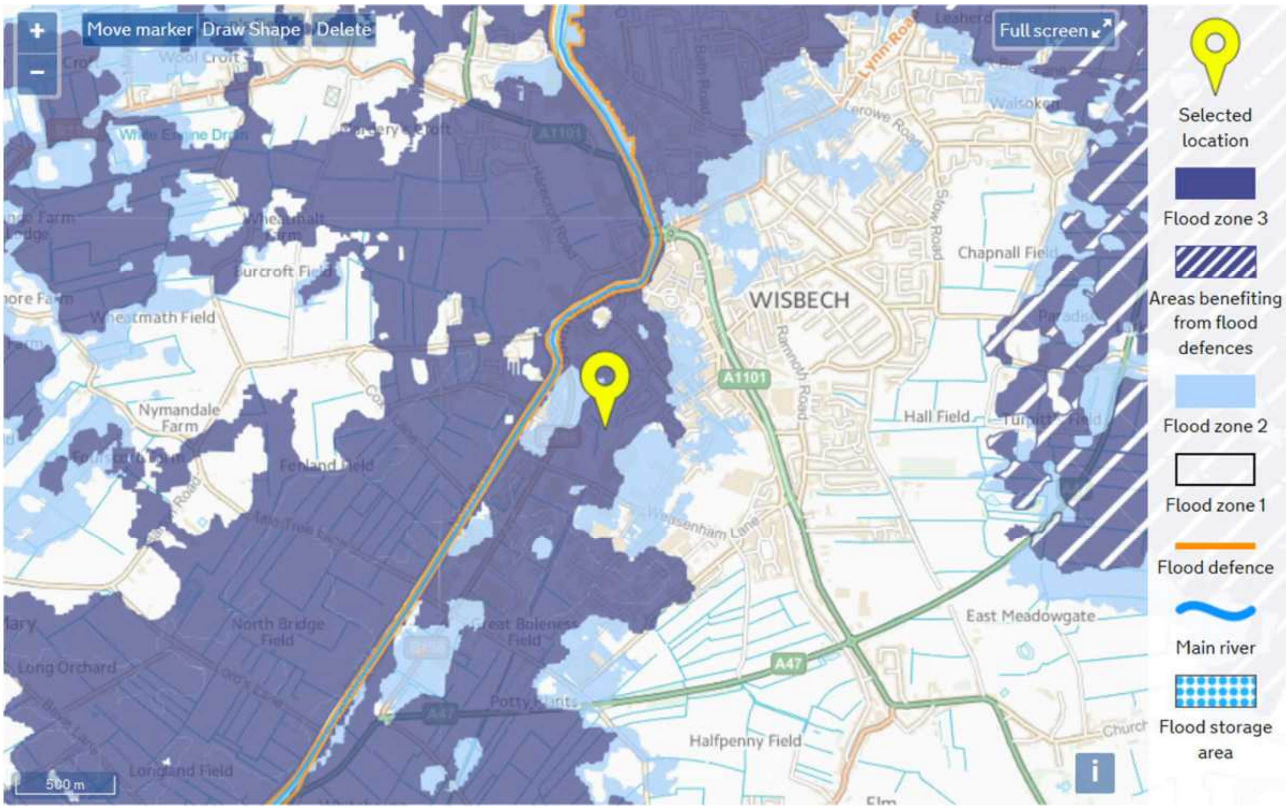
3.1 Natural Drainage

3.1.1 Fluvial/Tidal Flood Risk

The development site lies approximately 240m to the east of the River Nene, designated as a Main River by the Environment Agency.

Figure 1 below is an extract from the Environment Agency's (EA) online indicative Flood Map for Planning. The map shows the site to be in Flood Zone 3 (see Table 1).

Figure 1: Flood Map for Planning (Rivers and Sea)



It should be noted that the flood map indicates the area at risk of flooding for a 1% AEP (fluvial) or 0.5% AEP (tidal) event, whichever is greater, assuming no flood defences exist. A response received from the EA for flood risk information states that the Flood Map may provide a slightly misleading picture of the flood risk in areas like the Fens, such as Wisbech. If there were no flood defences, flooding could spread out across large areas of floodplain as shown but be relatively shallow in depth, leaving pockets of locally higher land as isolated dry islands. EA correspondence is included in Appendix C, for reference.

The Flood Map also represents the area at risk of flooding for present day only and does not take into account the possible changes in the future probability of flooding due to the impacts of climate change.

The EA response in Appendix C states that the site is protected from flooding by flood defences consisting of earthen embankments and concrete floodwalls. They are noted to be in a fair condition and reduce the risk of flooding (at the defence) to a 0.5% AEP (1 in 200 year) chance of flooding and 50 years of climate change has been allowed for (increasing the climate change horizon to the year 2056). The response in Appendix C also includes output maps from hydraulic modelling undertaken in 2011 including the most recent hazard mapping for breach modelling. However, more recent flood modelling for overtopping of the defences was undertaken by JacksonHyder in 2015 as part of the Tidal Nene Modelling Improvements Report. Output flood mapping from this report is included in Appendix E.

The 2011 breach output maps indicate that the site floods for all modelled breaches (2011 "present day" and 2115) for both modelled flood events, 0.5%AEP (1 in 200-year) and 0.1%AEP (1 in 1000-year). For the year 2115 1 in 1000-year flood event, much of the site is shown to flood up to depths of 1.0m and the IDB watercourse flowing through the site is shown to flood up to depths of 1.6m and over. The proposed carpark and access roads are shown to be at higher-risk of flooding to greater depths, whereas the station and platform are shown to be in an area at a lesser risk.

The maximum velocity of flooding is shown to be between 0 and 1.0m/s. The maximum hazard rating for the site is considered to be between Danger for Most and Danger for All[11].

The 2015 overtopping output maps indicate that part of the site floods during a 1 in 1000-year flood event plus climate change up to depths of 0.25m. For the same flood event, a small area toward the south of the site, which corresponds both with the location of the proposed car park and the existing IDB District Drain, is shown to flood up to a depth of 2.0m. Surrounding areas are also shown to flood to various depths.

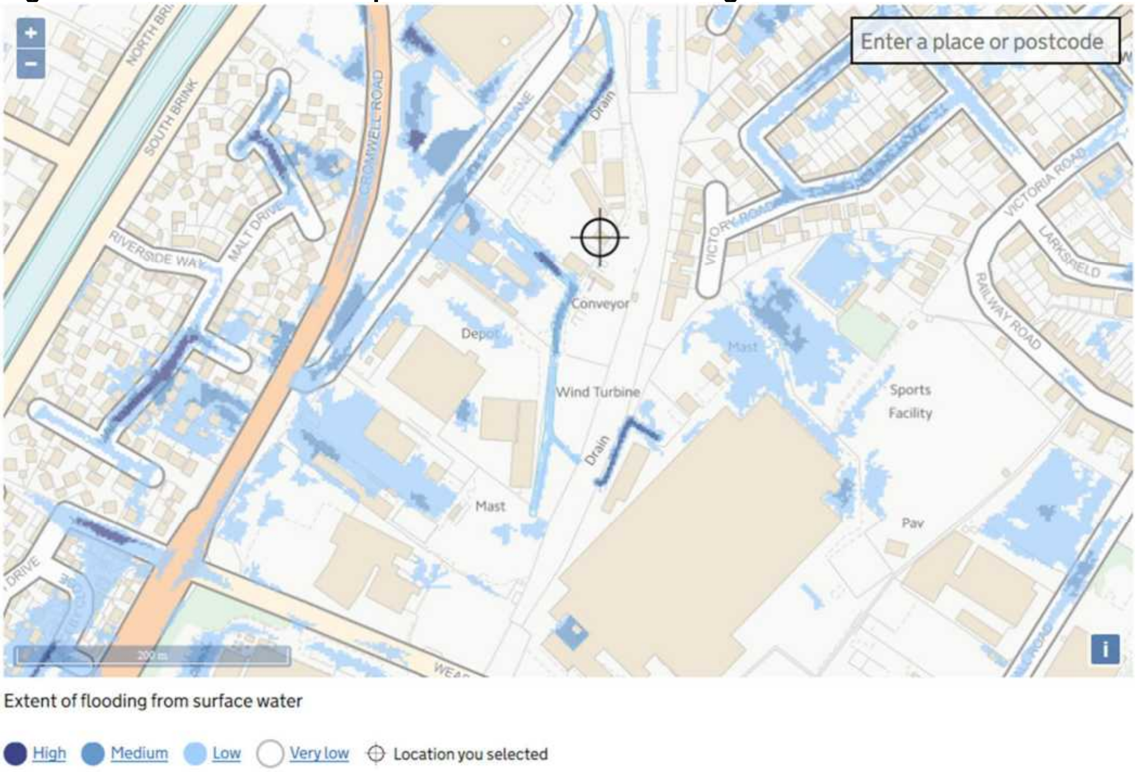
It should be noted that the principal flood risk to the site will be the risk of flooding from this source (fluvial/tidal) during both construction and operation. Please refer to Sections 6 and 7 for mitigation measures to protect from this source of flooding.

3.1.2 Pluvial Flooding

With reference to the EA's indicative flood maps, data related to the risk of potential surface water inundation is provided overleaf in Figure 2. The site is shown to be mostly in an area at a very low risk from surface water flooding.

[11] Hazard ratings as per DEFRA/Environment Agency Flood Risks to People Guidance Document FD2321/TR2

Figure 2: EA Online Flood Map for Surface Water Flooding



Source: © Crown copyright and database rights 2019 OS 100024198.

The areas of low to high surface water flood risk surrounding the site correspond to the IDB District Drain, identified in Section 2.3.

Water level management systems are in place throughout the catchment and surface water is primarily managed via regular pumping to discharge surface water from the local watercourses into the River Nene.

An historical surface water flooding event from 1978 is recorded in the district-wide Fenland SFRA, which occurred when discharge of surface water via pumping was been impeded by high tides. The mapped extents of this flood are included in Appendix C, and the map shows the majority of the site to be outside the affected area. Land to the north and west of the site is shown to be at risk, with the extents of the flood encroaching onto the proposed access road to the site.

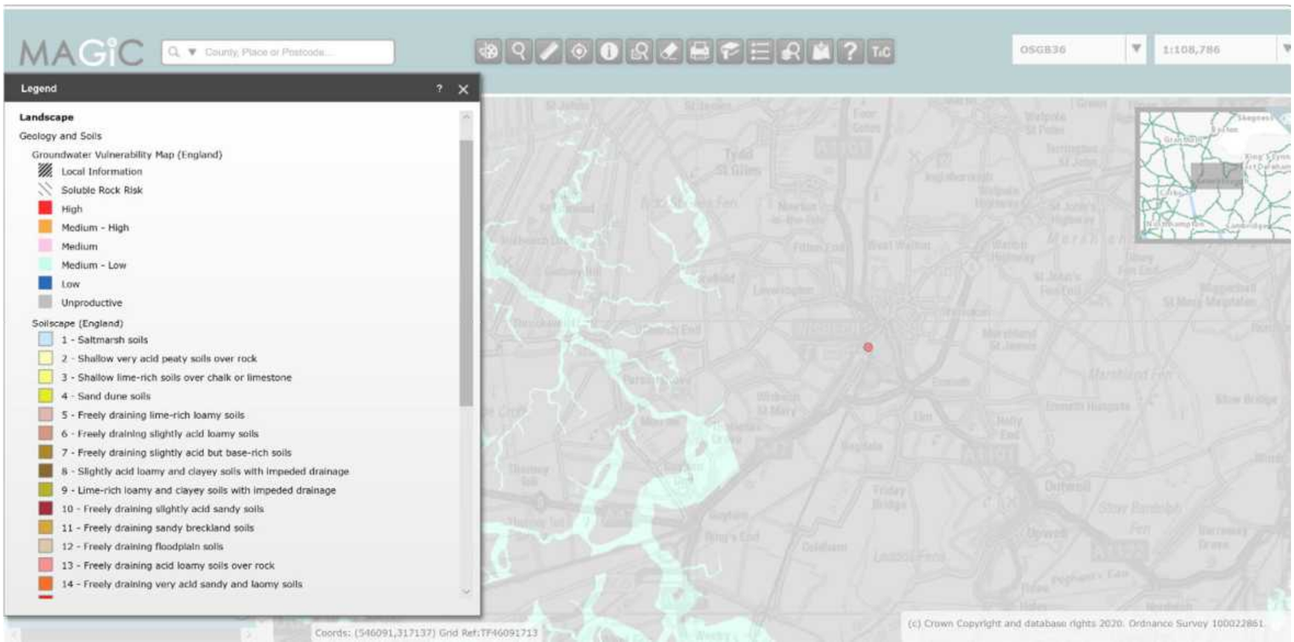
A similar flood occurred in 2013, whilst flood defences were under construction, in that unexpectedly high-tide levels caused a surge which backed-up surface water pipes in the area.

The risk of flooding from this source lies outside of the development site, as existing surface water systems in the area are influenced by external factors. Mitigation from this source of flooding is therefore more difficult. The site will be developed to incorporate a positive surface water drainage strategy. Please see Section 7.2 for more detail on mitigation measures related to surface water flooding during construction.

3.1.3 Groundwater

With reference to groundwater information provided by the British Geological Society (BGS), data related to the risk of potential groundwater issues is provided below. Figure 3, an extract from DEFRA's online Magic Map, shows the site to be underlain by unproductive strata. The site is also shown to be underlain by Soilscape class 21, loamy and clayey soils of coastal flats with naturally high groundwater.

Figure 3: DEFRA Magic Map for Groundwater Vulnerability and Soilscape



Source: (c) Crown Copyright and database rights 2020. Ordnance Survey 100022861.

The EA defines unproductive strata as layers of rock or drift deposits with low permeability and which have a negligible significance for water supply or river base flow.

Three boreholes close to the site have been identified using the BGS Geology of Britain Viewer. The deepest borehole is 6.0m below ground level (mbgl) and soft silts and clays were identified in each. Reference is made to Section 3.3.1.2. of the separately issued Geotechnical and Geo-Environmental Desk Study for the scheme, which notes that groundwater was not encountered in the boreholes near to or on the site. Groundwater monitoring information approximately 360m west of the station site indicate groundwater levels between 0.60 – 2.10mbgl.

Given the above and the relatively low-lying topography, it is recommended that groundwater monitoring is carried out at the next stage as part of any ground investigation.

3.1.4 Climate Change

The Environment Agency requires, in accordance with the NPPF, for there to be no increase in the rate of surface water emanating from a newly developed site above that of any previous development. Furthermore, it is the joint aim of the Environment Agency and Local Planning Authorities to actively encourage a reduction in the discharge of storm water as a condition of Approval for new developments. In addition, all drainage systems should be sized to accommodate the runoff arising from a 1 in 100-year rainfall event and should include a further allowance to account for the future effects of climate change. Table 2 below has been reproduced in part from Tables 1 and 2 of NPPF "flood risk assessments: climate change allowances"[12] and shows the anticipated increases in rainfall intensities and river flows with time.

Table 2: Recommended National Precautionary Sensitivity Ranges for Peak Rainfall intensities and Peak River flows

Type	Applies across all of England	2015 to 2039	2040 to 2069	2070 to 2115
River Basin - Humber	Upper End	20%	30%	50%
	Central	10%	15%	25%
Rainfall	Upper End	10%	20%	40%
	Central	5%	10%	20%

Source: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

It is assumed that the development will have a proposed design life of 50 – 100 years, which if constructed this year will be until 2070 – 2120. Therefore, a minimum climate change value for rainfall of 20% should be used for drainage design and 40% for checking. The proposed development is deemed to be Essential Infrastructure in Flood Zone 3 (see Table 1); PPG therefore advises that the upper end allowance of 50% river flows should be applied for the development.

3.2 Artificial Drainage

3.2.1 Adopted Drainage

Sewer records are not available at the time of writing.

3.2.2 Highway Drainage

Gullies and kerbs shown on aerial imagery indicate the presence of a positive drainage system along the existing access road onto the site, Oldfield Lane. Levels indicate that the lane falls from north-south, and it is assumed that runoff from this source discharges into the IDB District Drain which crosses the site.

At the northernmost point of Oldfield Lane is a junction, which sits at a higher elevation than the development site. Aerial imagery indicates that formal road drainage does not presently extend down towards the development site and a temporary road surface currently serves as an access road. Levels indicate that this road has a longitudinal fall towards the site and a cross-fall from east to west, indicating that runoff may discharge directly into the IDB District Drain.

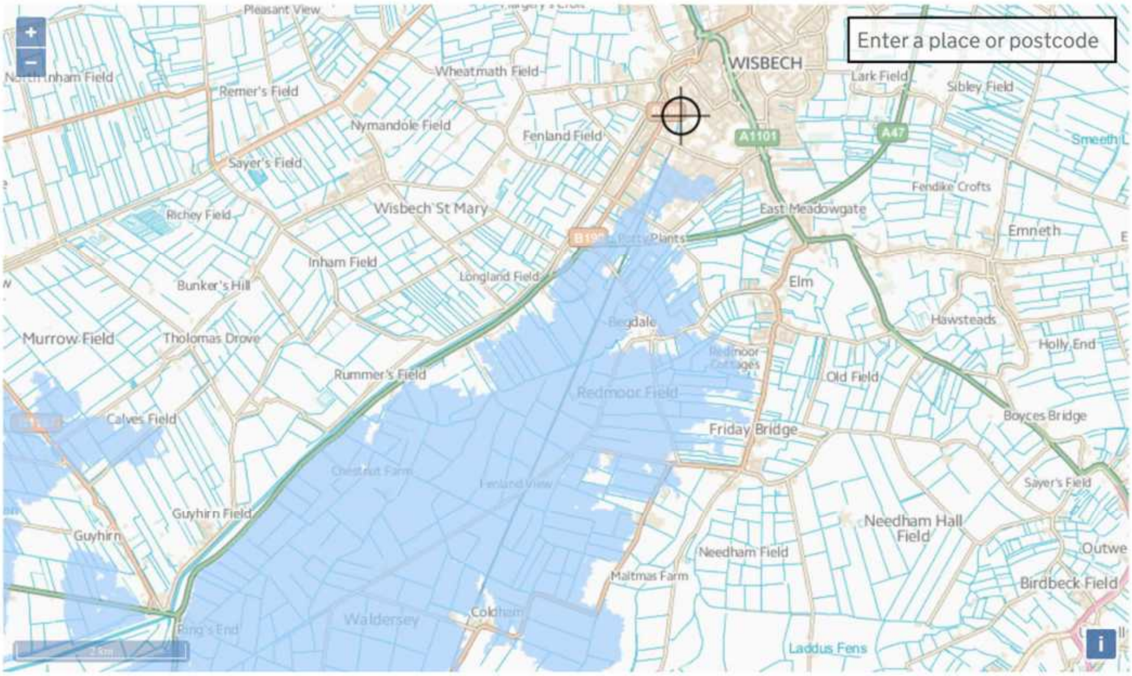
As part of the works, it is proposed to formalise this access road to create one of two primary access and egress routes onto the site, with the other providing access to the proposed car park further south. It is proposed to install combined kerb drainage along the access roads, as can be seen in the proposed drainage drawing in Appendix C. As such, flooding from this source is considered to be a low risk.

[12] Flood risk assessments: climate change allowances

3.2.3 Reservoir Flooding

With reference to the EA’s indicative flood maps, data related to the risk of potential reservoir flooding is provided in Figure 4, below. The EA’s online mapping shows that the Wisbech station site is not at risk from reservoir flooding.

Figure 4: EA Online Flood Map for Reservoir Flooding



Extent of flooding from rerservoirs

Maximum extent of flooding Location you selected

Source: © Crown copyright and database rights 2019 OS 100024198.

However, as can be seen from the figure, much of the railway alignment is at risk of flooding from reservoirs up to a depth of 2.0m.

Although an identified flood risk, the probability of reservoir flooding occurring is relatively low with the effect of an incident reduced by adopting resilient construction methods. Please refer to Section 7 for mitigation measures to protect from this source of flooding during construction.

3.2.4 Development Drainage

The drainage strategy should also include measures to improve run-off quality whilst maximising biodiversity and amenity to provide a sustainable drainage system as noted in PPG-TG.

The proposed access roads are to be of standard construction except where noted on the Proposed Drainage Strategy in Appendix C. It is proposed for the car park to be drained via permeable paving and the southern-most area of the car park is proposed to have a shallow build-up to allow for crossing the existing culvert. Permeable paving must be regularly maintained to ensure that the system performs as designed and does not become less effective due to silt build-up or weed growth.

At the time of writing, the proposed Wisbech station building is to be developed in more detail at the next GRIP stage and as such, the current drainage strategy primarily deals with the proposed car park and access roads. It is unknown at present whether there will be any foul flows emanating from the proposed station building. Surface water runoff from the station building is proposed to be collected via linear channels and attenuated within permeable paving subbases.

The biggest flood risk to this site remains to be flooding from fluvial sources. The site is classified as being within Flood Zone 3, as discussed in Section 3.1.1, and is protected by flood defences.

4 Drainage Strategy

Please refer to Section 5.8.1.2 in the GRIP 3 Heavy Rail Multi-Disciplinary Option Selection Report reference 398128-009-A for the detailed proposed drainage strategy for the site. The accompanying Proposed Drainage Strategy drawing (398128-MMD-00-XX-DR-D-0010) can be found in Appendix C.

At the time of writing, the proposed Wisbech station building is to be developed in more detail at the next GRIP stage and as such, the current drainage strategy primarily deals with the proposed car park and access roads.

The calculations that have been carried out to size the proposed attenuation have been for a 1 in 100-year event plus 40% climate change allowance. Two outfalls are proposed, each restricting discharge to 2.0l/s and 6.9l/s; the latter providing a 50% betterment compared to the existing hardstanding unrestricted runoff rate. A total combined storage volume of 33 + 112 + 950 = 1095m^3 is provided in the permeable subbase.

5 Sequential Test

The Sequential Test is designed to allocate development sites with the lowest flood risk in the first instance. Where such sites do not exist, the test allows Local Authorities to allocate developments in land within Flood Zone 2 for appropriate levels of flood risk.

Only where all reasonable sites have been assessed in Flood Zone 1 and 2 can Flood Zone 3 sites be considered.

The proposed Wisbech Station Town Centre (South) development site is shown to be within Flood Zone 3 and outside the influence of any other local flood risk elements.

In accordance with Table 3 of the NPPF Flood Risk and Coastal Change Guidance[13], it is concluded that the development is Essential Infrastructure and thus an Exception Test is required.

Given the above, it is considered that the Sequential Test has been passed in lieu of a feasible alternative site location within Flood Zone 1. The RFI response from the EA in Appendix C is also considered to support the Sequential Test, which states that flooding in areas such as Wisbech could be relatively shallow in depth (refer to Section 3.1.1 for a more detailed discussion).

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575184/Table_3_-_Flood_risk_vulnerability_and_flood_zone__compatibility_.pdf

6 Exception Test

Essential infrastructure should be designed and constructed to remain operational and safe for users during its lifetime and it is necessary to provide evidence to show that the site can be safely accessed and operated during an extreme flooding event. This is called the Exception Test.

The test is split in to two parts:

1. Demonstration of wider sustainability benefits;
2. Demonstration that the site is safe.

The Level 2 SFRA for Wisbech and the Level 1 SFRA for the Fenland district provide supporting information for the Exception Test, and reference has been made to these below.

6.1.1 Wider Sustainability Benefits

The development of this site has a few key sustainability benefits. As part of the wider scheme, the reopening of the March Wisbech railway line is being considered to bring a major boost to the economy of North Cambridge, one of the largest towns in the UK without direct access to a rail network. The scheme is part of The Cambridgeshire and Peterborough Combined Authority's Local Transport Plan for the area, and in combination with several other schemes, is forecast to significantly improve employment prospects for residents.

The closest railway station at present is the existing March station, which is difficult to access via public transport and is a 20-minute car drive away. The provision of the new train station in Wisbech town centre may contribute to a reduction in emissions in the area by promoting the use of public transport.

Wisbech is included in the River Nene Strategic Area 1 within the Cambridgeshire Green Infrastructure Strategy. The town is reportedly a focus area for sustainable growth and economic development, and development of the area can be highlighted as an influence for effective mitigation and adaptation to climate change.

6.1.2 Safe Operation

The site is protected from flooding by existing defences noted to be in a fair condition up to a 0.5% AEP (1 in 200 year) tidal flood plus climate change up to the year 2056. Findings from the Wisbech Level 2 SFRA include that Wisbech is currently well-defended from the risk of flooding. The 2015 flood model outputs in Appendix E indicate that part of the site floods during a 0.1% (1 in 1000 year) flood event plus climate change over-topping scenario up to depths of 0.25m. For the same flood, a small area toward the south of the site, which corresponds both with the location of the proposed car park and the existing IDB District Drain, is shown to flood up to 2.0m deep.

A proposed station plan is not available at this stage, however, a recommended minimum finished floor level (FFL) that will provide passive residual protection to the station building fabric for the lifetime of its operation based on the most up to date flood modelling available at this stage can be estimated. NPPF guidance states that the ground floor level should be a minimum of 600mm above the anticipated flood level. This will ensure, that as far as is practicable, the station will be safe from flooding.

A proposed level for the station platform can be inferred from track alignment drawing 398128-MMD-00-XX-DR-P-0013. The height of the platform will be 0.915m above the track, which has a highest proposed level of 3.826mAOD. The platform will therefore be
3.826 + 0.915 = 4.741mAOD. Given the predicted flood depth of up to 0.25m in this location, as discussed in Section 3.1.1 it is therefore recommended that the minimum ground floor level be 4.741 + 0.25m + 0.60m = 5.591mAOD.

In the event of a flood, it is necessary to provide safe pedestrian access and egress from the site, particularly for a breach scenario. The station should develop a Flood Warning and Evacuation Plan (FWEP) that will enable the station to be safely evacuated when high-flood levels are anticipated in the River Nene. Given the presence of existing defences and the tidal nature of the flooding, there will be sufficient time to execute the evacuation plan ahead of any overtopping scenarios associated with extreme tidal events. This will also permit the implementation of business continuity and resilience measures at the same time.

A breach event is unpredictable by nature, though is less likely to occur if defences are maintained and kept in a good condition. The EA note that the defences at Wisbech are in a 'fair' condition. Both proposed access roads to the site tie-in to Oldfield Lane, which is indicated to flood up to a depth of 1.0m along its length for both modelled overtopping and breach flood scenarios. Several areas surrounding the site are also shown to be flooded to various depths.

The modelled breach flood map outputs in Appendix D indicate that a safe pedestrian exit route may be possible toward the south of the site, heading south alongside the track and east along Weasenham Lane, away from the river. The proposed site plan will require further development to ensure that safe access and egress for users of the train station and the emergency services is achievable.

6.1.3 Conclusion

Given the above evidence it is considered that the site may pass the Exception Test, however, it will be necessary to review the current proposed site plan at the next GRIP stage to ensure safe access to/from the site can be maintained in the event of a flood and that the site remains operational.

In tandem, it will also be necessary to review the flood resilience and mitigation recommendations made in this report when site specific hydraulic modelling has been carried out and a design flood level agreed upon.

During and post-construction, it is recommended that the station site be included in the EA's flood warning scheme and for there to be a Flood Warning and Evacuation Plan (FWEP) in place to provide safe egress in the event of a flood, this is discussed in more detail in Section 7.1.

7 Flood Mitigation

7.1 Flood Warning and Evacuation Plan

As the site is wholly within Flood Zone 3, it is essential to have a Flood Warning and Evacuation Plan (FWEP) in place during construction of the scheme within Flood Zone 2 and 3 and operation (of Wisbech Station). A FWEP is a key document that accompanies FRAs in Flood Zones 2 and 3, and it helps ensure that there are measures in place to assure the safe evacuation of people in the event of a flood. The document is a requirement under NPPF[14] and should include potential evacuation routes and information relating to flood warnings and emergency contacts.

The station site is currently protected by flood defences that are noted to be in a fair condition and will provide a standard of protection for the area up to a 0.5% AEP (1 in 200-year) event plus climate change. It is good practice to ensure defences are inspected and maintained prior to and throughout construction.

As the majority of the land in the Middle Level area is situated below mean sea level, it is necessary to consider an overtopping scenario of the defences. It is essential that Early Flood Warnings are agreed with the EA and a designated person be responsible for maintaining contact with the EA during rainfall events. The development site should be registered with the EA's Flood Warnings Direct scheme.

A FWEP should be put in place prior to construction and another put in place and reviewed annually during the operation of the Station. Further guidance on Flood Warnings and Evacuation Plans can be found in the Wisbech Level 2 SFRA in Sections 1.3.6 to 1.3.9.

The FWEP for the wider scheme should also include emergency procedures in the event of flooding from a Reservoir breach.

7.2 Construction

During construction, any site compounds and welfare facilities should be included in the FWEP and positioned in an area that is shown to be outside of a flood envelope, at a higher elevation than the construction site.

Within a compound area the more vulnerable elements of the installation, including welfare facilities, stores and power and utilities, should be considered for installation in the least vulnerable parts of the compound and within these areas critical infrastructure should be located as high as possible from the ground.

As a site compound is a temporary structure, the runoff generated from it is not typically calculated as the effects of runoff are deemed to be minimal. It is recommended that the area of a compound be built-up using a free-draining material to minimise any run-off effects and the contractor must put in place a suitable system for either storing or discharging surface water. Considering groundwater, the contractor must ensure that suitable pollution control measures are put in place during construction to ensure that groundwater does not become contaminated.

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[14] Paragraphs 056 – 058 of NPPF guidance for Flood Risk and Coastal Change

Foul flows from any welfare units on site should be separately drained and contained, with a maintenance regime in place prior to construction. It is recommended that the contractor uses a suitable system such as a tank storage system or self-contained portable welfare systems.

The FWEP must be put in place prior to construction.

7.3 Post Construction

The FWEP is a live document and should be reviewed yearly to ensure it is up to date.

The station building should be designed with effective flood resilience and mitigation measures, this will include but not be limited to; elevated utility entries to the building, elevated utility meters, first floor down electricity sockets, solid construction walls and floors on the ground floor, non-return valves on sanitary fittings at ground level. A decision should be made early in the design development of the station as to whether it will be designed to be flood resilient or flood resistant. This decision should be made by the owner/operator of the facility.

Active management of surface water runoff is discussed in Section 4. The proposed works include the installation of a positive drainage system, formalising the current overland flow route toward the IDB watercourse. It is recommended that Sustainable Drainage Systems (SuDS) are a primary element of the proposed drainage collection and treatment systems. In line with Cambridgeshire County Council SuDS guidance, permeable paving has been selected as the primary means of surface water collection and attenuation at this stage due to its proven and effective application in car parks. The proposed drainage design can be seen in Appendix C.

7.4 Flood Routing

It is necessary to ensure that during a fluvial/tidal flooding event, water is able to drain back into the IDB ditch. It is important that overland flow routes to the watercourse are therefore not blocked or any vulnerable facilities placed within the path both during and after construction.

The proposed external level strategy of the site should match the existing, falling towards the watercourse.

7.5 Summary

Flooding from fluvial/tidal sources remains the primary long-term flood risk to this site. A robust Flood Warning and Evacuation Plan must be developed in conjunction with relevant parties including the Lead Local Flood Officer and/or Fenland District Council prior to construction. The FWEP for the wider scheme should also include emergency procedures in the event of flooding from a Reservoir breach.

In the ongoing development of the site, flood resilience and mitigation should be a key issue and it is recommended that site-specific hydraulic modelling is undertaken so that these issues can be addressed in full.

The application of a SuDS based system must be considered as the primary measure for dealing with surface water for any proposals, as these systems will provide the required level of treatment for runoff generated by the development. The natural topography and nature of the site is such that the construction of a combination of permeable paving, combined kerbs and linear drains are recommended to be suitable and provide the correct level of treatment for the runoff.

8 Conclusions and Recommendations

Following this assessment, it is considered that the site can be classified as being within Flood Zone 3 and is currently in an area benefiting from flood defences up to a 1 in 200-year flood event plus climate change until the year 2056. The site is not shown to flood for overtopping of the defences for this return period plus 50 years' climate change.

Flood modelling has been carried out for both overtopping and breach scenarios for 1 in 200-year and 1 in 1000-year flood events. The breach output flood mapping from 2011 indicates that the site floods for all modelled breaches (2011 “present day” and 2115) for both flood events. The site is shown to flood up to depths of 1.0m for the 2115 event and the IDB watercourse crossing the site is shown to flood to depths of 1.6m and over. The station and platform are shown to be in an area at a lesser risk than the proposed carpark and access roads. The maximum velocity of flooding is shown to be between 0 and 1.0m/s and the maximum hazard rating for the site is considered to be between Danger for Most and Danger for All[15].

The 2015 overtopping output maps indicate that part of the site floods during the 1 in 1000-year flood event plus climate change up to depths of 0.25m. For the same flood event, a small area toward the south of the site corresponding to the location of the proposed car park and the existing IDB District Drain, is shown to flood up to a depth of 2.0m.

To ensure that as far as is practicable the station will be safe from flooding, a minimum Finished Floor Level (FFL) is recommended to provide passive residual protection to the station building fabric for the lifetime of its operation. Based on current proposed levels for the track, a minimum ground floor FFL of 5.59mAOD has been inferred.

For the work itself to be carried out safely and for the station to remain safe and operational in the event of a flood, the site should be included in the EA's Flood Watch scheme and a suitable and robust Flood Warning and Evacuation Plan developed for the site prior to construction. The FWEP is a necessary document for planning and should be kept as a live document once the site is in operation.

It is recommended that hydraulic modelling be carried out at the next GRIP stage to address a variety of issues raised by this Flood Risk Appraisal. Necessary next steps include the determination of safe access and egress routes from the proposed station in the event of a flood and the development of the station design with necessary flood mitigation and resilience measures put in place (as discussed in Section 7).

The Wisbech Level 2 SFRA advises that any development in Flood Zone 3 should be discussed with Fenland District Council's development management planners prior to planning approval being sought.

It is important to note that the wider scheme is at risk of flooding from reservoirs and this risk should be addressed in the FWEP.

The area has an historical record of surface water flooding associated with high-tides on the River Nene. As this influence lies outside of the development site, it is difficult to mitigate this

[15] Hazard ratings as per DEFRA/Environment Agency Flood Risks to People Guidance Document FD2321/TR2

source of flooding as part of the development. Flood mitigation and resilience measures established in response to the primary fluvial flood risk to the site should inherently provide some protection from this source of flooding.

The flood risk associated with other viable sources of flood potential has been evaluated and deemed to be sufficiently low and/or manageable during the construction of and lifetime of the development, indicating that the development may be suitable for this location pending the determination of safe access to/from the site in the event of an extreme tidal flood event.

The management of flows generated by the development is proposed to be via linear channels/combined kerbs and attenuation is to be provided via permeable paving. The proposed attenuation has been designed for a 1 in 100-year flood event with a 40% allowance for climate change. The total combined storage volume provided in the permeable subbase is $1095m^3$.

Two outfalls, restricted to 2.0l/s and 6.9l/s, are proposed to discharge into the IDB watercourse; the latter providing a 50% betterment compared to the existing hardstanding unrestricted runoff rate. Consent must be sought for these proposed connections and ongoing maintenance will be required to ensure the system performs as designed. The proposed drainage strategy can be seen in Appendix C and reference is made to Section 5.8.1.2 in the GRIP 3 Report 398128-009-A for further detail on the proposed drainage strategy for the site.

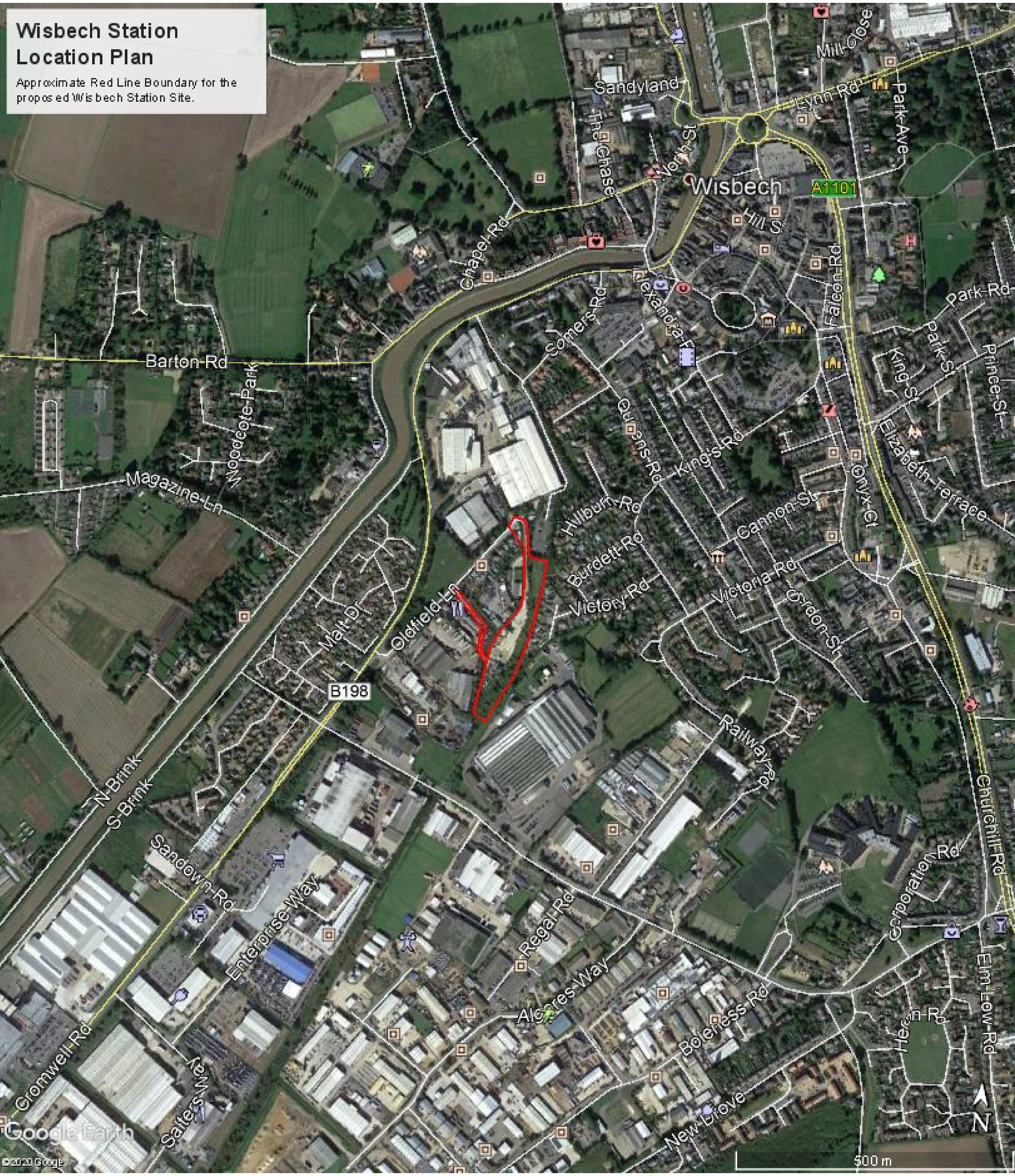
It is recommended that groundwater monitoring is carried out at the next stage as part of any ground investigation. Topographical and drainage surveys are also recommended to be undertaken and the IDB watercourse level information should be sought.

During construction, consideration should be given to the location of stored materials, plant and the site compound. The most vulnerable assets should be situated at a higher elevation and be outside of a flooding envelope. The recovery of plant and materials should also be included in the FWEP. It is also recommended that site compound and welfare areas are built-up using a free-draining material and that any foul flows are collected separately and stored above the anticipated flood level.

Whether there will be any foul flows emanating from the proposed station is to be confirmed at the next GRIP stage and subsequent design will be dependent on sewer records.

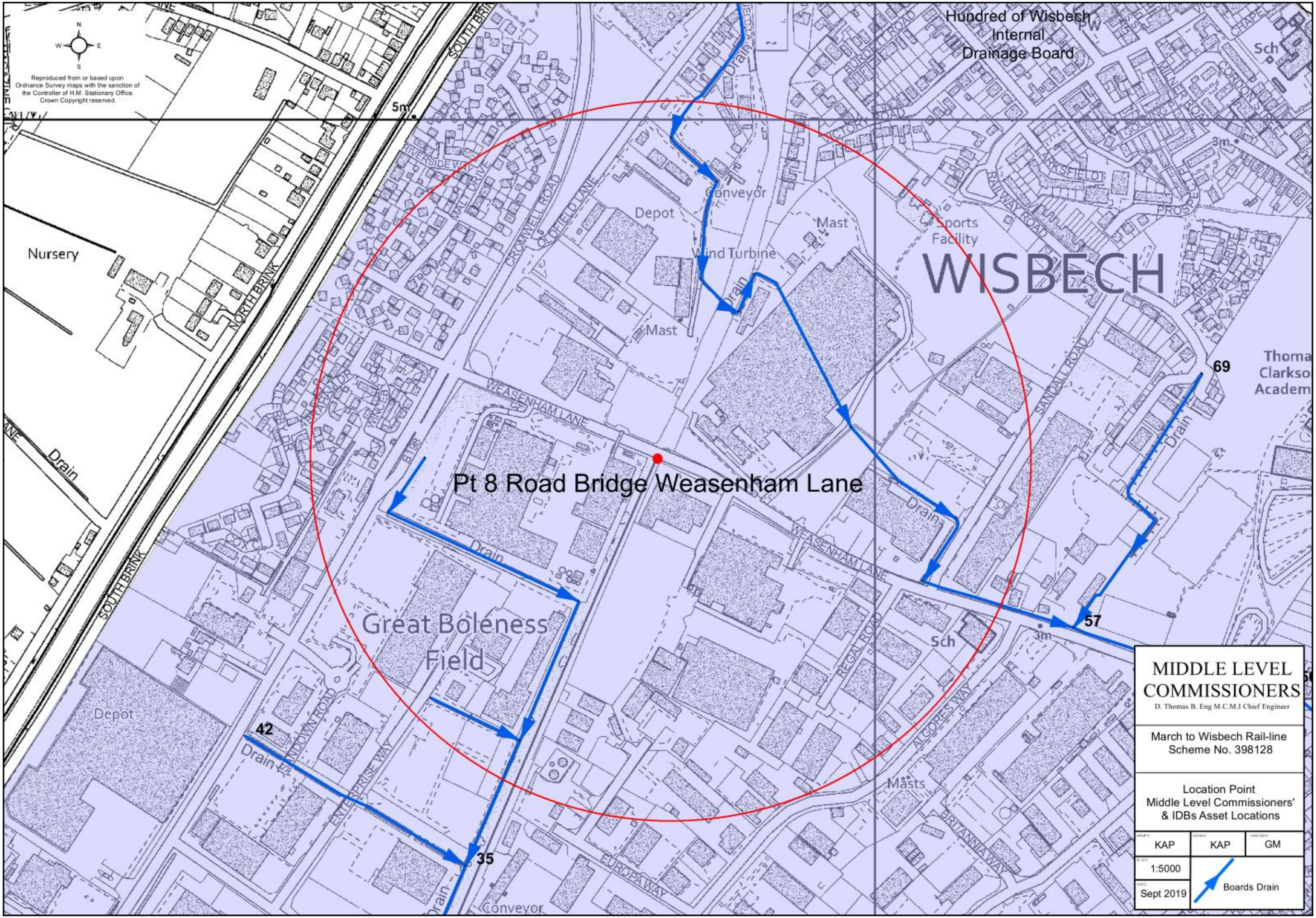
Appendices

A. Site Location Plan



Wisbech Station
Location Plan
Approximate Red Line Boundary for the proposed Wisbech Station Site.
Wisbech
A1101
B198
Sandyland
Mill Close
Lynn Rd
Park Ave
The Chase
North St
Hill St
Chapel Rd
Falcon Rd
Park Rd
Somers Rd
Alexandra Rd
Barton Rd
Woodcote Park
Queens Rd
King's Rd
King St
Prince St
Elizabeth Terrace
Magazine Ln
Hilburn Rd
Cannon St
Onyx Ct
Burdett Rd
Victoria Rd
Victory Rd
Oldfield Ln
Malt Dr
Cyldon St
Railway Rd
N Brink
S Brink
Churchill Rd
Sandown Rd
Enterprise Way
Rega Rd
Corporation Rd
Algores Way
Boleness Rd
Elm Low Rd
Cromwell Rd
Salters Way
New Drove
N
500 m
Google Earth
© 2020 Google

B. Middle Level Commissioners and Internal Drainage Boards Asset Location Map



MIDDLE LEVEL COMMISSIONERS
D. Thomas B. Eng M.C.M.I Chief Engineer
March to Wisbech Rail-line
Scheme No. 398128
Location Point
Middle Level Commissioners' & IDBs Asset Locations
KAP
KAP
GM
1:5000
Sept 2019
Boards Drain
Pt 8 Road Bridge Weasenham Lane
Hundred of Wisbech Internal Drainage Board
WISBECH
Great Boleness Field
Weasenham Lane
Nursery
Depot
Drain
Mast
Wind Turbine
Conveyor
Sports Facility
Thomas Clarkson Academy
North Brink
South Brink
Cromwell Road
Sandall Road
Enterprise Way
Europa Way
Algores Way
Britannia Way
Regal Road
Masts
Sch
69
57
42
35
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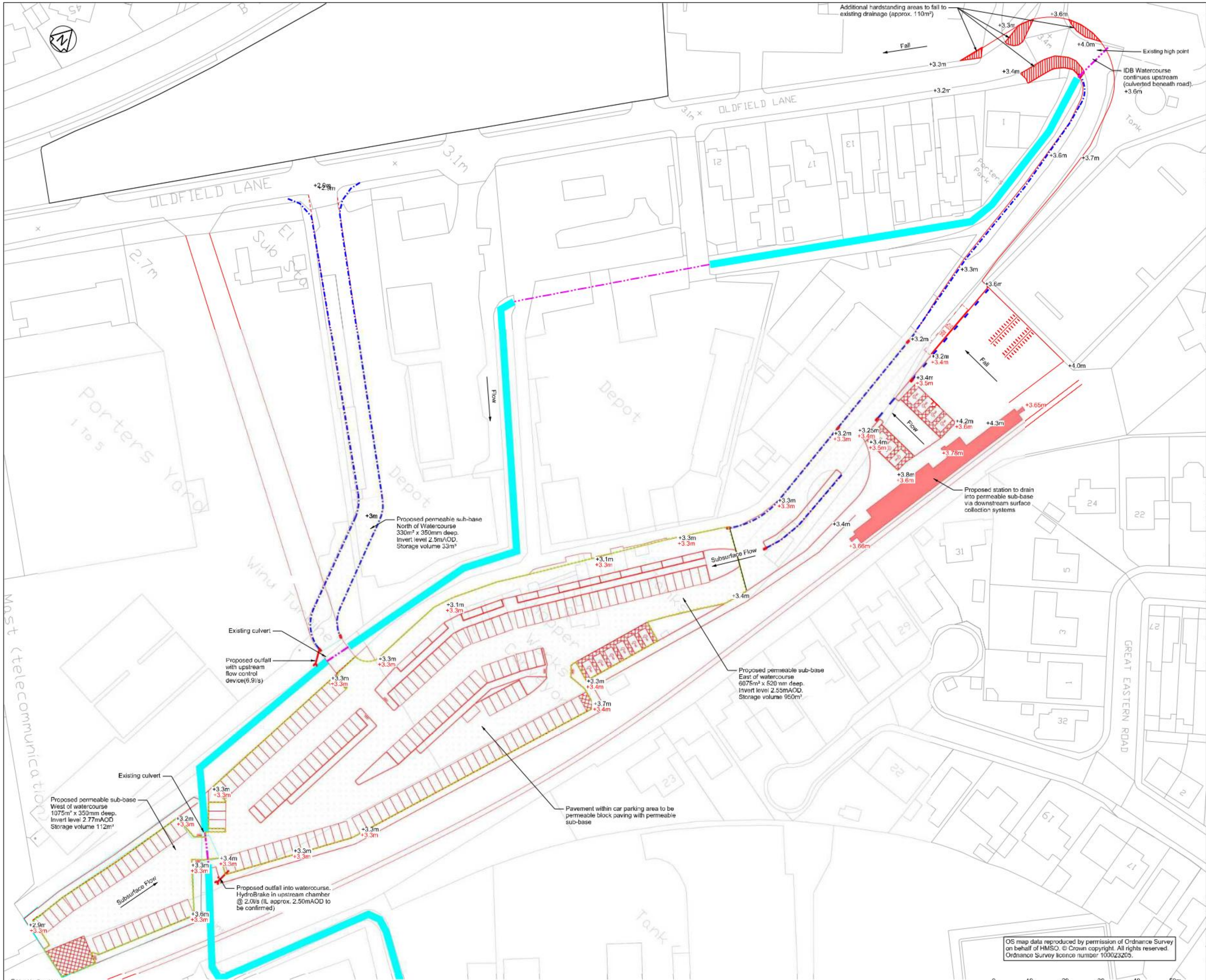
C. Proposed Drainage Strategy



General Arrangement
1:500

Notes

1. All dimensions are in metres unless otherwise stated and levels Above Ordnance Datum (AOD)
2. Design is based on OS mapping and LIDAR data.
3. Design is preliminary only and should not be used for construction
4. Drawing to be printed in colour.
5. Drainage design to follow general provisions of BS EN752.
6. Discharge rates to be agreed with relevant IDB districts or Lead Local Flood Authority.
7. Design subject to confirmation of water levels and IDB and/or LLFA agreement where required.
8. Design subject to topographical and existing drainage survey.
9. Attenuation sized based on 1 in 100 year return period + 40% climate change.
10. Design subject to co-ordination with existing utilities.
11. Do not scale from this drawing.

Key to symbols

- Permeable sub-base
- Junction Widening (see drawing 398128-MMD-00-XX-DR-H-1000)
- Extent of Proposed Permeable Block Paving (6720m²)
- IDB Watercourse
- Proposed linear drainage channel
- Proposed combined kerb drainage
- Assumed Culvert
- +3.3m Existing Ground Level
- +3.3m Proposed Level

Reference drawings

Reference Models
- 398128-MMD-00-XX-M3-H-1000 - Wisbech Car Park
- 398128-MMD-00-XX-M3-P-0001 - PWay 3D Rails
- TF4505 - Topo

Rev	Date	Drawn	Description	Ch'k'd	App'd
P01	02/03/20	SP	Issued for Client Review	AP	
P02	03/03/20	SP	Issued for Client Review	AP	GJ

Status Stamp

MOTT MACDONALD
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4th Floor, Derwent House
150 Arundel Gate
Sheffield, S1 2JY
United Kingdom
T +44 (0)114 276 1242
F +44 (0)114 272 4699
W www.mottmac.com

Client
CAMBRIDGESHIRE & PETERBOROUGH COMBINED AUTHORITY

Title
March to Wisbech Transport Corridor
Wisbech Station
Car Park
Proposed Drainage Strategy
Sheet 1 of 1

Designed	K. Bagnall	KB	Eng check	M.JONES	MJ
Drawn	S.K.PELL	SP	Coordination	S.B.LONGDEN	SL
Dwg check	M.JONES	MJ	Approved	G.JENNINGS	GJ

MMD Project Number	Scale at A1	Security
398128	1:500	STD

Suitability Description	Suit. Code
Suitable for Stage Approval	S4

Drawing Number	Revision
398128-MMD-00-XX-DR-D-0010	P02

Sheet Size A1 841 x 594

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D. Environment Agency Flood Risk Information

D.1 RFI Response for Flood Risk Information for Oldfield Lane, Wisbech

Excluding overtopping flood hazard output maps; more recent mapping can be found in Appendix E.

D.2 Flood Map for Planning

Megan Jones
Megan.Jones@mottmac.com

Our ref: CCN/2019/139760

Date: 30 August 2019

Dear Megan

Provision of Flood Risk Information for Oldfield Lane, Wisbech

Thank you for your request to use our flood risk information in the development of the Flood Risk Assessment (FRA) for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

Historic Flood Extent Map

A copy of the Historic Flood Extent Map showing the extent of previous recorded flooding in your area is attached. This only covers information we hold and it is possible other flooding may have occurred which other organisations, such as the Local Authority or Internal Drainage Boards, may have records.

Tidal Flood Risk Information

Tidal Defence Information

The tidal defences protecting this site consist of earth embankments and concrete floodwalls. They are in fair condition and reduce the risk of flooding (at the defence) to a 0.5% (1 in 200) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Tidal Flood Levels

The attached table shows our current best estimate for extreme tide levels.

Levels for the Humber Estuary have an assessment date of 2014, with others having an assessment date of 2006, which should be used in any consideration of future increases due to climate change.

Modelled Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available. Hazard mapping is also available for fluvial flood risk in Northampton, Lincoln, Wainfleet and some isolated rural locations.

The number of locations we have this information for is expected to increase in time.

Hazard Mapping – Breaching

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

- Year 2011 0.5% (1 in 200) chance
- Year 2011 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

Hazard Mapping – Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

- Year 2115 0.1% (1 in 1000) chance

Your site is not affected by overtopping of the defences for the present day (2011) scenarios.

Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at lnplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

FLOODS DESTROY BE PREPARED

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals.

General advice on flood risk assessment for planning applications can be found on GOV.UK at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Climate change will increase flood risk due to overtopping of defences. Please note the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in February 2016. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

Supporting Information

Please see the Standard Notice or licence for details of permitted use. The Standard Notice can be found at the link below.
http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from your Lead Local Flood Authority (i.e. county council or unitary authority) or, where they exist, the Internal Drainage Board.

Further Contact

I hope we have correctly interpreted your request. If you are not satisfied with our response to your request for information, you can contact us within two calendar months to ask for our decision to be reviewed.

If you have any queries or would like to discuss the content of this letter further please contact Sarah Curl using the details below.

Yours sincerely,

p.p. [redacted]

Alastair Windler
Partnerships and Strategic Overview Team Leader - Welland and Nene

Direct dial 020 302 53535

FLOODS DESTROY BE PREPARED

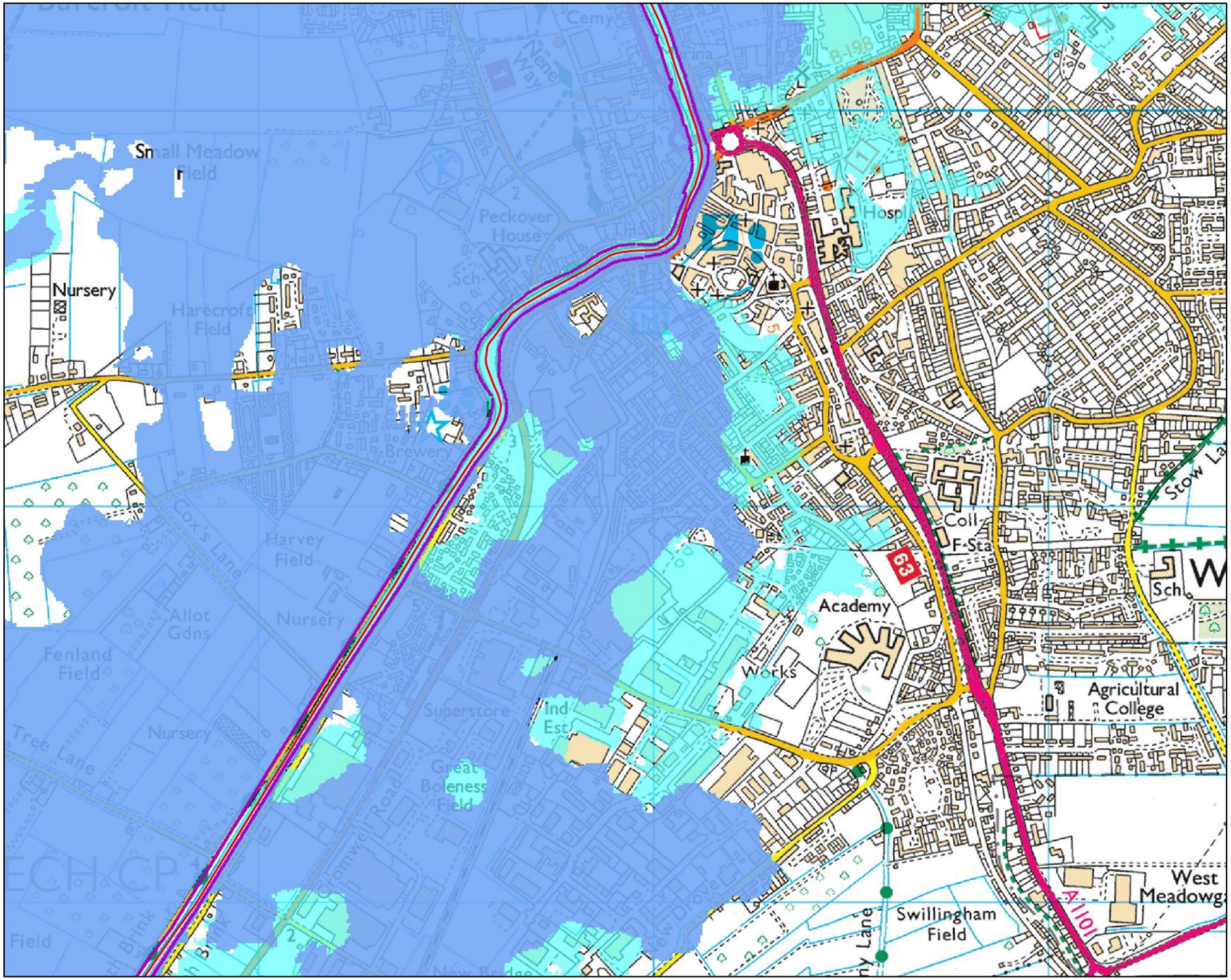
Ceres House, Searby Road, Lincoln, LN2 4DT
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

Direct e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map
Historic Flood Extent Map
Estimated Tide Levels
Tidal Breach Locations Map
Hazard Mapping – Breaching (4 maps)
Hazard Mapping – Overtopping (1 map)

Ceres House, Searby Road, Lincoln, LN2 4DT
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

Flood Map centred on TF 45905 09041 - created August 2019 [Ref: CCN-2019-139760]



Scale 1:10,000

N

Legend

- Main River
- Raised Defences
- Flood Storage Areas
- Area at Risk of Flooding from Rivers or The Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

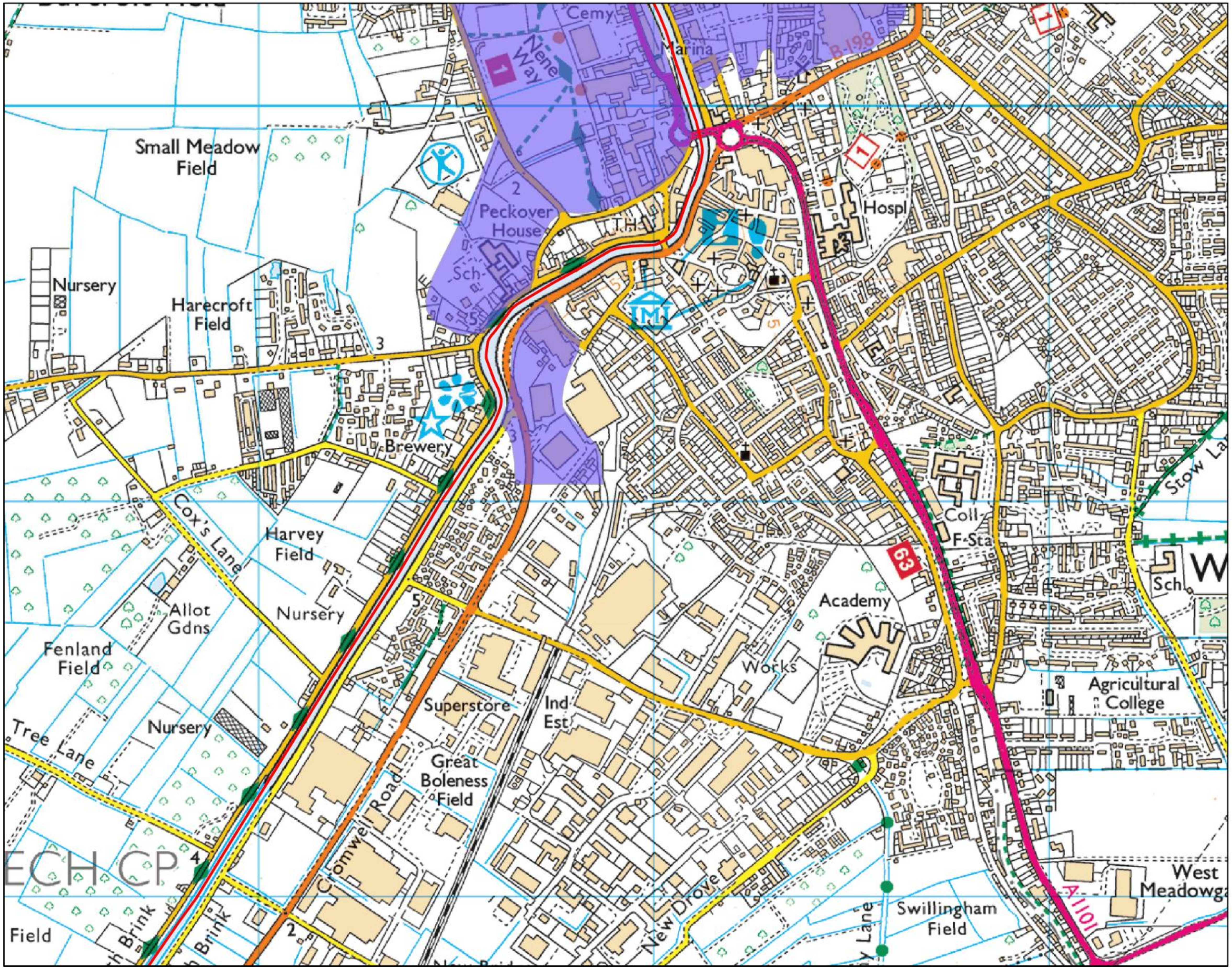
Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Kettering

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Historic Flood Map centred on TF 45905 09041 - created August 2019 [Ref: CCN-2019-139760



Environment Agency

Scale 1:10,000

N

Main River

January 1978 on the Tidal River Nene

Created by the Partnership & Strategic Overview Team, Kettering

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

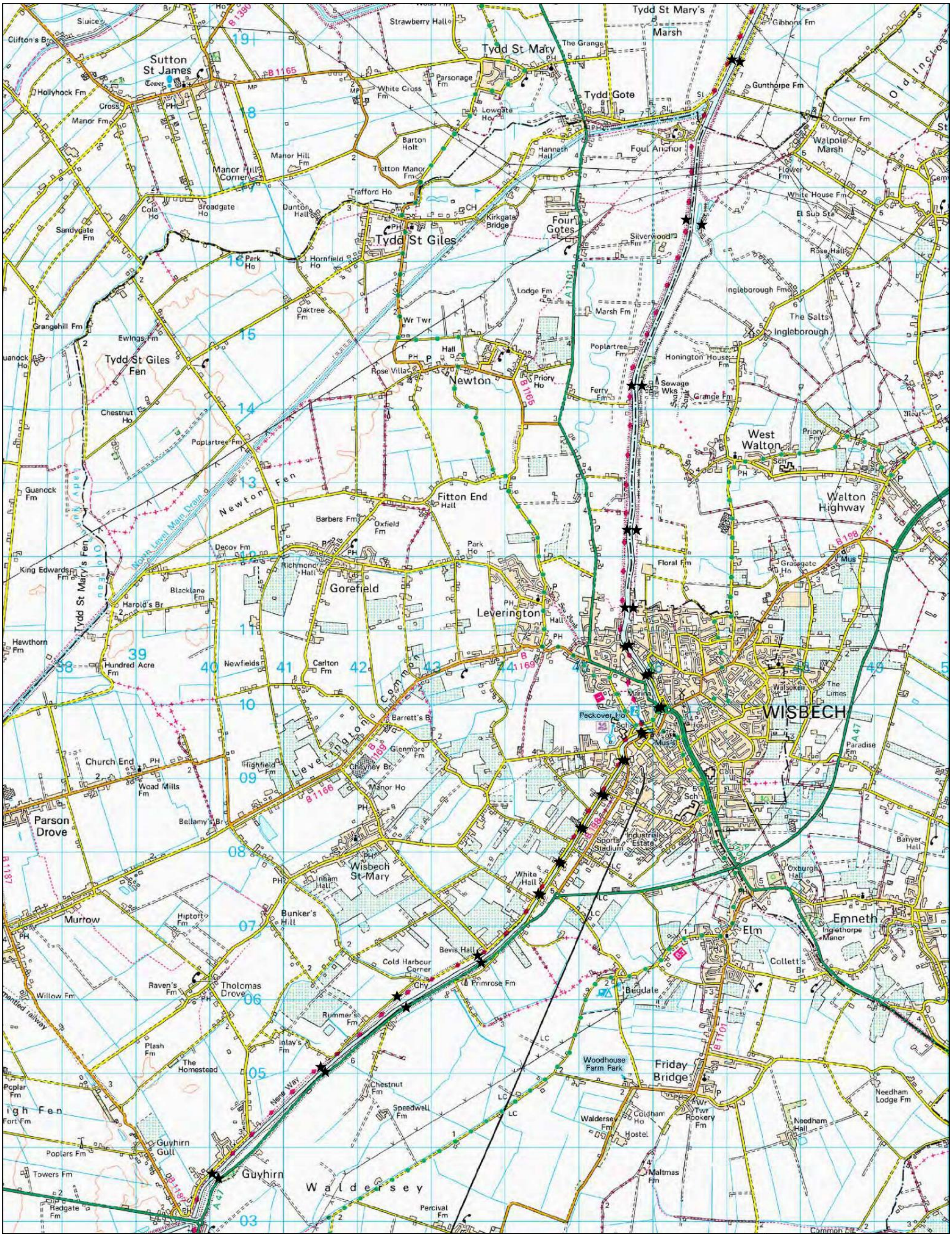
Tidal Level Location Map
Lincolnshire & Northamptonshire Area

Tidal Water Levels for the South Humber, East Coast and The Wash

The table below shows still water levels for locations, from the above location map, around the South Humber Estuary, East Coast and The Wash. It is important to note the following:

- The base date for the data is 2014 for the South Humber and 2006 for the East Coast and The Wash.
- The data are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- The water level quoted is the 'Best Estimate' water level. Depending on the use of the data it may be necessary to carry out sensitivity testing. Upper and Lower 95% confidence bandings are available upon request.
- Levels for other annual chance scenarios are available if required.

Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level metres ODN					
				1	10	50	100	200	1000
HUMBER									
H030	Tetney	535420	403180	3.94	4.29	4.56	4.69	4.82	5.15
H050	Buck Beck	532700	406580	4.03	4.36	4.62	4.74	4.87	5.18
H060	Grimsby	527878	411346	4.10	4.43	4.70	4.82	4.95	5.27
H080	Haborough Marsh	520790	415740	4.26	4.61	4.88	5.01	5.14	5.47
H090	Immingham	519141	417449	4.26	4.61	4.88	5.01	5.14	5.47
H100	South Killingholme	518700	417120	4.41	4.77	5.05	5.18	5.32	5.66
H130	North Killingholme	516530	420000	4.51	4.87	5.15	5.28	5.42	5.77
H150	East Halton	514450	422870	4.59	4.96	5.25	5.39	5.53	5.89
H170	Goxhill	511970	425440	4.67	5.04	5.34	5.47	5.61	5.95
H200	New Holland	508020	424330	4.87	5.26	5.55	5.68	5.81	6.12
H210	Barrow Haven	506380	422620	4.92	5.31	5.60	5.73	5.86	6.17
H220	Ferriby	497550	421150	5.04	5.42	5.67	5.77	5.86	6.04
H230	Winterton	493420	422830	5.14	5.51	5.74	5.83	5.90	6.02
H250	Blacktoft	484247	424190	5.25	5.62	5.83	5.90	5.96	6.04
H270	Goole	474857	422960	5.46	5.85	6.07	6.15	6.21	6.29
East Coast									
~	Great Eau	545500	393800	3.80	4.19	4.46	4.57	4.69	4.96
~	Boygrift	553300	379800	3.84	4.24	4.53	4.65	4.77	5.05
~	Burgh Sluice	555190	358620	4.26	4.45	4.76	4.90	5.03	5.34
Wash									
~	Hobhole	536610	339940	4.82	5.30	5.64	5.78	5.93	6.27
~	Lawyers Sluice	540750	334550	4.84	5.32	5.66	5.80	5.95	6.29
~	West Lighthouse	549150	325750	4.88	5.37	5.71	5.86	6.01	6.35
~	Grand Sluice	532400	344500	4.88	5.33	5.65	5.78	5.93	~
~	Fosdyke Bridge	531700	332200	4.91	5.38	5.71	5.85	5.99	~
~	Marsh Road	526000	324000	5.04	5.44	5.73	5.85	5.98	~
~	Wisbech	546100	310000	4.83	5.25	5.53	5.66	5.78	~
~	Dog In Doublet	527300	299300	3.67	4.00	4.22	4.32	4.42	~



★ **Modelled Breach Locations**

0 0.5 1 2 Kilometres

This map indicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

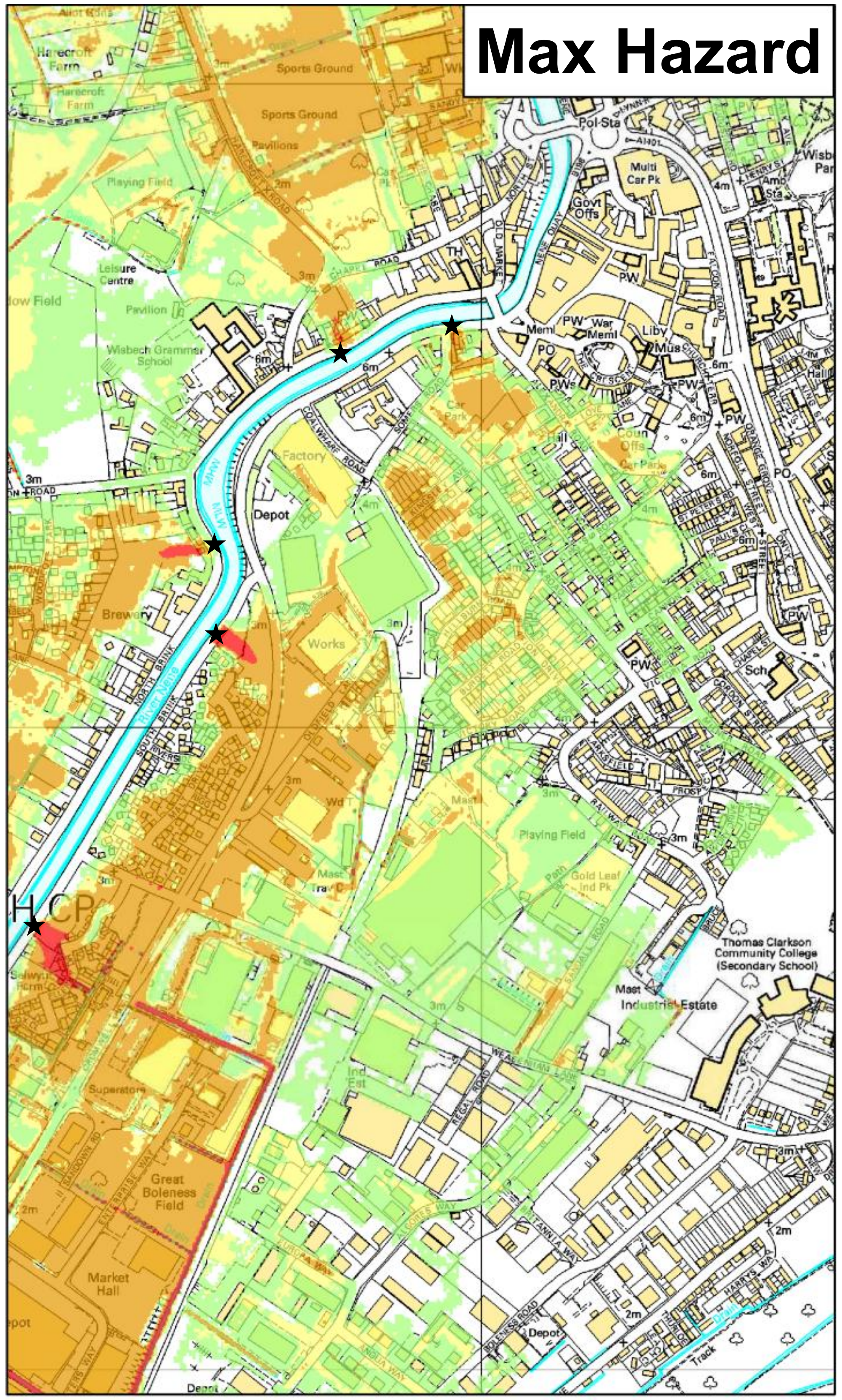
General Enquiries No: 03708 506 506.
Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

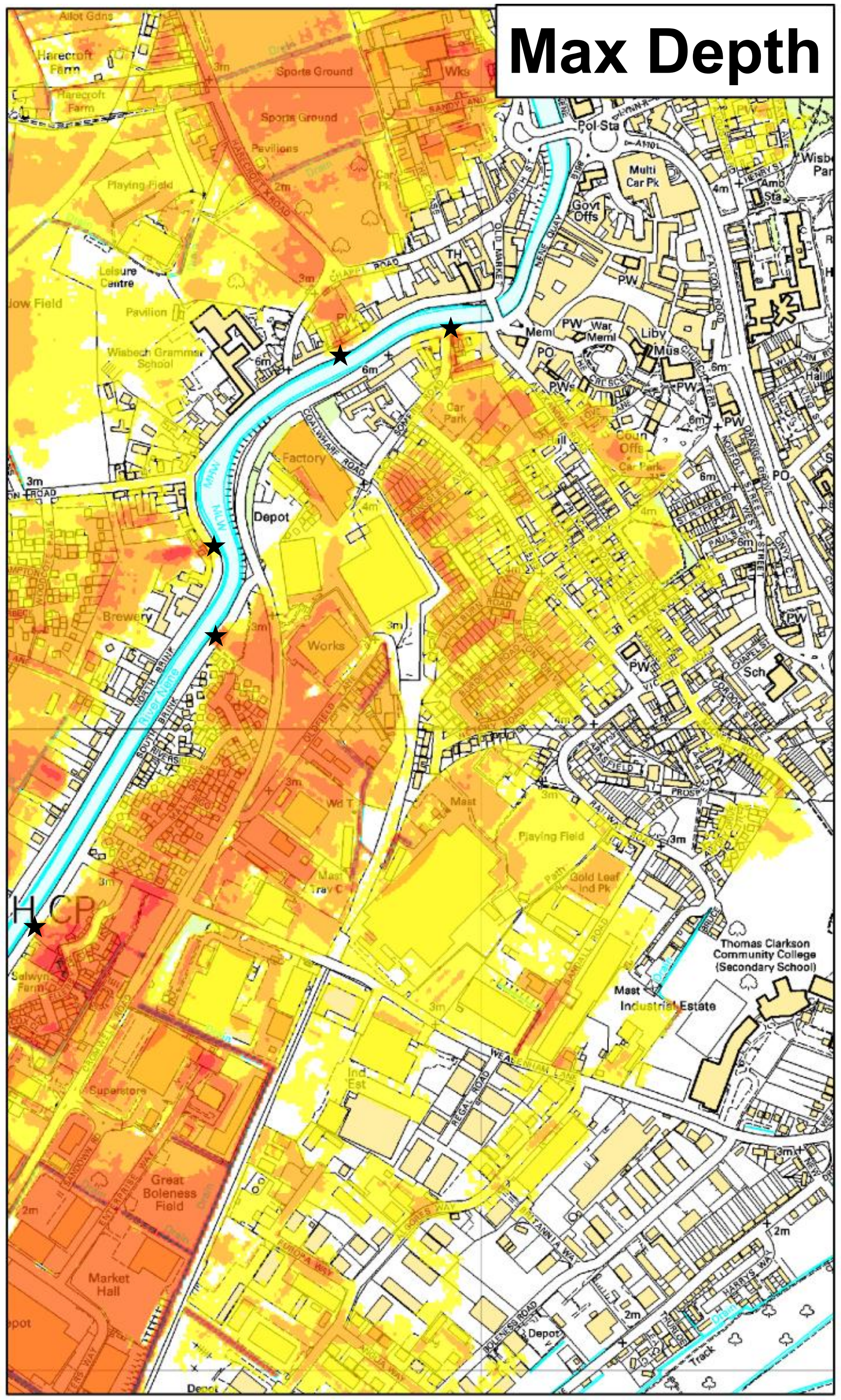
Environment Agency

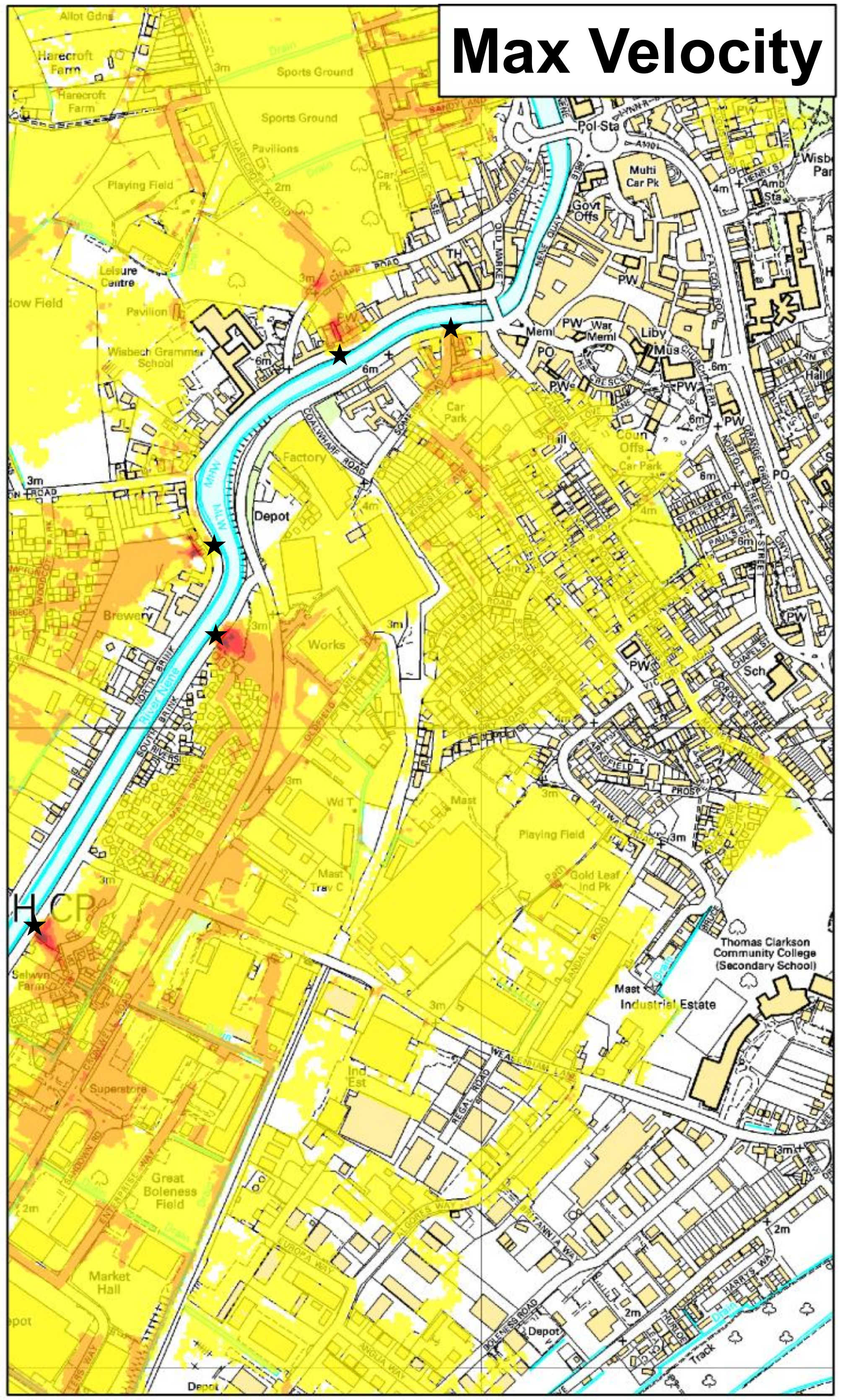
Produced by the Flood Risk Mapping & Data Management Team, Lincoln
General Enquiries No: 03708 506 506

Northern Area Tidal Hazard Mapping

Location of Modelled Breaches







★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	August 2019	Scenario year	2011	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2019-139760

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

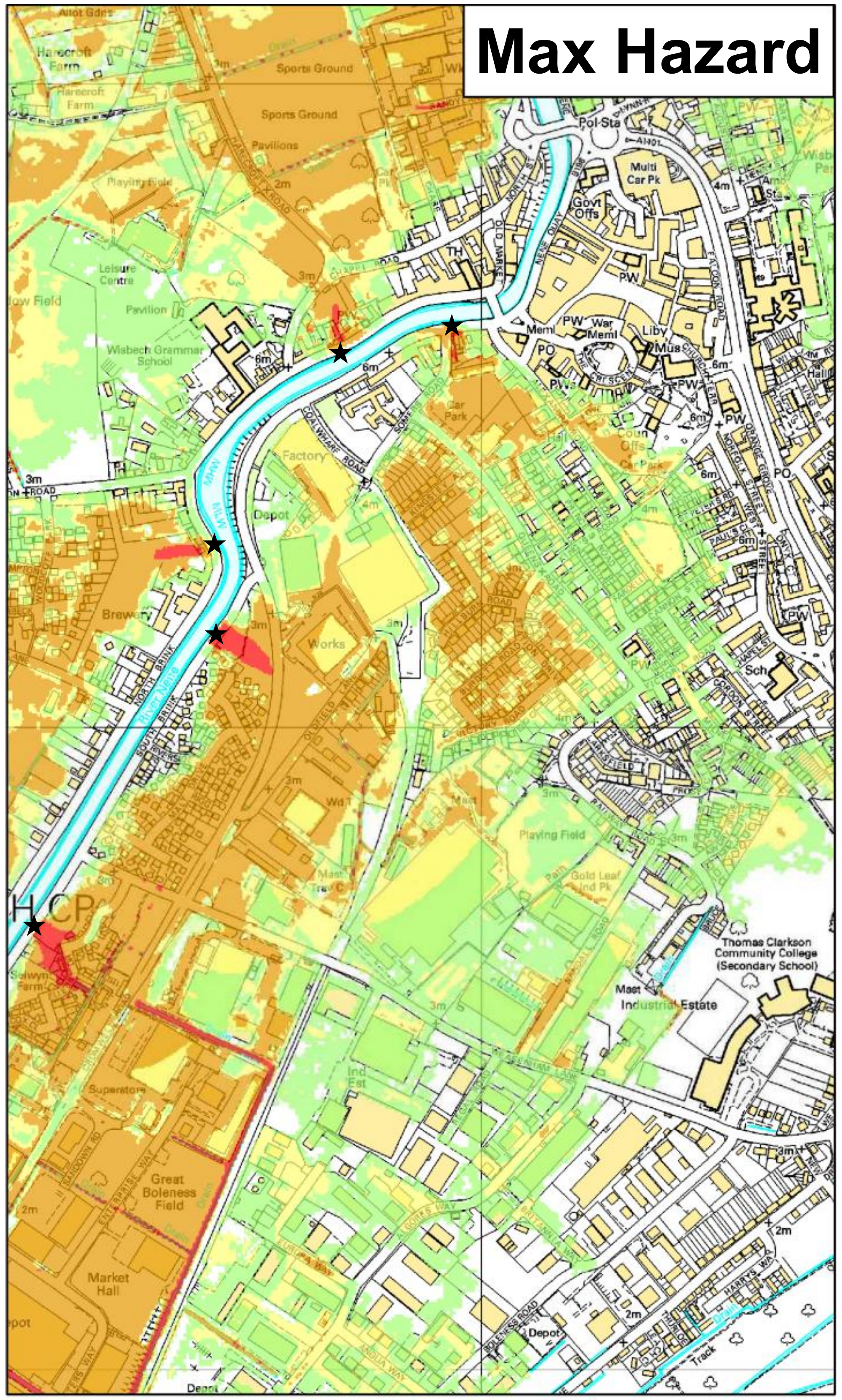
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

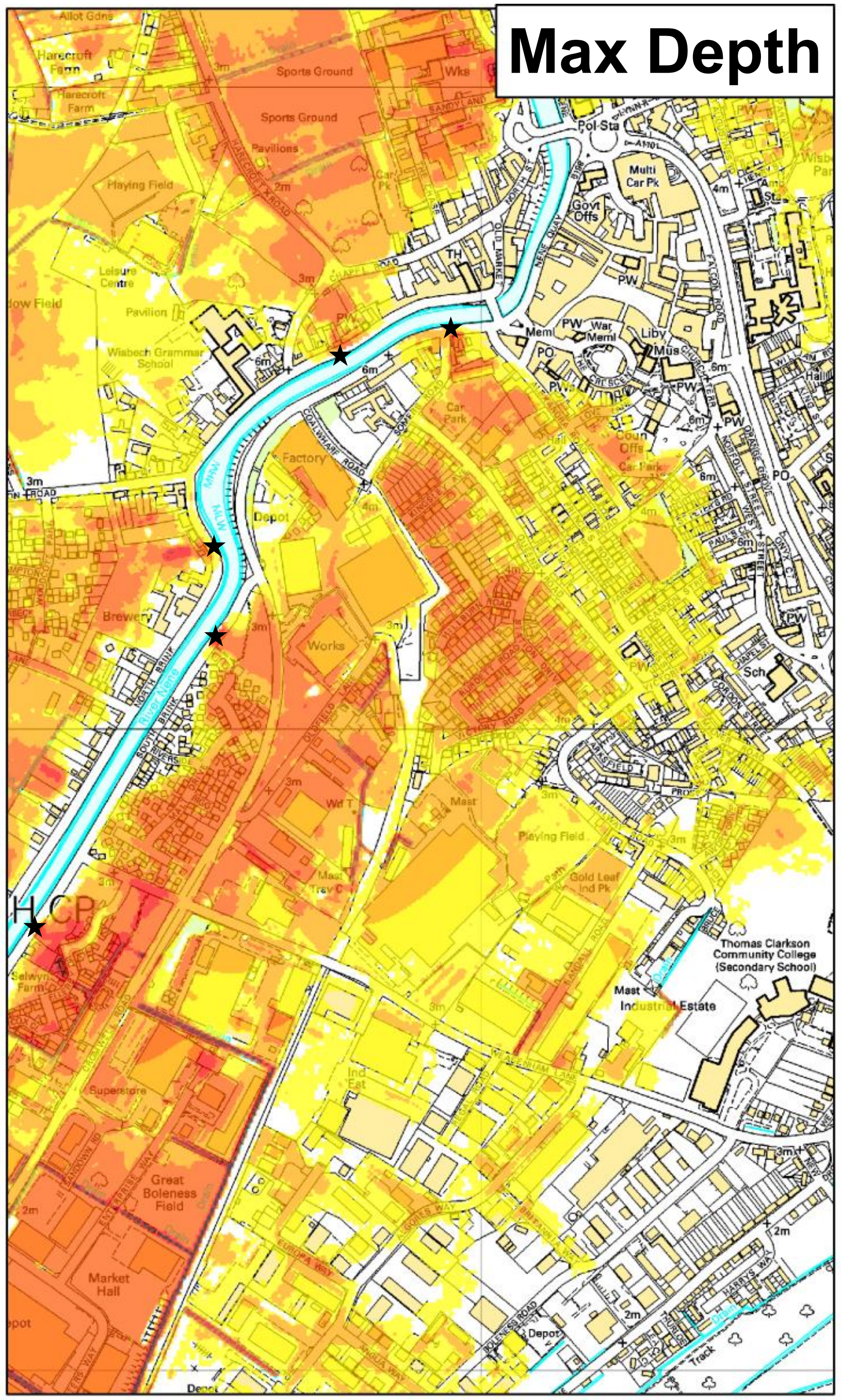
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

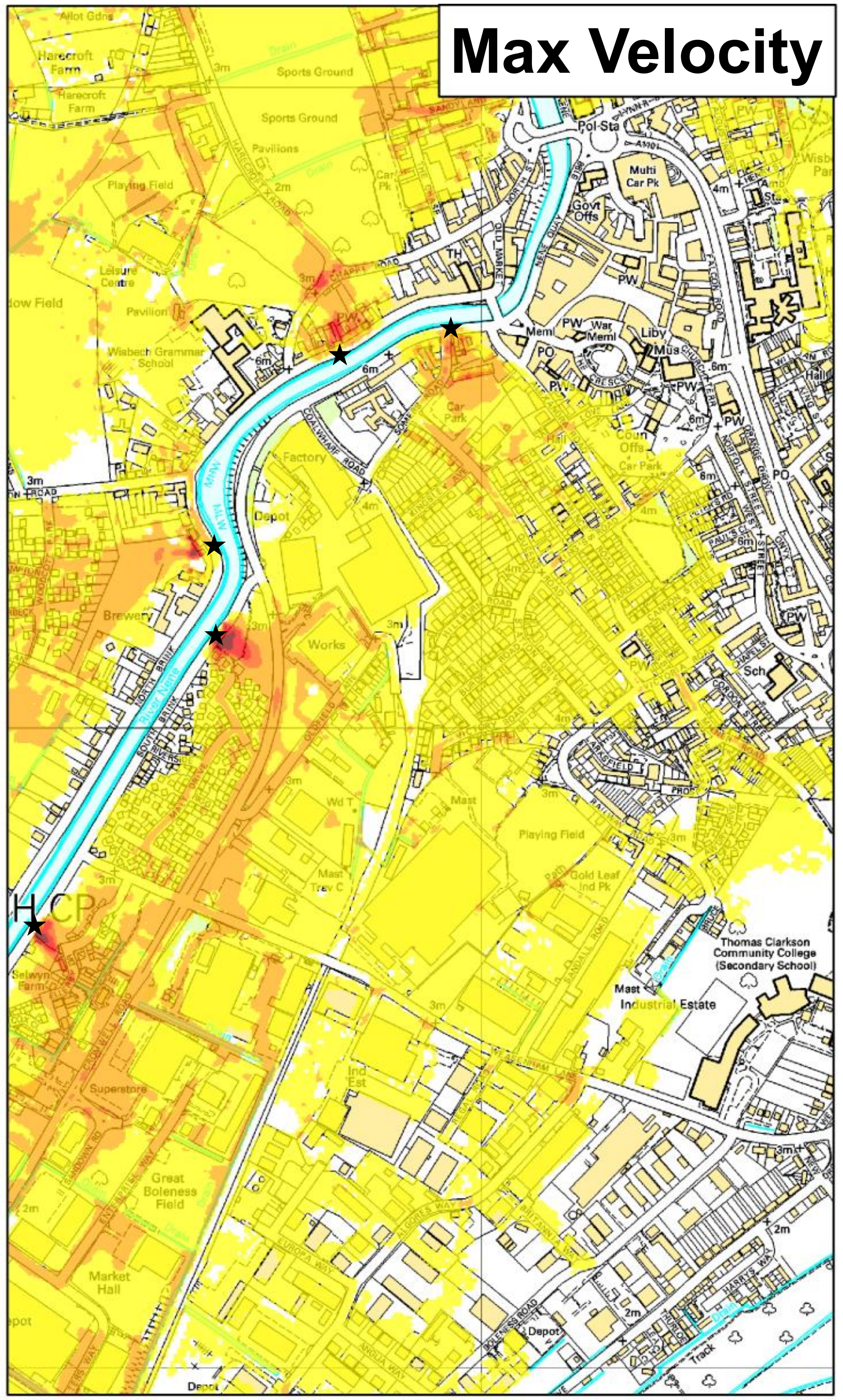
Environment Agency

Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 45905 09041







★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	August 2019	Scenario year	2011	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2019-139760

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

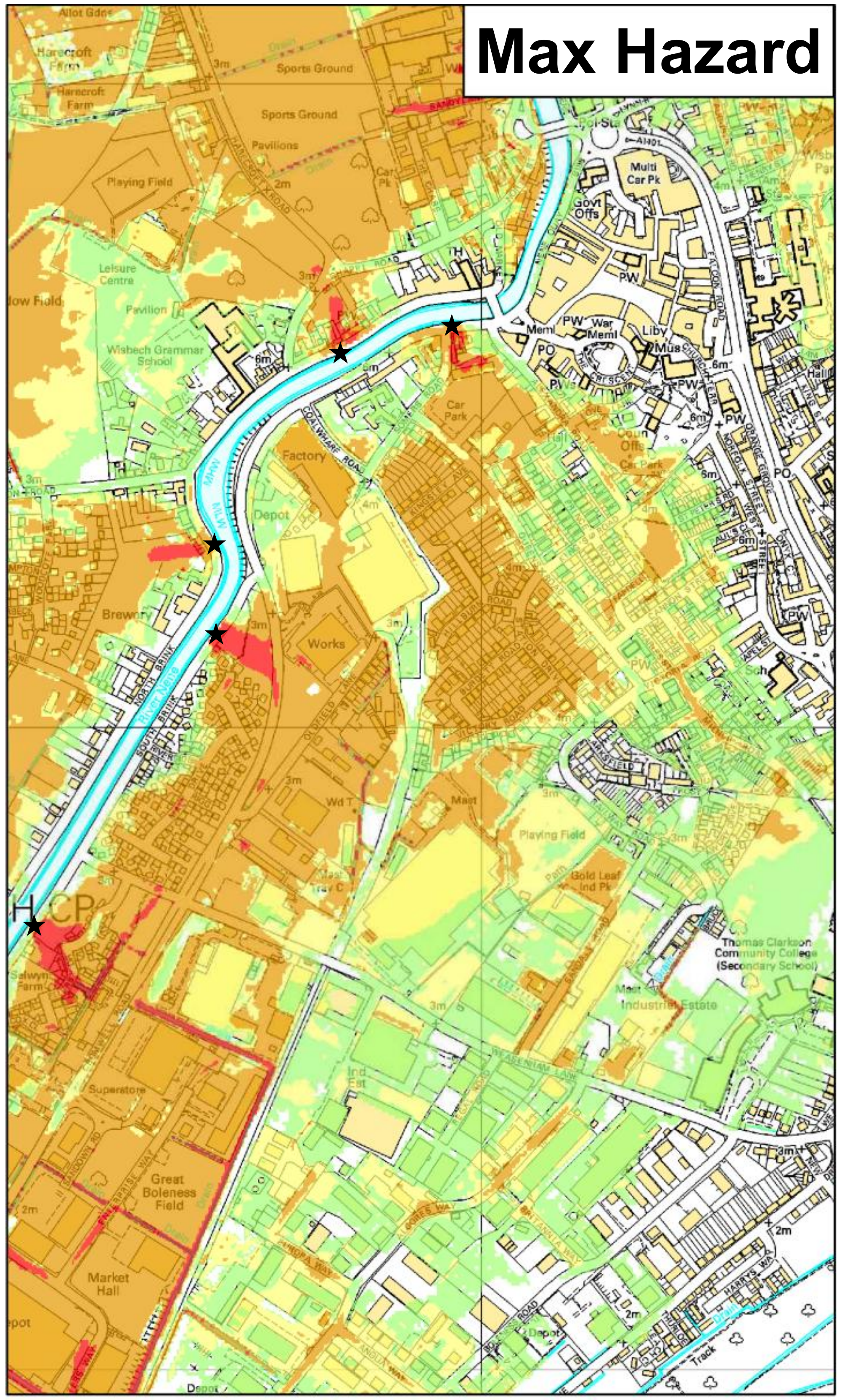
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

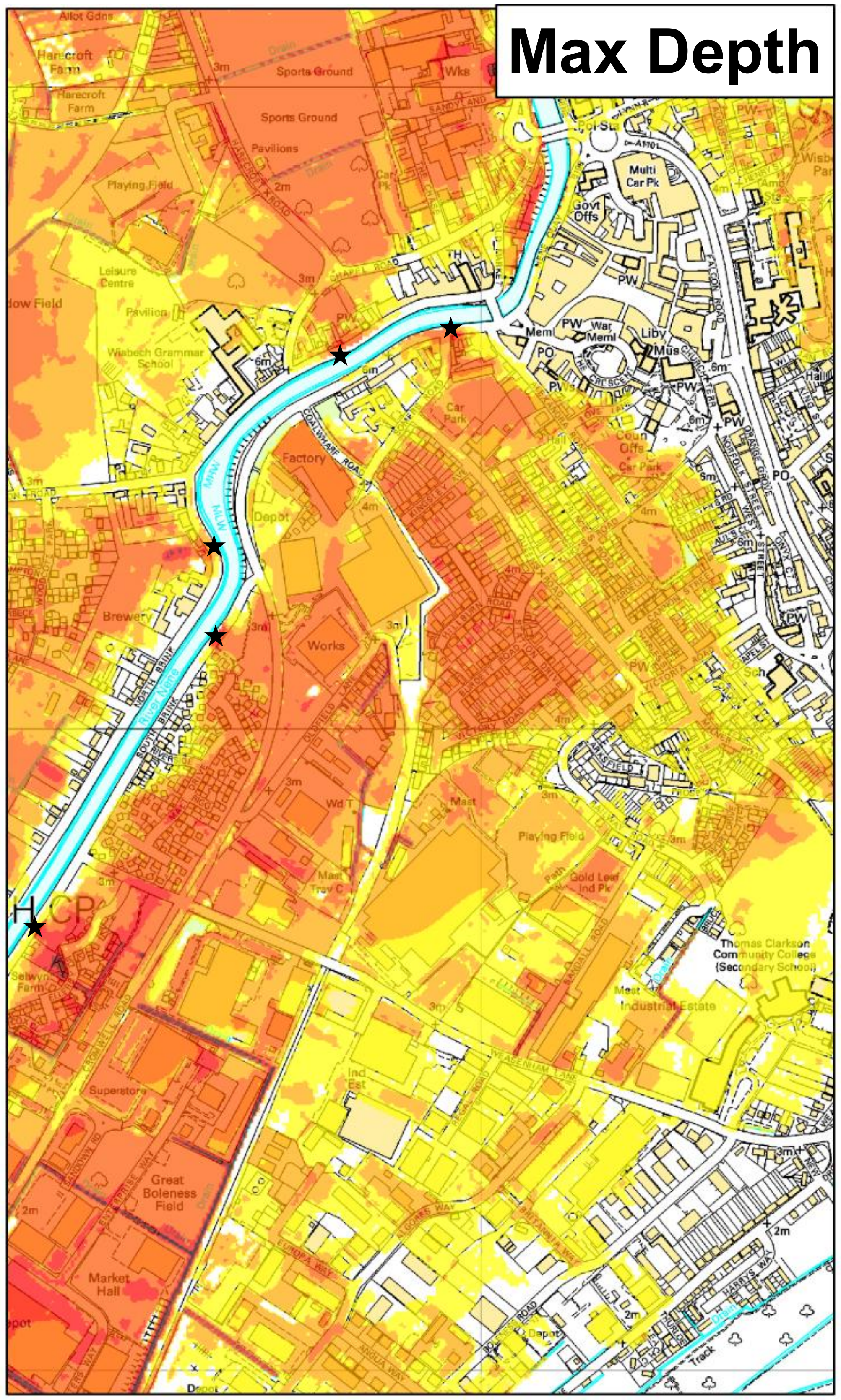
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

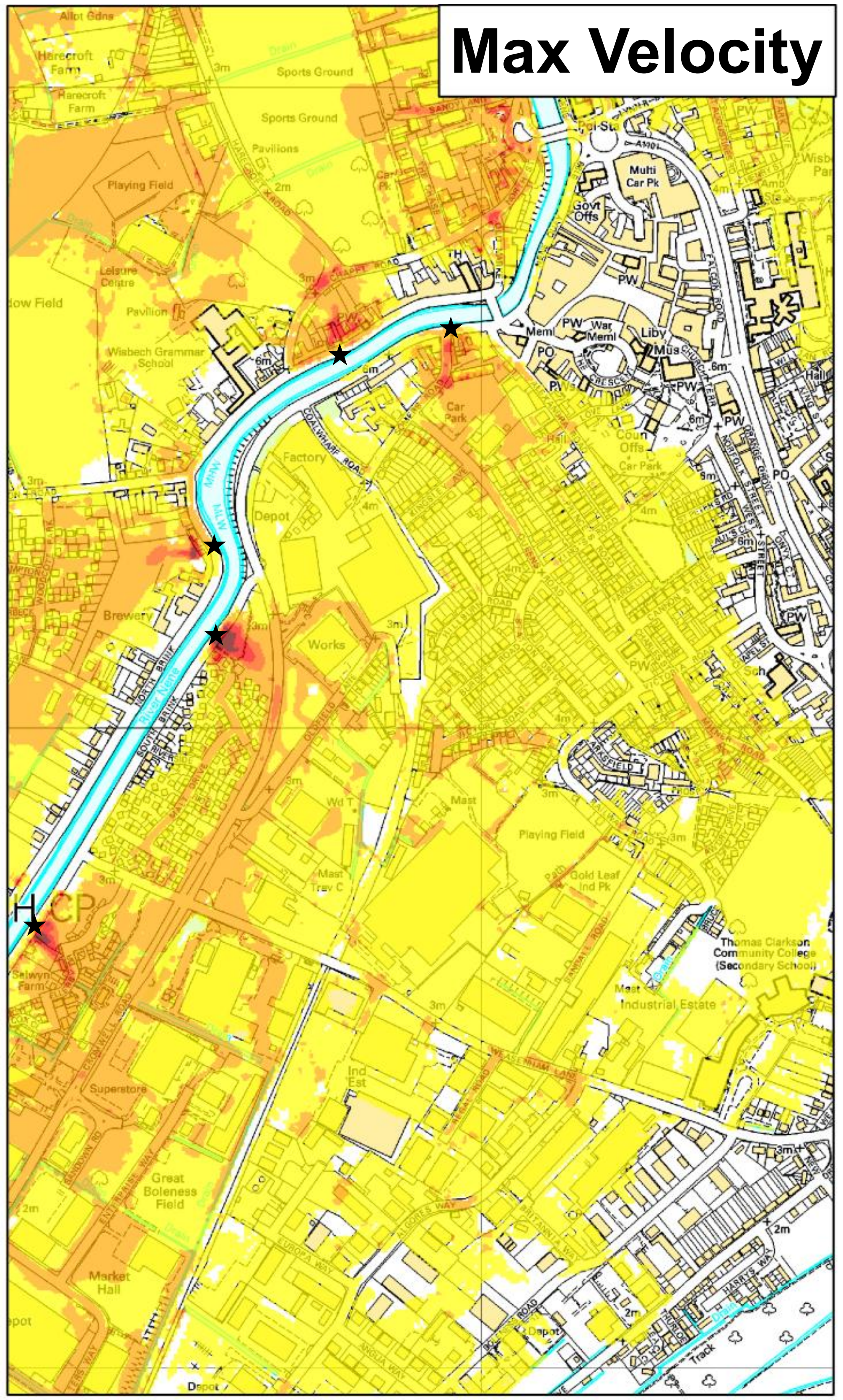
Environment Agency

Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 45905 09041







★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard (Flood Risk to People : FD2320)	Max Depth (m)	Max Velocity (m/s)
Less than 0.75 (Low Hazard)	0 - 0.25	0 - 0.3
Between 0.75 and 1.25 (Danger for Some)	0.25 - 0.50	0.3 - 1.0
Between 1.25 and 2.0 (Danger for Most)	0.50 - 1.0	1.0 - 1.5
Greater than 2.0 (Danger for All)	1.0 - 1.6	1.5 - 2.5
	1.6 +	2.5 +

Date Printed	August 2019	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2019-139760

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

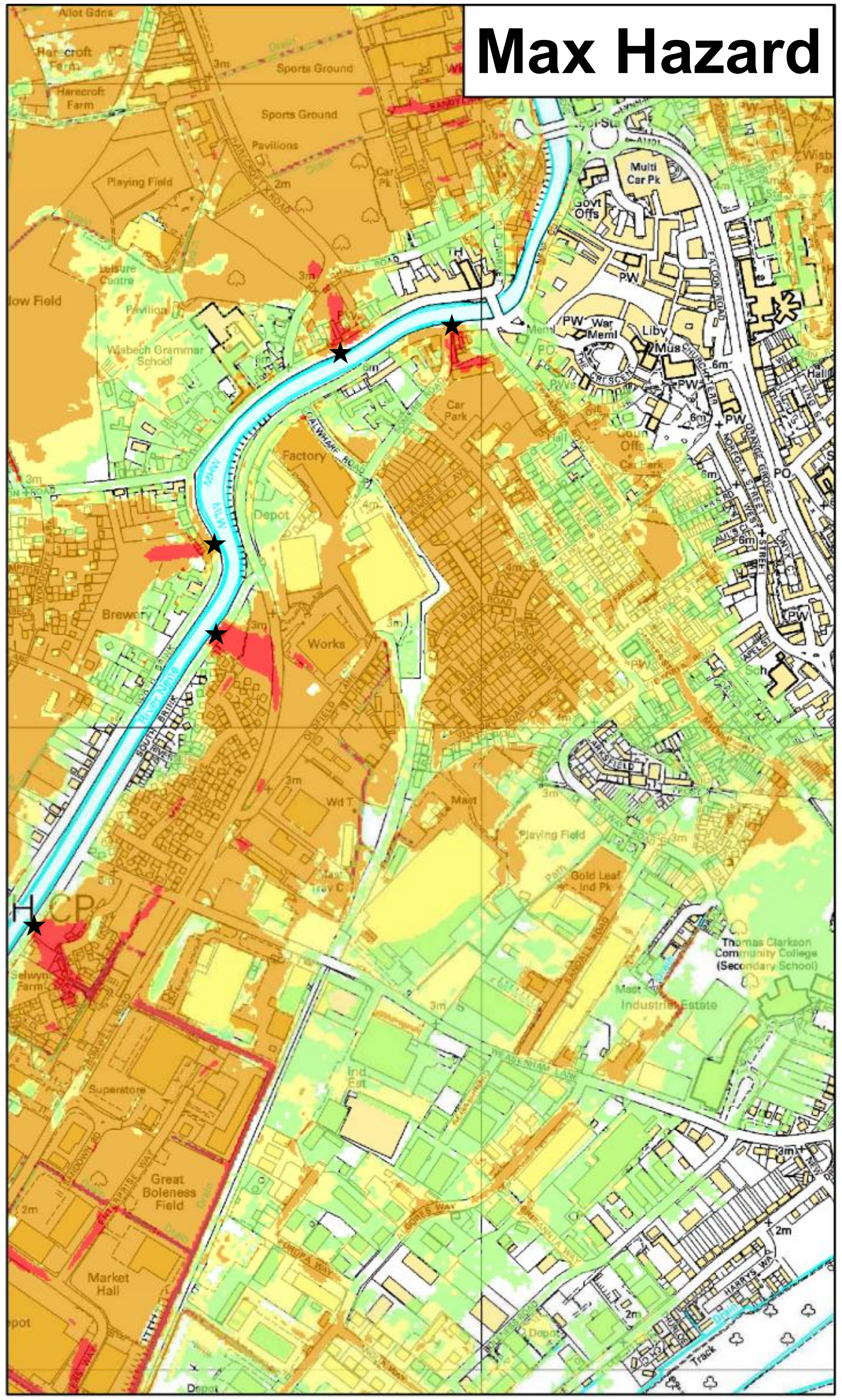
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

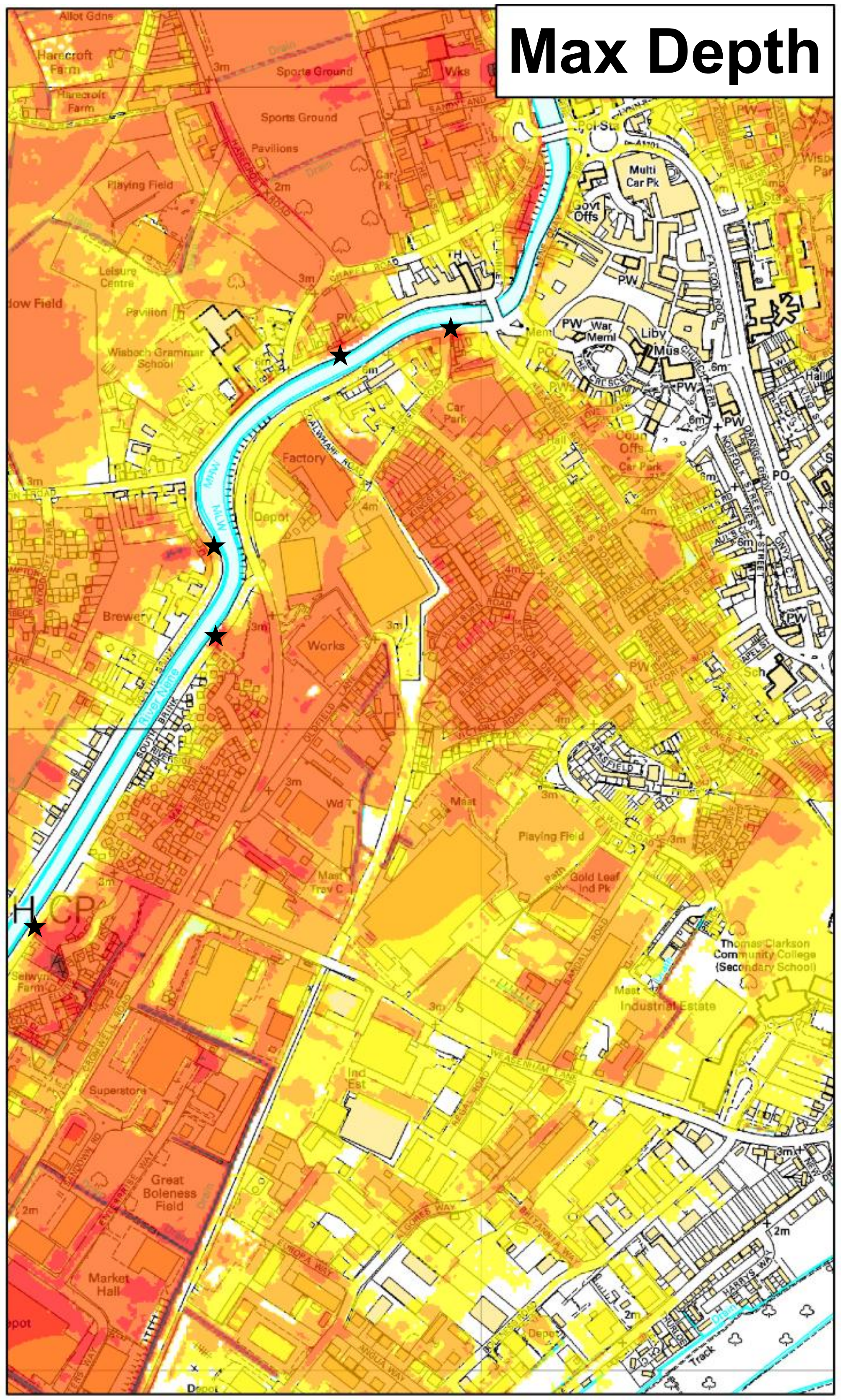
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

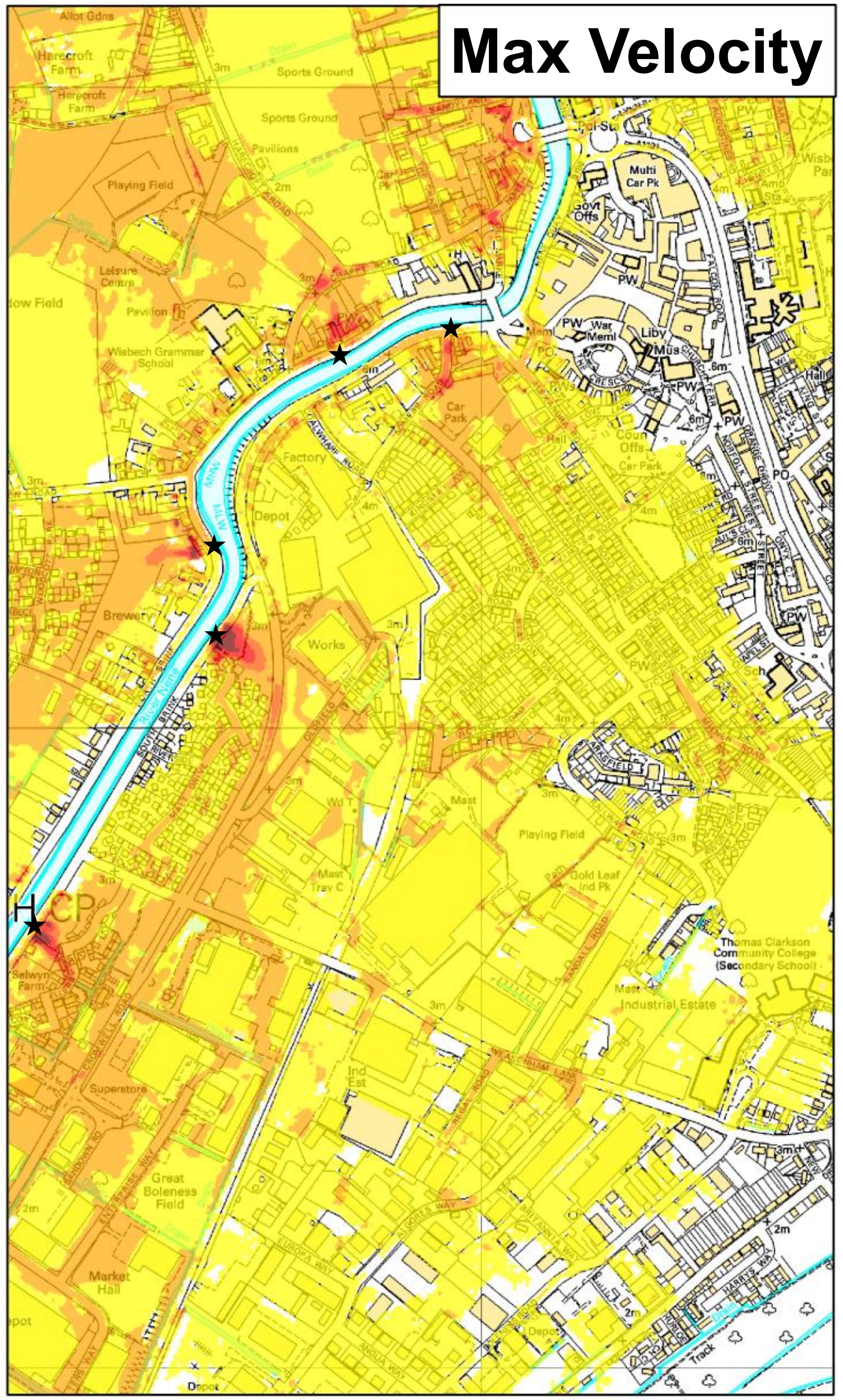
Environment Agency

Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 45905 09041







★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard (Flood Risk to People : FD2320)	Max Depth (m)	Max Velocity (m/s)
Less than 0.75 (Low Hazard)	0 - 0.25	0 - 0.3
Between 0.75 and 1.25 (Danger for Some)	0.25 - 0.50	0.3 - 1.0
Between 1.25 and 2.0 (Danger for Most)	0.50 - 1.0	1.0 - 1.5
Greater than 2.0 (Danger for All)	1.0 - 1.6	1.5 - 2.5
	1.6 +	2.5 +

Date Printed	August 2019	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2019-139760

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

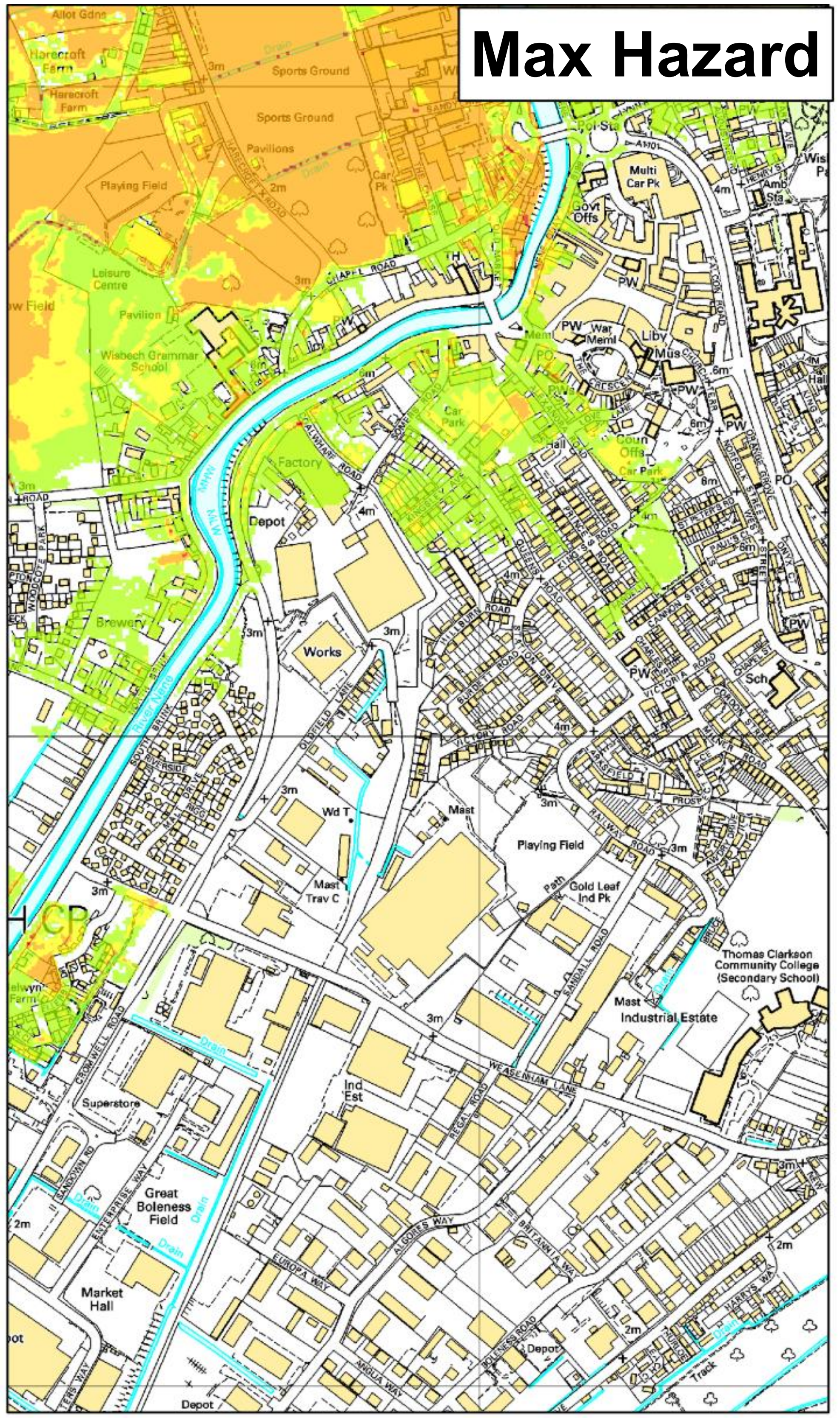
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

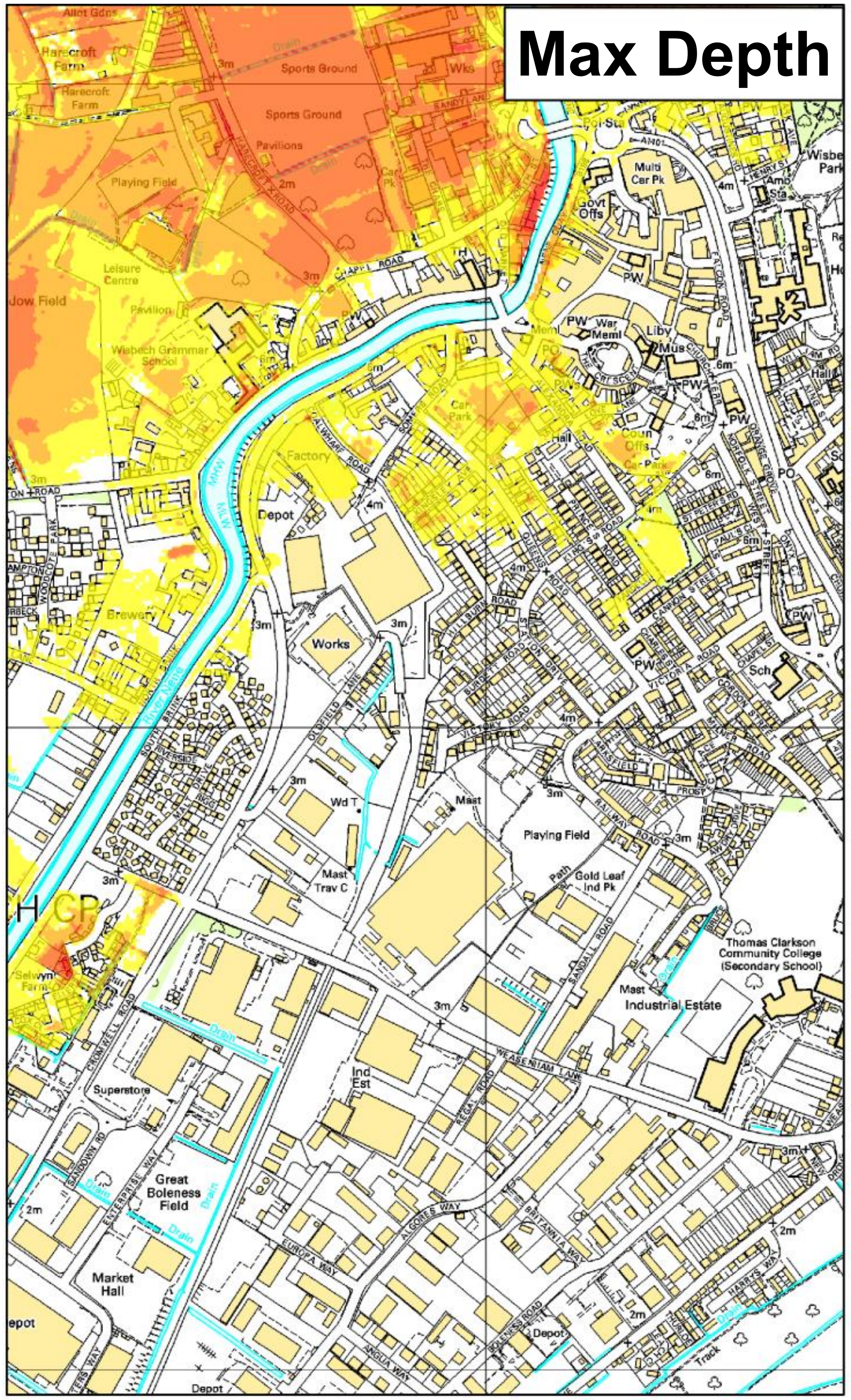
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

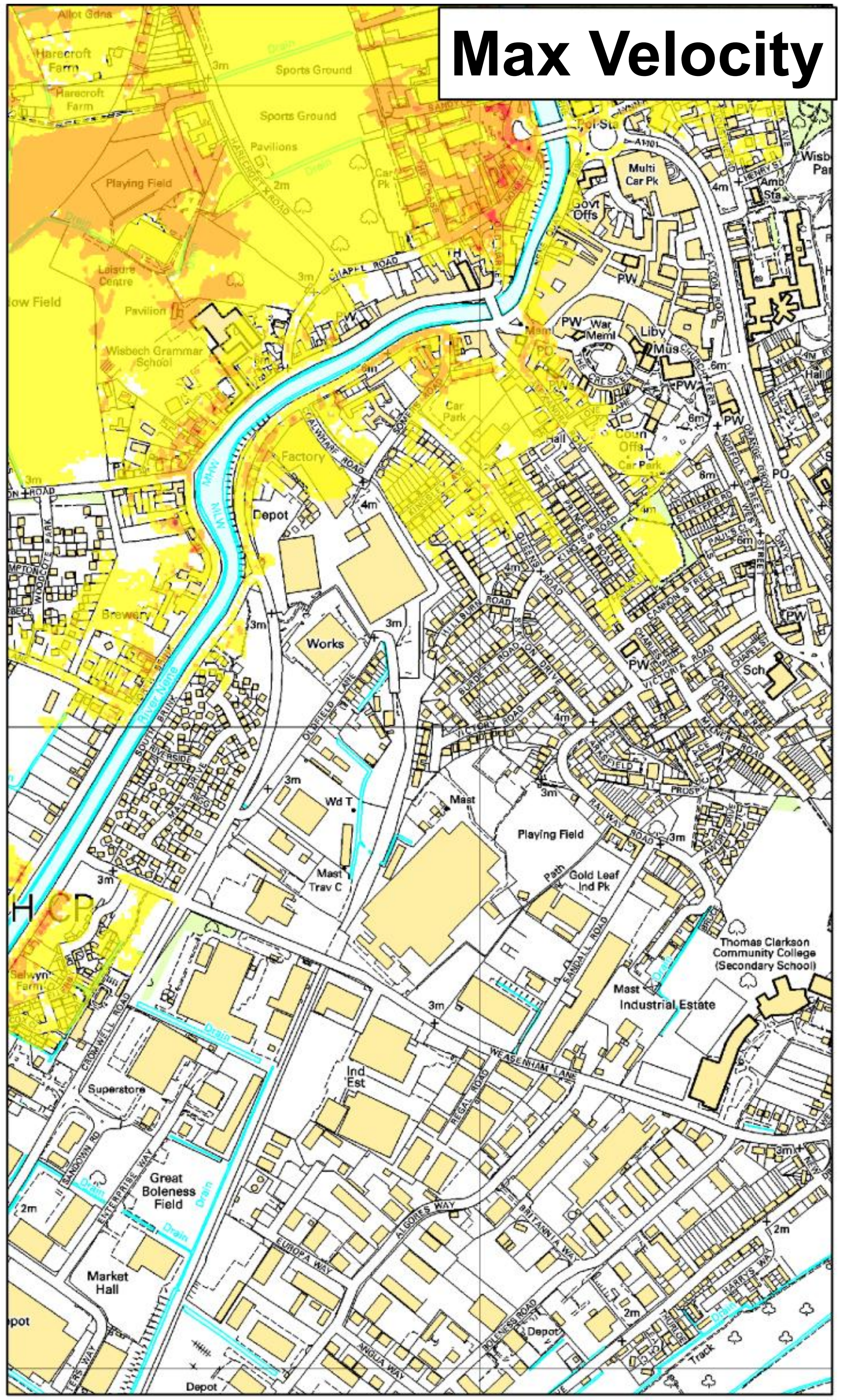
Environment Agency

Lincolnshire and Northamptonshire Tidal Breaching Hazard Mapping

Map Centred on TF 45905 09041







Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	August 2019	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2019-139760

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

For future climate change scenarios it is assumed that defences remain at 2006 heights.

These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

Environment Agency

Lincolnshire and Northamptonshire Tidal Overtopping Hazard Mapping

Map Centred on TF 45905 09041

Flood map for planning

Your reference	Location (easting/northing)	Created
FMFP_WBS_01	**545850/308903**	**14 Feb 2020 15:44**

Your selected location is in flood zone 3, an area with a high probability of flooding.

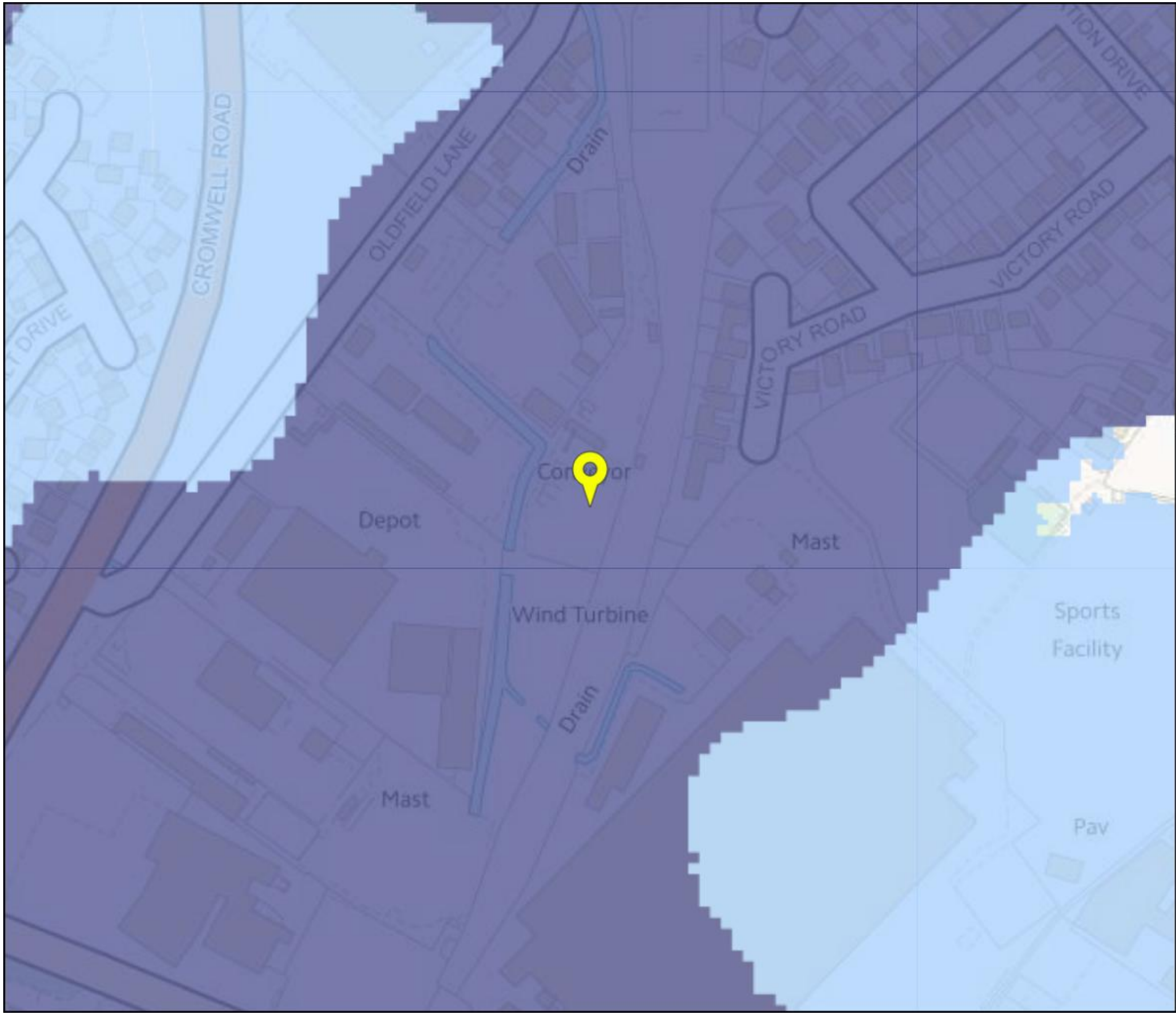
This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
FMFP_WBS_01

Location (easting/northing)
545850/308903

Scale
1:2500

Created
14 Feb 2020 15:44

Selected point

Flood zone 3

Flood zone 3: areas benefitting from flood defences

Flood zone 2

Flood zone 1

Flood defence

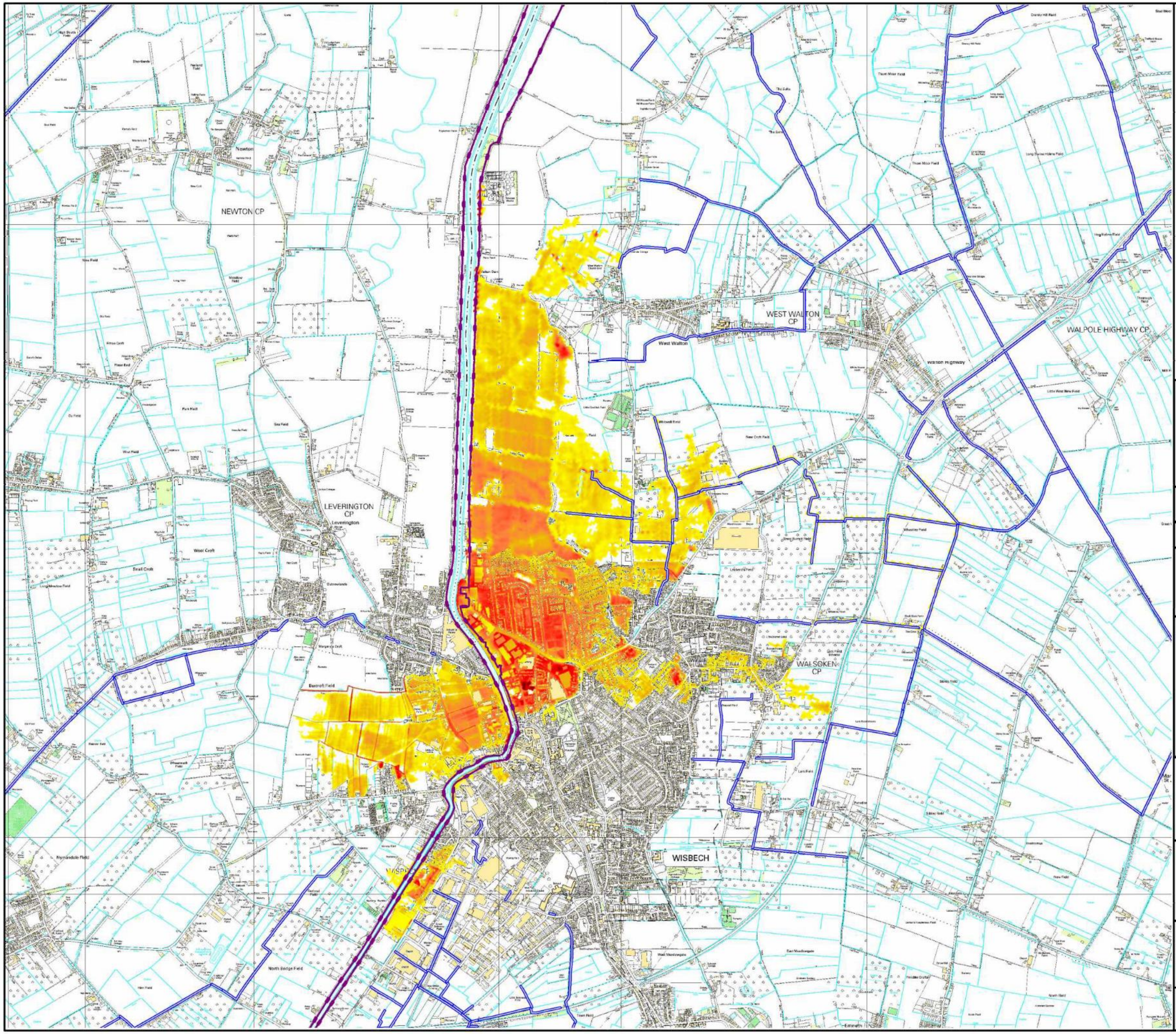
Main river

Flood storage area

0 20 40 60m

E. Flood Map Outputs

EA JacksonHyder 2015 Tidal Nene Modelling Improvements Report – Overtopping Output Maps



Modelled flood depth (m)

- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 2.00
- >2.00

- Wisbech Defences
- Whittlesey Washes Defences
- IDB network

1	First Issue	LR	MG	RG	29/5/15
Issue	Description	Auth	Ckd	Appd	Date

Environment Agency

HYDER CONSULTING (UK) LTD.

HCL House
St. Mellons Business Park
Cardiff
CF3 0EY

Tel +44 (0) 29 2092 6700

www.jacksonhyder.com

Project

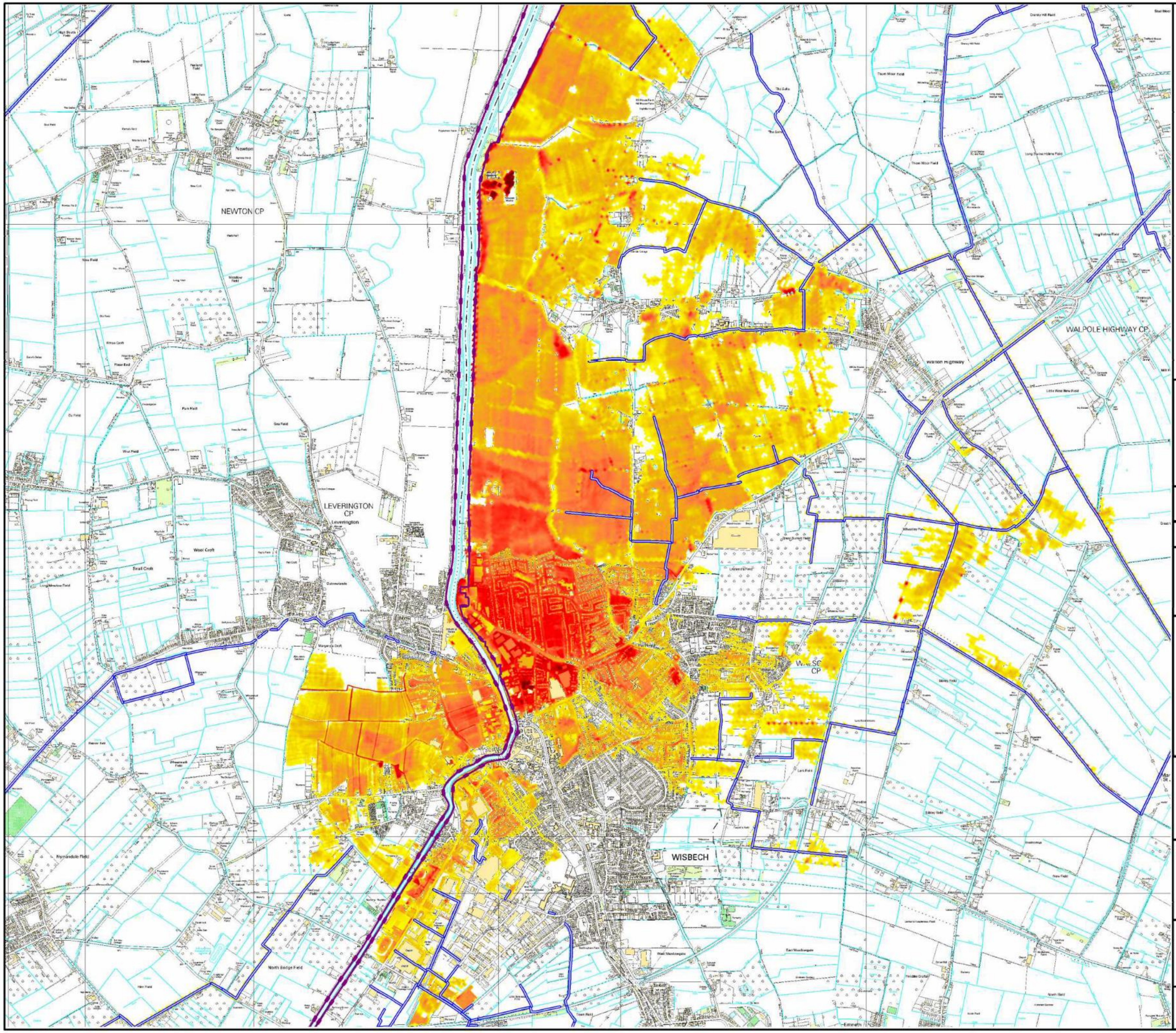
Tidal Nene Model Improvements

Title

0.5% AEP plus Climate Change Flood Depth Wisbech

Scale (A3):
1:50,000

Project Code	Drawing No.	Issue
UA007588	UU41D-002B	01



Modelled flood depth (m)

- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 2.00
- >2.00

- Wisbech Defences
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JacksonHyder

Project

Tidal Nene Model Improvements

Title

0.1% AEP plus Climate Change Flood Depth Wisbech

Scale (A3):
1:50,000

N

Project Code	Drawing No.	Issue
UA007588	UU41D-003B	01

mottmac.com

R. Signalling Design Specification

MOTT MACDONALD

Signalling Design Specification - GRIP 3

March to Wisbech Transport Corridor

27 February 2020

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9 St Saviourgate
York YO1 8NQ
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Signalling Design Specification - GRIP 3

March to Wisbech Transport Corridor

27 February 2020

Mott MacDonald Limited. Registered in
England and Wales no. 1243967.
Registered office: Mott MacDonald House,
8-10 Sydenham Road, Croydon CR0 2EE,
United Kingdom

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	27/02/2020	D. Crawford	P. Buck	L. Kent	Initial Issue

n

Document reference: 398128-MMD-00-XX-RP-SG-0001 | A

	Name	Role	Signature	Date
Prepared	Douglas Crawford	Assistant Signalling Designer		27/02/2020
Checked	Paul Buck	Technical Specialist (Signalling)		28/02/2020
Approved (Signalling Design)	Lawrence Kent	CRE (Signalling)		28/02/2020
Network Rail Acceptance				

Information class: Standard

Contents

1 Outline & Scope

The Cambridgeshire and Peterborough Combined Authority (CPCA) was formed in 2017 with responsibilities for housing, transport, skills and public service reform. Wisbech and March have been a focus for growth and wider economic regeneration. Enabling this growth through the delivery of transport infrastructure which provides March and Wisbech with improved connectivity to regional centres of economic activity in Peterborough and Cambridge is a high priority for CPCA. CPCA is keen to bring forward transport improvements to the March to Wisbech corridor which delivers this important objective.

The previous GRIP 2 study and parallel assessment of business case for the reinstatement of heavy rail services between Wisbech identified that a high value for money (VfM) case was reinstating the March-Wisbech line and providing a half hourly (2tph) services from Wisbech to Ely and Cambridge.

The line from March to Wisbech, Engineers Line Reference (ELR) WIG, formal title the Wisbech Goods Branch, currently runs from March East Junction (85 miles + 78 chains) to the nominal end of the line at Wisbech (93 miles + 49 chains), however, the track does not appear to physically exist beyond Weasenham Lane Level Crossing (93 miles + 15 chains).

Originally opened as a two-track railway by the Eastern Counties Railway in 1847, the line had one intermediate station at Coldham. The line was later extended to Watlington Junction (near Watlington on the Fen Line).

Coldham Station closed in 1966. Closure of Wisbech Station (and the extension to Watlington) followed in 1968. The line was singled in 1972 and used for freight-only operations as far as the Metal Box and Purina sites located south of Wisbech until around 2000.

Since then the line has been described in the Network Rail Sectional Appendix as Out of Use (OOU) temporarily from 86 miles + 18 chains to Wisbech.

The March end of the line is currently used to access Whitemoor Yard in conjunction with the chord from March West Junction and to support shunting movements, but only as a far as 86 miles + 18 chains.

The track layout at March station was altered in 2001, moving March East Junction and the connection to the East Curve from the Ely side of the station to the Peterborough end of platform 2.

The proposed scheme reinstates a junction at the Ely side of the station and provides a 3rd operational platform at March station. The new track through platform 3 runs parallel with a realigned East Curve under Norwood Road overbridge and joins the existing alignment of the Wisbech line at Whitemoor Junction beyond the connection into Whitemoor Yard.

The single line track to Wisbech is divided by a Down direction passing loop at Coldham. Wisbech station is provided with a single platform.

On the main line a new 40mph crossover is provided from the Down Main to the Up Main, on the Ely side of March East Level Crossing. The Level Crossing is expected to be closed by another project.

In addition to signalling for the reinstated track, the March to Wisbech project requires signalling alterations at Whitemoor Junction, on the East curve, at March Station platform 2, on the Up Main approaching March and on the Down Main approaching March for the reconfigured junction.

The Ely – March – Peterborough route (Engineers Line Reference EMP) is currently controlled from a number of traditional signal boxes mostly using mechanical lever frames.

March East Signal Box (at 85 miles + 68 chains) is located on the Ely side of March East level crossing over the B1101. The signal box works to Three Horse Shoes Signal Box in the Down (Peterborough) direction, and to March South Signal Box in the Up (Ely) direction.

March South Signal Box (at 85 miles + 35 chains), is located by March South Level Crossing and works to Stoney Signal Box in the Up (Ely) direction.

Network Rail's Anglia Route Strategic plan (April 2019) indicates resignalling on the Ely – March – Peterborough corridor will abolish March East S.B. and March South S.B and the route will be controlled from Cambridge PSB by the end of CP7.

The Ely Area Capacity Enhancement Programme (EACE) requires level crossing closures on the Ely – Peterborough route in order to achieve an increase in train movements. This includes closure of March East Level Crossing.

The March to Wisbech Transport Corridor GRIP3 study has developed scheme sketches for three track layout options at March.

The preferred Option is "March Option 4C" and the Scheme Sketch for this is 398128-MMD-00-XX-SK-SG-0003.

2 Standards

Engineering details shall be compliant with Railway Group Standards, Network Rail Company Standards, and RSSB Railway Industry Standards (RIS).

Any proposal to deviate from Railway Group Standards or Network Rail Company Standards shall be subject to agreement with Network Rail.

Conflicts in Standards that may arise will be dealt with on an individual basis in the form of a Technical Query.

The Client will confirm if any changes to Standards shall be applied to the Project. All changes to Standards shall be agreed with the Client and the Network Rail Designated Project Engineer prior to implementation. If this is the case, the Signalling Design Specification and engineering details will need to be amended accordingly.

The project shall comply with the requirements of the Common Safety Method (CSM) and demonstrate compliance through documented hazard identification and risk assessment in the form of a Hazard Log / Risk Register.

Construction and Design Management (CDM) Regulations 2015 and guidance on ‘Safe by Design’ shall apply to this project.

Should the project be deemed ‘interoperable’, it would be subject to a number of Technical Specifications for Interoperability (TSIs).

3 Timescales

Proposed dates for the milestones of each alteration, stage or key deliverables are as follows:

Description	Completion Date
GRIP 3 (Option Selection)	June 2020
GRIP 4 (Single Option Development)	To be confirmed
GRIP 5 (Detailed Design)	To be confirmed
GRIP 6 (Construct, Test & Commission)	To be confirmed

4 System Safety Assurance

System Safety should be assured by the historical operating performance of the signalling equipment and the application of standard proven designs based on Network Rail typical circuits.

There shall be no reduction in the operational safety as a result of these works.

Any non-standard or novel solutions will be subject to Network Rail acceptance and appropriate risk assessments.

5 Occupational Safety

5.1 General

The Network Rail Hazard Directory shall be consulted for details of hazards in the area. The directory shall be updated to reflect any new hazards created by the project or identified during the works.

The project shall provide appropriate protection for project personnel working on or near the line. When working on or near the line is unavoidable, Work Package Plans will be prepared and accepted by Network Rail prior to starting work. As part of this, Safe System of Work Assessments and Controller of Site Safety (COSS) evaluations shall be carried out.

The project requirements shall be implemented with the focus on minimising staff exposure to the operational railway throughout all phases of the infrastructure cycle.

Special risks that might arise during the execution of the works must be stated in health and safety documentation in accordance with NR/L2/SIG/11201 (Signalling Design Handbook) and NR/GN/CPR/401 (Guidance on Contractual Health and Safety Requirements). Any decisions based on risk assessment must be clearly stated.

5.2 Hazardous Substances

All hazardous substances will be handled and disposed of in accordance with Network Rail Group Standards, COSHH regulations, the Environmental Protection Act, and any other applicable regulations or codes.

The Asbestos Register shall be consulted for details of relevant hazards in the area.

6 Systems & Equipment

6.1 Interlocking

March East Signal Box consists of a 61-lever (numbered A-E and 1-56) Saxby and Farmer 1888 Duplex locking frame dating from 1897 which was re-locked to current standard tappet locking in 1987 when the signal box absorbed the March West and Whitemoor Junction control areas. There are 21 spare levers.

Most signals are colour-light with some mechanical shunt and ground signals. Point operation is a mix of mechanical and power-operated.

The colour-light signalling for the Whitemoor Junction area, dating from 2006/2007, is controlled via a Relocatable Equipment Building (REB) located on the station side of the March East level crossing.

Network Rail's Anglia Route Strategic plan (April 2019) indicates resignalling on the Ely – March – Peterborough corridor will abolish March East S.B. and March South S.B and the route will be controlled from Cambridge Power Signal Box by the end of CP7.

It is expected that the resignalling will utilise a Computer Based Interlocking (CBI).

The March to Wisbech re-opening scheme should use capacity available in the new interlocking for the proposed changes at March, Whitemoor Junction and the single line with crossing loop at Coldham.

6.2 Control & Indication System

It is proposed that the March to Wisbech line should be included in the VDU workstation that is to control the Ely – Peterborough route from Cambridge PSB.

6.3 Level Crossings

The GRIP 3 assumption is that all the existing level crossings, accommodation, and occupational crossings on the Wisbech line will be closed.

For the main line, the GRIP 3 assumption is the Ely Area Capacity Enhancements Programme will close level crossings at Horsemoor, Badgeney Road, March East and Norwood Road.

The March to Wisbech project will not be altering any existing Level crossings.

6.4 Train Detection

The existing train detection is Medium Voltage DC track circuiting in the area around March Station and Whitemoor Junction. On the plain line section West of Norwood Road Level Crossing, TI21 frequency track circuiting is used. The area controlled by March South is largely Low Voltage DC track circuiting.

Train detection using axle counters is proposed for the single line section of the Wisbech line from north of Whitemoor Junction to the Buffer stops at Wisbech due to the length of the train detection sections.

Medium voltage DC track circuiting has been proposed for new tracks in the area around March Station and Whitemoor Junction. However, this could change if the proposed resignalling of the Ely – Peterborough line replaces existing tracks in this area with a different technology such as axle counters.

6.5 Spares

This project introduces new equipment. This should be similar type to that specified for the main line. Stocks of spares will need to be increased commensurately.

7 Competent Resources

Safety-critical staff must hold competency certificates for the work being undertaken with additional track safety certification held as appropriate (e.g. PTS/IWA).

All Signalling engineers involved with this project will be appropriately trained and competent in accordance with NR/L2/SIG/10160 (Signal Engineering: Implementation of IRSE Licensing Scheme), NR/L1/CTM/001 and NR/L2/CTM/201 (Competence Management).

All Signalling engineers shall hold or be working towards attaining appropriate IRSE accreditation commensurate with the activity being undertaken. Appropriate levels of auditable mentorship shall be provided for personnel working towards accreditation.

A register of competent designers, together with their initials and field(s) of competence (including, where appropriate, details of their certificate of competence e.g. IRSE licence), shall be maintained and be available for inspection by Network Rail.

Staff shall hold the appropriate IRSE licence and Authority to Work certification for the design work they undertake and have an IRSE Log Book detailing their experience and certification. Any person(s) not holding an appropriate IRSE licence will work under the direct supervision of a licenced and competent mentor who will be responsible for the work undertaken.

All design details shall be independently checked and certified by an IRSE licenced person holding the appropriate IRSE licence category.

8 Management of Interfaces

This project is multi-disciplinary and will affect engineering assets including:

- Buildings
- Bridges
- Signalling
- Track
- Civils
- Level Crossings
- Electrification and Plant (E&P)
- Telecommunications

8.1 Nominated Project Managers/Engineers

Role	Nominated Person
Project Manager	Robert Leather (Mott MacDonald)

8.2 Other Engineers Involved

For this GRIP3 study, the following Mott MacDonald staff have been involved.

Role	Nominated Person
Contractor's Engineering Manager	Gavin Jennings
Track	Gavin Jennings
Signalling	Douglas Crawford
Signal Sighting Chairman	Damian Nesom
Signalling CRE	Lawrence Kent
Operations	Roy Chapman
Telecoms	David Crilly
Ancillary Civil/Stations Civil Engineering	Andrew Corcoran
Geotechnics	Richard Spence
Highways	Naomi Ward
Bridges and Civil Structures	Gerry Dissanaike
E&P	Timothy Granger
Drainage and Flood Risk	Megan Jones
Environmental Surveys and Reporting	Katherine Gareau
Building Information Modelling	Steven Longden

8.3 Interfaces with Other Projects

Interfaces with other projects are to be confirmed with Network Rail as this may have an impact on Overlapping Design Agreements (ODAs) and commissioning works.

From published Route plans it is understood the following projects are relevant:

- Ely Area Capacity Enhancements Programme
- Ely – Peterborough Life Extensions
- Ely – Peterborough Resignalling

9 Assessment of Existing Signalling and Site Surveys

A visual inspection of the route was undertaken by Mott MacDonald staff on the 21st and 22nd April 2015.

March East Signal Box has been a Grade II listed building since March 2012, English Heritage number 1408197.

The colour-light signalling for the Whitemoor Junction area, dating from 2006/2007, is controlled via a Relocatable Equipment Building (REB) located on the station side of March East level crossing.

Some of the existing signal structures and location cases at March station and Whitemoor Junction may need alterations.

All equipment on the disused line to Wisbech will be abolished.

10 Stageworks & Testing Strategies

This is to be determined at a later GRIP stage.

11 Environmental Considerations

11.1 General

In accordance with Network Rail's Environmental Policy Statement, all environmental issues will adhere to NR/L2/ENV/015 (Environment and Social Minimum Requirements for Projects – Design and Construction). Environmental factors as identified in the Network Rail Hazard Directory shall be considered in the design and delivery of signalling works. Where these factors are relevant, an investigation shall be undertaken by the relevant design authority to establish the nature of the site-specific contaminant prior to commencing site works. Where necessary, corrective action shall be implemented to minimise the risk to staff.

The working environment should consider noise, vibration, dust, and other factors likely to generate hazardous fumes or dust. Hazards likely to be experienced by installers, maintainers, or operators and the necessary protective measures to be taken must be stated in health and safety documentation in accordance with NR/L2/SIG/11201 (Signalling Design Handbook). This includes the handling of hazardous substances (e.g. batteries). Noise and other environmental nuisance should also be considered to minimise emissions and reduce waste taking into account the life cycle environmental impact of products and services.

All waste will be disposed of in accordance with the current waste management legislation. An agreed Site Waste Management Plan (SWMP) will be developed by the installation contractor and included in the Environmental Management Plan.

Excessive noise levels shall be avoided during hours of darkness to comply with Noise Pollution legislation.

During site work, adequate lighting shall be provided. When using site lighting, consideration must be given to its potential impact on local residents, and if necessary, suitable mitigation measures applied.

Materials and tools shall be stored securely when not in use.

11.2 Vandalism

Cable theft across the rail network is an ongoing problem and causes high costs to be incurred. Design measures to encompass cable theft will be required if the infrastructure controller deems special provision against vandalism is required.

12 Operating Requirements

The re-opened line is required to support a 2 trains per hour service between Wisbech and Cambridge.

The ability to run 2 trains per hour through to Cambridge is dependent on the Ely Area Capacity Enhancement programme delivering a remodelled Ely North Junction and level crossing upgrades and closures between March and Cambridge.

Whitemoor Yard is a strategic node for Network Rail's engineering trains across the Anglia Route, and has lengthy materials trains arriving/departing on both the East Curve and West Curve.

The assumed rolling stock for the proposed Wisbech to Cambridge service is a two-car Class 170 which is 47.22m long. This train length requires operational platform lengths of 53 m.

March Station platforms 1 and 2 have a published operational length of 114m.

A new platform 3 at March Station will be 55m in length with passive provision for 4-car trains.

Wisbech Station will have a single platform 55m in length with passive provision for 4-car trains.

An intermediate passing loop with provision for 4-car trains is proposed to cater for the proposed service pattern. This necessitates the use of Track Circuit Block (TCB) method of working for the Wisbech line and provision of train detection which must be displayed to the signaller.

Train Ready To Start (TRTS) plungers, and OFF indicators subject to Signal Sighting, will be required at March Station on platforms 2 and 3 for train dispatch.

A telephone should be provided on Wisbech station platform to allow staff to contact the signaller should the need arise.

13 Overlapping & Parallel Work

There are no Overlapping Design Agreements (ODAs) in place. Network Rail shall advise of any ODAs being required.

An ODA will not be applied unless a Responsible Overlapping Design Engineer (RODE) for the agreement has been nominated and agreed upon.

14 Special Control Measures

This is to be determined at a later GRIP stage.

15 Check Recording

All signalling design will be production checked by the designer responsible and where necessary, an Error Report Form (ERF) will be initiated and presented with the design for independent check. If no errors are found, the error report is to be endorsed as Error Free.

A competent designer who has not been involved in the production process will independently check the design. Deficiencies will be identified on the design and recorded on the ERF together with a brief indication of the area where correction is required.

The production and independent check process will be repeated until the design is Error Free and suitable for issue.

The process of the checking process will be recorded by a system of marking or ticking a copy of the design clearly identified for either production of independent check purposes. For minor changes, e.g. colouring errors, the same copy may be used providing that the production check and independent check are clearly identified.

The Signalling Design Manager (DM) / Contractor’s Responsible Engineer (CRE) will review the completed error report forms.

16 Configuration Control

Configuration Control will be undertaken in accordance with NR/L2/SIG/11201 (Signalling Design Handbook) which details the requirements for design drawing identification, numbering, indexing and change recording.

Amendment Letters shall be requested as required from Network Rail's records custodian.

Any queries raised during the testing and commissioning phase will be addressed by the issue of Test Logs. All design alterations issued once installation has commenced shall be produced using modification sheets. This process will be controlled from the signalling design office.

17 Approval Documentation

Regular review of the contract specification and any contract variations will be undertaken by the CRE to ensure that the design meets the contract requirements.

Approval shall generally be in accordance with NR/L2/SIG/11201 (Signalling Design Handbook).

18 System Interfaces

Network Rail's Anglia Route Strategic plan (April 2019) indicates resignalling on the Ely – March – Peterborough corridor will abolish March East S.B. and March South S.B and the route will be controlled from Cambridge PSB by the end of CP7.

It is expected that the resignalling will utilise a Computer Based Interlocking (CBI).

The March to Wisbech re-opening scheme should use capacity available in the new interlocking for the proposed changes at March, Whitemoor Junction and the single line with crossing loop at Coldham.

This will avoid having an interface between two different types of signalling systems at March.

19 Change Control

A process shall be agreed to control and authorise changes to the project scope. This includes changes to the Client's requirements, Scheme Plan, and Design Specification.

Any change to the design philosophy which conflicts with this specification shall not be adopted without a revised Signalling Design Specification having been accepted by Network Rail.

Any changes to the design details following their issue shall be subject to version control in accordance with NR/L2/SIG/11201 (Signalling Design Handbook).

A log of changes or variations to the Scheme shall be appended to the SDS as the Scheme progresses or recorded in a design log.

Decisions taken with respect to the implementation of changed standards shall be similarly recorded.

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S. Initial Signal Sighting

Initial Signal Sighting Report - GRIP 3

March to Wisbech Transport Corridor

21 February 2020

Mott MacDonald
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Initial Signal Sighting Report - GRIP 3

March to Wisbech Transport Corridor

21 February 2020

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	21/02/20	J. Lee	D. Nesom	L. Kent	Initial Issue

Document reference: 398128-MMD-00-XX-RP-SG-0003 | A

	Name	Role	Signature	Date
Prepared	Jez Lee	Design Engineer – Signalling		21/02/2020
Checked	Damian Nesom	Signal Sighting Chairman		25/02/2020
Approved (Signal Design)	Lawrence Kent	Signalling CRE		28/02/2020
Network Rail Acceptance				

Information class: Standard

Contents

1 Outline & Scope

This GRIP 3 Initial Signal Sighting Report has been produced to support the requirements of NR/L2/SIG/11201 Module A3-7 (Issue 1), NR/L2/SIG/10157 (Issue 3), NR/L2/SIG/10158 (Issue 1), RIS-0737-CCS (Issue 1), and RIS-0703-CCS (Issue 1.1).

A review has been undertaken to assess the proposed positions of the signals and lineside signage using the GRIP 3 signalling scheme sketch (398128-MMD-00-XX-SK-SG-0003 Revision P01), track alignment drawings (398128-MMD-00-XX-DR-P-0003 to 0014 Revision P01.1), multi-discipline co-ordination model (398128-MMD-00-XX-CR-U-0001 Revision P10), and signal sighting forms for existing assets where available.

It should be noted that 3D models and cab footage were not available for this assessment. Furthermore, the assessment has not had access to platform design.

It has been assumed that the Wisbech line will not be electrified. Assessment has discounted the presence of OCS structures e.g. stanchions.

The position of assets on the main lines (ELR: EMP) is given in Miles + yards. For assets on the new tracks, the project datum is taken as the 87 MP at chainage 140km + 12.928m on the Wisbech line (ELR: WIG).

Hazards have been identified and noted on the scheme sketch and within design logs.

2 Initial Assessment

2.1 Up Main

2.1.1 Up Direction

2.1.1.1 ME48 (86MP + 768y)

This is an existing 4-aspect signal with its double yellow aspect blanked. It has a position 1 Position Light Junction Indicator (PLJI). The approach speed is 75mph.

It is proposed that a warner class route be provided by this Scheme. Sighting is not expected to be affected by this as the approach speed to the signal for a warner class route will be significantly less than 75mph. The train will be main aspect approach released from red (MAR).

A Baseline Response Time (BRT) of 7s and Supplementary Response Time (SRT) of 1.1s (complex signal: 0.5s; 2 routes: 0.6s) gives an Minimum Response Time (MRT) of 8.1s. This gives a Minimum Readable Distance (MRD) of 272m. The existing signal sighting form indicates an achievable distance of 800m.

2.1.1.2 40 Permissible Speed Indicator (85MP + 1759y)

This is an existing miniature Permissible Speed Indicator (PSI).

A BRT of 4s at an approach speed of 20mph from the East Curve gives an MRD of 36m. Based on the P-Way design (revised East Curve alignment), sighting is expected to be in excess of 36m and an improvement on existing sighting.

From the Up Main, a BRT of 4s at an approach speed of 40mph gives an MRD of 72m. Based on the P-Way design, sighting is expected to be in excess of 100m.

2.1.1.3 ME45/ME22 (85MP + 1592y)

ME45 is an existing 3-aspect signal. ME22 is an associated subsidiary signal with 5-indication miniature alphanumeric route indicator (MARI) and subsidiary signal. These are to be relocated 12m in rear of their current position. It should be noted that the new MARI may only be able to support 4 single-character indications. In this case, a second MARI would be required as part of the signal structure.

The approach is on a slight right-hand curve with an approach speed of 40mph. Its new position will place it in rear of the existing pedestrian footbridge at March station. A new footbridge is also planned for construction at the north end of March station in addition to the existing footbridge. It is not expected that these changes will significantly affect signal sighting.

ME45 has a multi-SPaD history. ME45 has 2 occurrences of overrun recorded since 2010. The overrun distances were between 10 and 216m. The existing overlap is recorded as 148m. The only recorded detail specifies a misjudgement of environmental conditions for the SPaD.

It is noted from the existing sighting form that ME45 could be obscured by a train standing in platform 1.

A BRT of 7s and SRT of 1.5s (complex signal: 0.5s; full obscuration in zone 2: 1s) gives an MRT of 8.5s. This gives an MRD of 152m.

The calculation of MRT has not included the MARI indications as the shunt routes would only be available to trains controlled almost to a stand i.e. they would be approaching the signal at a significantly reduced speed in comparison to 40mph.

Notwithstanding, the existing sighting form for the signal at its current position indicates an achievable distance of 290m.

2.1.1.4 40 Permissible Speed Indicator (85MP + 1474y)

This is currently a proposed miniature PSI, however, it is to be mounted back-to-back with a full-size PSI. For consistency, this sign could also be full-size

A BRT of 4s at an approach speed of 20mph from the Up Wisbech Down gives an MRD of 36m. Based on the P-Way design, sighting is expected to be in excess of 50m.

From the Up Main, a BRT of 4s at an approach speed of 40mph gives an MRD of 72m. Based on the P-Way design, sighting is expected to be in excess of 90m.

2.1.2 Down Direction

2.1.2.1 25 Permissible Speed Indicator (85MP + 1474y)

This is a proposed PSI with right-hand direction arrow.

A BRT of 4s at an approach speed of 40mph from the Down Main via Signal ME3 over PM3 points gives an MRD of 72m. Based on the P-Way design, sighting is expected to be in excess of the MRD.

From the Up Goods No. 1, a BRT of 4s at an approach speed of 15mph gives an MRD of 27m. Based on the P-Way design, sighting is expected to be in excess of 50m.

2.1.2.2 ME46 (85MP + 1725y)

This is an existing right-hand mounted 3-aspect signal with standard alphanumeric route indicator (SARI). There are 20mph and 10mph PSIs on the approach to the signal between March station platform 2 and the signal. Both routes from ME46 are MAR.

As the speed of the East Curve will be raised from 10mph to 20mph, it is recommended that the current pair of 20mph and 10mph PSIs with direction arrows on the approach to the signal be combined as a single 20mph PSI.

The signal is not altered by this project, however, the approach speed to the signal will be increased from 20mph to 40mph. The approach is on a slight left-hand curve. Furthermore, a new pedestrian footbridge is to be installed at the North end of March station. This is not expected to obscure the view of the signal.

A BRT of 7s and SRT of 1.1s (complex signal: 0.5s; 2 routes: 0.6s), gives an MRT of 8.1s. This gives an MRD of 145m. Based on the P-Way design, this MRD should be achievable.

2.2 Down Main

2.2.1 Down Direction

2.2.1.1 MS35/MS33 (84MP + 1673y)

MS35 is an existing 3-aspect signal to be relocated 120m in rear of its current position. A flashing yellow aspect will be provided by these works for ME3 C(M) which is 25mph. The approach speed is 60mph.

MS33 is an existing associated subsidiary signal with 2-indication MARI which will also be relocated.

MS35 has a multi-SPaD history. MS35 has 4 occurrences of overrun recorded since 2001. Details of the 3rd incident on 15/04/2008 are not available but of the remaining overruns, the overrun distances were between 10 and 22m. The existing overlap is recorded as 219m. The only recorded detail specifies anticipation of signal clearance for the SPaD.

The existing sighting form does not have an assessed reading distance.

A BRT of 7s and SRT of 0.5s (complex signal: 0.5s) gives an MRT of 7.5s. This gives an MRD of 201m.

The calculation of MRT has not included the MARI indications as the shunt routes would only be available to trains controlled almost to a stand i.e. they would be approaching the signal at a significantly reduced speed.

The approach to the signal is a right-hand curve and based on the P-Way design, it is recommended that the signal be mounted at least 3m from the left rail to ensure sufficient sighting is available. This is to cater for the possibility of a long train standing between MS934 and MS27 and thereby obstructing the view around the curve.

Sighting should be confirmed with a site visit, cab footage, or a 3D model as based on the P-Way design, it is estimated to be 210m should a train be standing between MS934 and MS27.

2.2.1.2 ME3BR (85MP + 1018y)

ME3BR is a proposed splitting banner repeater.

A BRT of 4s gives an MRD of 72m.

There is limited clearance between tracks so it has been proposed to mount the signal from a cantilever.

The approach to ME3BR is on a left-hand curve and a train standing on the Down Goods No. 1 will limit sighting, however, based on the P-Way design, sighting is estimated to be at least 90m.

It is noted that ME3BR is in advance of the AWS magnet for ME3.

2.2.1.3 ME3 (85MP + 1166y)

ME3 is an existing 3-aspect signal to be relocated 170m in rear of its existing position and with its overlap clear of PM3 points. Positions 4 and 5 PLJIs will be provided. The approach speed will be 40mph and the driver may have received a flashing yellow aspect.

A BRT of 7s and SRT of 1.4s (complex signal: 0.5s; 3 routes: 0.9s) gives an MRT of 8.4s. This gives an MRD of 150m.

There is limited clearance between tracks so it has been proposed to mount the signal from a cantilever. Placing the aspect central to the Down Main line will improve sighting and allow the signal to come into view sooner as the train approaches on a left-hand curve.

The curved approach to ME3 may lead to a train standing on the Down Goods No. 1 limiting sighting to ~135m if the aspect of ME3 is not visible above the standing train. A banner repeater has therefore been proposed 135m in rear of ME3.

This would reduce the BRT to 5s and the MRD to 89m which would be achievable, even with a train standing on the Down Goods No. 1.

2.2.1.4 ME4 (85MP + 1726y)

This is an existing 3-aspect signal. The signal itself is not altered by this project, however, the approach is altered by the proposed construction of a pedestrian footbridge at March station.

A BRT of 7s and SRT of 0s, gives an MRT of 7s. This gives an MRD of 125m at an approach speed of 40mph. Based on the P-Way design, sighting is expected to be in excess of 150m.

2.3 East Curve

2.3.1 Up Direction

2.3.1.1 ME36 (Datum: 138429)

This is an existing 3-aspect signal with an approach speed of 20mph to be relocated in advance of its current position. It is provisionally shown on the sketch as being left-hand mounted.

A BRT of 7s and SRT of 0s gives an MRT of 7s. This gives an MRD of 63m.

The approach to the signal is a left-hand curve and subject to exceptional track radius which is likely to limit sighting. Should sighting be insufficient, right-hand mounting the signal would improve sighting distance. It is expected that a right-hand mounted signal would provide sighting in excess of 63m.

Trains travelling in the Up direction and approaching March station platform 3 on the Up Wisbech Down will be able to sight ME36, however, a read across risk is not considered to exist as no parallel signal exists on the Up Wisbech Down in the Up direction. Furthermore, route knowledge should ensure that the driver expects their next signal to be ME302 at March station platform 3.

2.3.2 Down Direction

2.3.2.1 ME305/ME55 (Datum: 138514)

ME305 is a proposed 2-aspect signal with an approach speed of 20mph. ME55 is an associated subsidiary signal. These are to replace the existing fixed red signal with associated subsidiary signal designated ME55.

There is 1 reported occurrence of overrun at ME55 on 06/01/2008. The overrun distances was between 109 and 110m. The existing overlap is recorded as 202m. The recorded detail specifies a failure to check signal aspect for the SPaD.

A BRT of 7s and SRT of 0.5s (complex signal: 0.5s) gives an MRT of 7.5s. This gives an MRD of 65m.

The approach to the signal is a right-hand curve and subject to exceptional track radius, however, based on P-Way design, sighting is estimated to be in excess of the MRD.

2.4 West Curve

2.4.1 Down Direction

2.4.1.1 ME303/ME49 (Datum: 138523)

ME303 is a proposed right-hand mounted 2-aspect signal with an approach speed of 10mph. ME49 is an associated subsidiary signal. These are to replace the existing fixed red signal with associated subsidiary signal designated ME49.

A BRT of 7s and SRT of 0.5s (complex signal: 0.5s) gives an MRT of 7.5s. This gives an MRD of 34m.

The approach to the signal is a left-hand curve and subject to exceptional track radius, however, given the low approach speed and the track layout, sighting in excess of 50m is expected.

An SRT has not been applied as although right-hand mounted, it is assumed that the left-hand curve on the approach will lead to the perception that the signal is mounted in the standard position. Furthermore, this is consistent with the existing presentation of ME49 signal (fixed red aspect with associated subsidiary signal and MARI).

2.5 Up Wisbech Down

2.5.1 Up Direction

2.5.1.1 ME302-OFF (Datum: 138295)

This is a proposed OFF indicator for ME302 on March station platform 3. Sighting is not expected to be an issue.

This OFF indicator may not be required if ME302 is right-hand mounted.

2.5.1.2 ME302 (Datum: 138226)

ME302 is a proposed 3-aspect platform starter signal at March station with an approach speed of 25mph.

A BRT of 7s and SRT of 0s gives an MRT of 7s. This gives an MRD of 78m. Based on the proposed P-Way alignment, this is achievable.

Consideration should be given to right-hand mounting the signal so that it is consistent with other platform starter signals at March station. This would also aid train dispatch as a left-hand mounted signal may not be visible to station staff (dependent on train length).

2.5.2 Down Direction

2.5.2.1 20 Permissible Speed Indicator (Datum: 138366)

This is a proposed PSI at March station platform 3 north end.

A BRT of 4s at an approach speed of 25mph gives an MRD of 45m. Based on the proposed P-Way alignment, this is achievable.

Trains are unlikely to be induced to accelerate towards this board from the station platform as it is expected to be in view even when using short stock.

2.5.2.2 ME301 (Datum: 138368)

ME301 is a proposed 2-aspect signal at March station.

Trains are unlikely to be induced to accelerate towards ME301 from the station platform as the signal is expected to be in view even when using short stock.

A BRT of 7s and SRT of 1.5s (complex signal: 0.5s; lineside distractions: 1.0s) gives an MRT of 8.5s. An approach speed of 25 mph gives an MRD of 95m. Based on the proposed P-Way alignment, this may be achievable. Given the curvature of the platform, this should be confirmed with a 3D model.

2.6 Wisbech Single

2.6.1 Up Direction

2.6.1.1 30 Permissible Speed Indicator (Datum: 150330)

This board will be at the platform end and would not be approached at speed. Sighting is not foreseen to be an issue.

It is noted that there is a possibility that the platform could be extended to datum 150288 and the PSI relocated so that longer stock (class 755) could use the platform. Based on the P-Way design, this would not affect a driver's ability to sight the PSI as the track within the station is linear.

2.6.1.2 45 Permissible Speed Indicator (Datum: 150185)

A BRT of 4s at an approach speed of 30mph gives an MRD of 54m. Based on the P-Way design, sighting is expected to be at least 100m.

2.6.1.3 60 Permissible Speed Indicator (Datum: 150033)

A BRT of 4s at an approach speed of 45mph gives an MRD of 80m. Based on the P-Way design, sighting is expected to be at least 100m.

2.6.1.4 AWS Cancelling Indicator (Datum: 149103)

A BRT of 2s at an approach speed of 60mph gives an MRD of 54m. Based on the P-Way design, sighting is expected to be at least 180m.

2.6.1.5 ME402 (Datum: 145261)

ME402 is a proposed 2-aspect distant signal with an approach speed of 60mph.

A BRT of 7s and SRT of 0s gives an MRT of 7s. This gives an MRD of 188m. Based on the P-Way design, sighting is expected to be at least 400m.

2.6.1.6 ME404 (Datum: 144691)

ME404 is a proposed 3-aspect signal with an approach speed of 60mph.

A BRT of 7s and SRT of 0s gives an MRT of 7s. This gives an MRD of 188m. Based on the P-Way design, sighting is expected to be at least 400m.

2.6.1.7 ME406 (Datum: 144121)

ME406 is a proposed 2-aspect signal with an approach speed of 60mph.

A BRT of 7s and SRT of 0s gives an MRT of 7s. This gives an MRD of 188m. Based on the P-Way design, sighting is expected to be at least 400m.

2.6.1.8 20 Permissible Speed Warning Indicator (Datum: 139650)

A BRT of 4s at an approach speed of 60mph gives an MRD of 107m. Based on the P-Way design, sighting is expected to be in excess of 180m.

2.6.1.9 ME306 (Datum: 139470)

ME306 is a proposed 2-aspect distant signal with an approach speed of 60mph.

A BRT of 7s and SRT of 0.5s (driver workload: 0.5s) gives an MRT of 7.5s. This gives an MRD of 201m.

Maintenance of lineside vegetation in the Down cess may be required to ensure sufficient sighting.

2.6.1.10 ME304 (Datum: 138900)

ME304 is a proposed 3-aspect signal with positions 1, 2, and 4 PLJIs. The approach speed is 60mph but all forward routes are 20mph.

A BRT of 7s and SRT of 1.4s (complex signal: 0.5s; 3 routes: 0.9s) gives an MRT of 8.4s. This gives an MRD of 225m.

The approach to the signal is a slight left-hand curve and sighting may be limited by lineside vegetation and/or the limits of the railway boundary in conjunction with adjoining property. If this is the case, consideration should be given to vegetation clearance followed by right-hand mounting the signal should the former not provide sufficient sighting. Right-hand mounting the signal is not expected to lead to a risk of misreading as the Wisbech Single is a single line.

Sighting should be confirmed with a site visit, cab footage, or a 3D model.

2.6.1.11 20 Permissible Speed Indicator (Datum: 138717)

A BRT of 4s at an approach speed of 60mph gives an MRD of 107m. As the approach is straight track, this MRD should be achievable.

2.6.1.12 10 Permissible Speed Indicator (Datum: 138617)

This is a proposed PSI with right-hand arrow to indicate divergence speed.

A BRT of 4s at an approach speed of 20mph gives an MRD of 36m. The approach from the Wisbech Single is straight track so the MRD is expected to be achievable.

The approach from Whitemoor Yard (ME53) is across 51 points but sighting is not expected to be an issue. As mitigation, there is an existing 10mph PSR across 51 points.

2.6.2 Down Direction

2.6.2.1 60 Permissible Speed Indicator (Datum: 138717)

A BRT of 4s and SRT of 0s gives an MRT of 4s. At an approach speed of 20mph, this gives an MRD of 36m. Based on the P-Way design, it is expected that sighting of 150m can be achieved from all approaches.

2.6.2.2 AWS Cancelling Indicator (Datum: 140010)

A BRT of 2s at an approach speed of 60mph gives an MRD of 54m. Based on the P-Way design, sighting is expected to be in excess of 180m.

2.6.2.3 ME401 (Datum: 142870)

ME401 is a proposed 2-aspect distant signal with an approach speed of 60mph.

A BRT of 7s and SRT of 0s gives an MRT of 7s. This gives an MRD of 188m. Based on the P-Way design, sighting is expected to be in excess of 300m.

2.6.2.4 ME403 (Datum: 143440)

ME403 is a proposed 3-aspect signal with a position 1 PLJI. The approach speed is 60mph.

A BRT of 7s and SRT of 1.1s (complex signal: 0.5s; 2 routes: 0.6s) gives an MRT of 8.1s. This gives an MRD of 217m. Based on the P-Way design, sighting is expected to exceed 300m.

2.6.2.5 40 Permissible Speed Indicator (Datum: 143849)

This is a proposed PSI with left-hand arrow to indicate divergence speed.

A BRT of 4s at an approach speed of 60mph gives an MRD of 107m. The approach to the signal is a slight right-hand curve but based on the P-Way design, sighting is expected to be in excess of 150m.

2.6.2.6 60 Permissible Speed Indicator (Datum: 144381)

This is a proposed miniature PSI.

A BRT of 4s at an approach speed of 40mph from the Coldham Loop gives an MRD of 72m. Given the converging approach from the Coldham Loop, sighting is estimated to be in excess of 100m based on the P-Way design.

2.6.2.7 Distant Board (Datum: 149463)

A BRT of 7s and SRT of 0.5s (AWI co-located with the signal) gives an MRT of 7.5s. At an approach speed of 60mph this gives an MRD of 201m. Based on the P-Way design, sighting should be in excess of 240m.

2.6.2.8 45 Permissible Speed Indicator (Datum: 150033)

A BRT of 4s and an approach speed of 60mph gives an MRD of 107m. The approach to the board is a slight right-hand curve but based on the P-Way design, sighting is expected to be in excess of 150m.

2.6.2.9 30 Permissible Speed Indicator (Datum: 150185)

A BRT of 4s and an approach speed of 45mph gives an MRD of 80m. The approach to the board is a slight left-hand curve but based on the P-Way design, sighting is expected to be in excess of 100m.

2.6.2.10 Buffer Stop with Red Light (Datum: 150390)

The approach speed is 15mph with a Required Reading Distance (RRD) of 100m. Track drawings indicate 122m of straight track therefore sighting of the buffer stop is not considered to be an issue.

2.7 Coldham Down Loop

2.7.1 Down Direction

2.7.1.1 ME405 (Datum: 144108)

ME405 is a proposed 2-aspect signal with an approach speed of 40mph.

A BRT of 7s and SRT of 0s gives an MRT of 7s. This gives an MRD of 125m. Although the approach is a diverging route over PL1 points, based on the P-Way design, sighting of at least 400m is expected.

3 Conclusions

An initial desktop signal sighting assessment has been conducted for the March to Wisbech Transport Corridor project. This was conducted using the GRIP 3 signalling scheme sketch, track alignment drawings, the multi-discipline co-ordination model, and signal sighting forms for existing assets where available. 3D models and cab footage were not available for this assessment. Furthermore, the assessment did not have access to platform design.

Hazards that were identified during the GRIP 3 Scheme design and prior to this assessment have been noted on the Scheme sketch and design log.

In conjunction with the P-Way design and co-ordination model, the proposed positions of lineside signals and signage has been provisionally assessed as being compliant with the relevant standards (see Outline & Scope).

Sighting should be further assessed at GRIP 4 with site visits and/or 3D models to verify sighting is compliant.

ME36 on the East Curve could be right-hand mounted to improve sighting. This would not be expected to increase the risk of a misread.

ME302 could be right-hand mounted so that its position is consistent with other platform starter signals at March station. It would also remove the need to provide an OFF indicator on platform 3 for train dispatch.

Space permitting, the PSI at March station platform 3 north end could be combined on the same post as ME301 signal unless a folding lightweight post is to be used.

ME304 sighting may be improved by right-hand mounting. In its current position, sighting may be limited by the railway boundary and vegetation.

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T. Carbon Portal Assessment

MOTT MACDONALD

March to Wisbech Carbon Assessment

Equivalent Carbon Optioneering for March to Wisbech

Project:	March to Wisbech		
Our reference:	398128	**Your reference:**	n/a
Prepared by:	M Lewis	**Date:**	09/03/2020
Approved by:	G Jennings	**Checked by:**	S Bah
Subject:	Equivalent Carbon Optioneering for March to Wisbech		

A carbon portal assessment was undertaken to quantify and compare the carbon footprints of the considered options for the project. This technical note provides a breakdown of the contributing factors to the embodied carbon totals and final totals to facilitate a comparison.

The carbon portal tool is constantly developing, and multiple assumptions are required in its use. The resulting output is therefore to be considered for indicative purposes only, and not as a comprehensive analysis of a projects carbon footprint.

The main options considered in the carbon assessment are each made up of various component cost estimates. These are represented by letters A-Z. The relevant interventions for the applicable components used in this analysis are:

A – Two new through platforms at March

B – One new through platform at March

E – Re-instatement on intermediate plain line section

F – Two new bay platforms at Wisbech

G – One new bay platform at Wisbech

H – Optional extension of reinstated line to Wisbech Town Centre (South) site

K – Level crossing closure schemes 1-3, associated highways diversions and new grade separations (intermediate section)

L – Level crossing closure schemes 4 and 5 (for Weasenham Lane and the A47), highway diversions and new grade separations

M – Coldham Passing Loop

CARBON PORTAL ASSESSMENT OF M2W OPTIONS

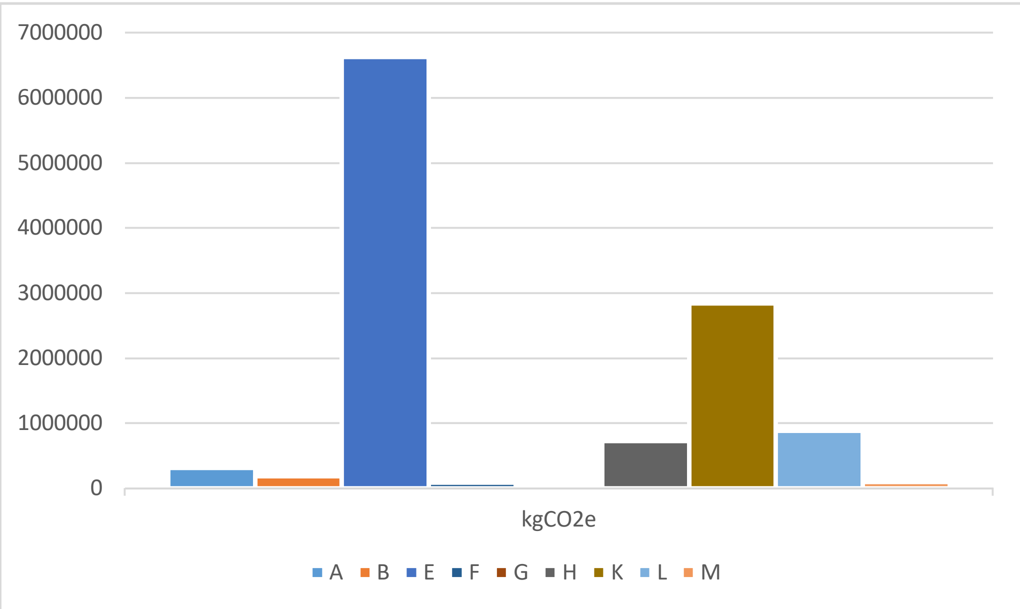
OPTIONEERING - ALL SUB-OPTIONS

Carbon by Sub - option

	kgCO2e
A	313547
B	184434.3
E	6629369
F	91119.7
G	45276.7
H	729046.1
K	2847609
L	877701.4
M	95202

Carbon by main option

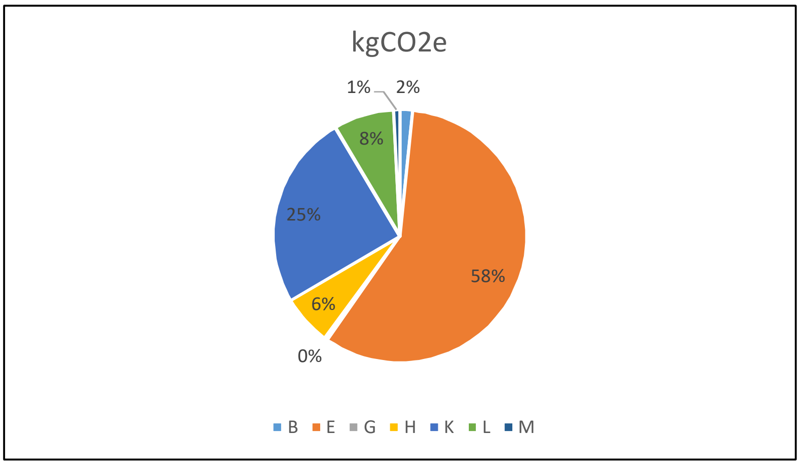
	TCO2e
Infrastructure configuration i	11409
Infrastructure configuration ii	11488



OPTION - Infrastructure configuration i

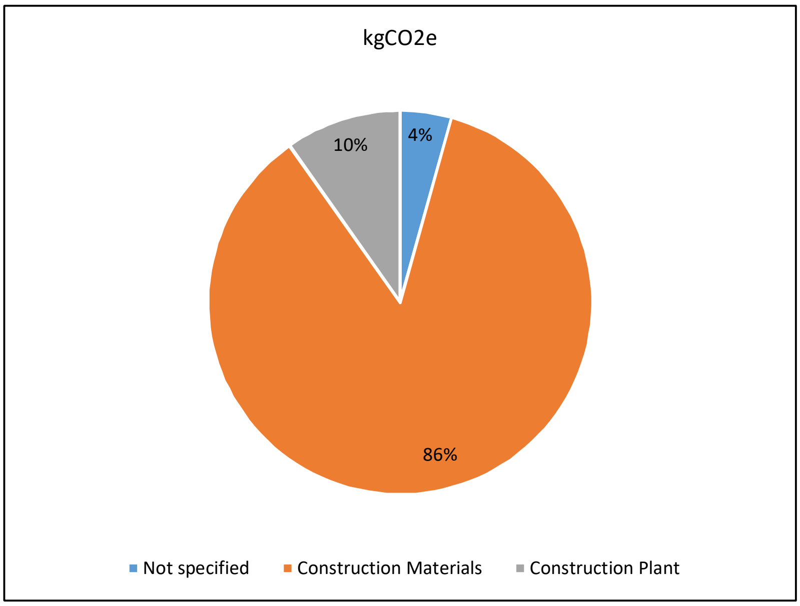
Carbon by Sub - option

	kgCO2e	perc
B	184434.3	1.60%
E	6629368.8	58.10%
G	45276.7	0.40%
H	729046.1	6.40%
K	2847608.8	25.00%
L	877701.4	7.70%
M	95202	0.80%



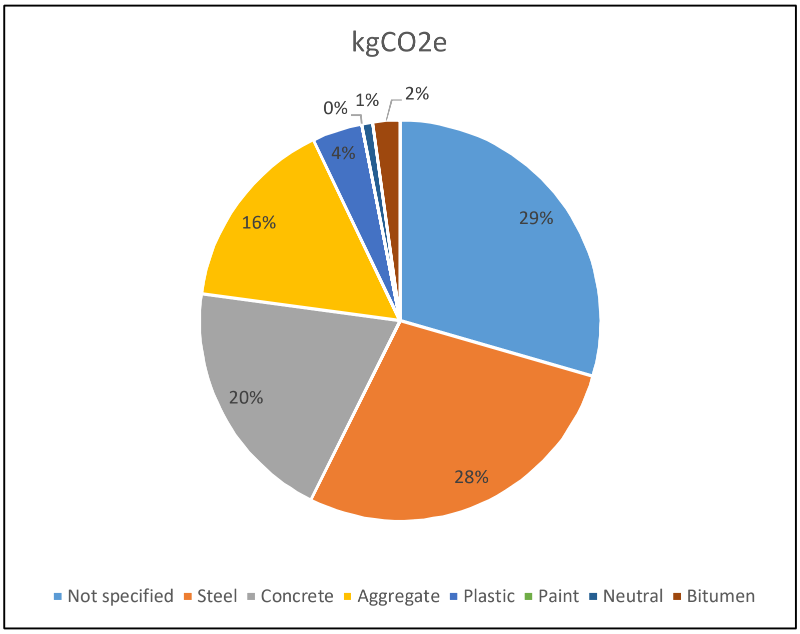
Carbon Split - materials/plant

	kgCO2e	perc
Not specified	491553.6	4.30%
Construction Materials	9801566.6	85.90%
Construction Plant	1115517.8	9.80%



Carbon Split by material

	kgCO2e	perc
Not specified	2889516.3	29.50%
Steel	2732309.4	27.90%
Concrete	1937971.3	19.80%
Aggregate	1542697.1	15.70%
Plastic	396661.2	4.00%
Paint	55.8	0.00%
Neutral	87922.6	0.90%
Bitumen	214436	2.20%

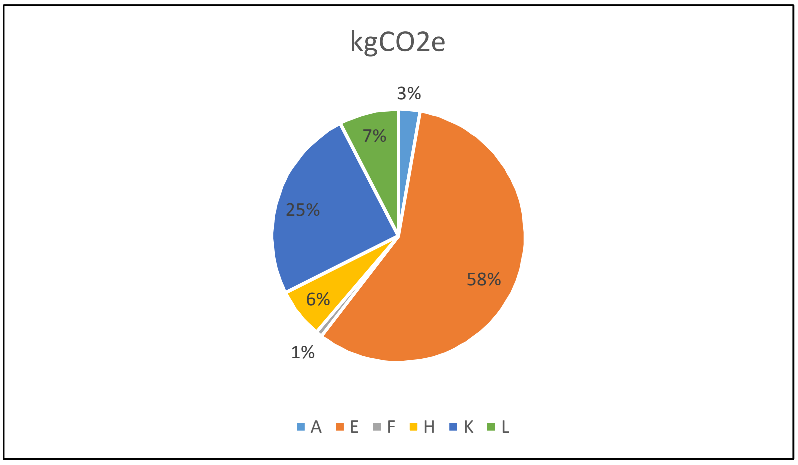


TOTAL T CO_2e = **11408.64**

OPTION - Infrastructure configuration ii

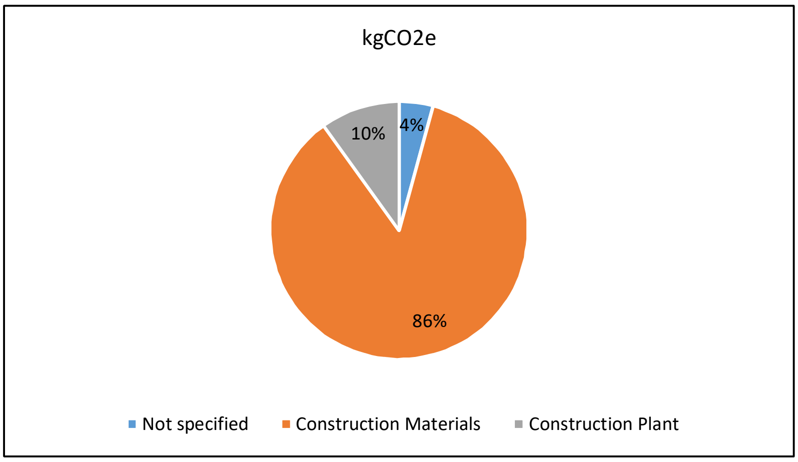
Carbon by Sub - option

	kgCO2e	perc
A	313547	2.70%
E	6629368.8	57.70%
F	91119.7	0.80%
H	729046.1	6.30%
K	2847608.8	24.80%
L	877701.4	7.60%



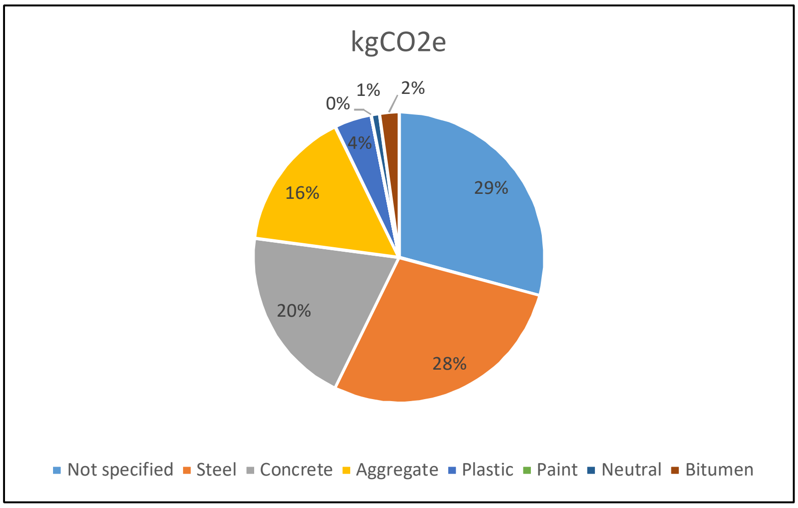
Carbon Split - materials/plant

	kgCO2e	perc
Not specified	491553.6	4.3%
Construction Materials	9853037.9	85.8%
Construction Plant	1143800.2	10.0%



Carbon Split by material

	kgCO2e	perc
Not specified	2876873.1	29.20%
Steel	2762216.9	28.00%
Concrete	1956931.9	19.90%
Aggregate	1547495.6	15.70%
Plastic	407053.4	4.10%
Paint	111.6	0.00%
Neutral	87922.6	0.90%
Bitumen	214436	2.20%



TOTAL T CO_2e = **11488.39**

March to Wisbech Carbon Assessment – Assumptions

The carbon portal assessment was based on the GRIP 2 pricing documents. Due to limitations and exclusions in the tool, assumptions were required to be made along with swaps for equivalent inclusions. In addition, there were some exclusions where realistic swaps and assumptions could not be made.

The carbon portal tool is constantly developing, and multiple assumptions are required in its use. Results are therefore to be considered for indicative purposes only, and not as a comprehensive analysis of a projects carbon footprint.

Assumptions

- Assume existing power equipment to be re-used.
- Assume track foundations are already in place.
- Track bed assumed to be 4.5m wide.
- Sleeper spacing of 650mm.
- Waterproof membrane assumed to be 4.5x1500m polythene sheet.
- Type CV9.25 turnouts have been assumed.
- Existing rail assumed to have concrete sleepers.
- Lighting columns assumed to be 10m high
- Platforms - assumed 1m depth, 20% concrete, 80% gravel.
- Type 1 fill assumed to be general fill.
- WIG/2314 re-decking - assumed 10 large cross beams, 5m long. 12.5tonnes.
- Cable ducting assumed to be galvanised steel, 200mm diameter.
- Culverts assumed to be 1m2, precast concrete.
- Ticket office - assumed allowance is 60m^3 of reinforced concrete, provision and placing included.
- Medium and heavy vegetation clearance both covered by "wooded areas".
- Pre-cast concrete bridge decks assumed to be 1m deep.
- Manholes assumed to have concrete walls.
- Excavated material for road assumed to be "unacceptable".
- Carriageway base assumed to be DTp type 1 granular material.
- Carriageway binder assumed to be wet mix macadam.
- Traffic island assumed equivalent to 300mm x 40m^2 slab.
- Kerbs - assumed 150x305mm.
- Assume manhole internal diameter of 3m^2.
- Assume 150mm deep track slab.

Exclusions

- Permanent way fittings not included.
- Section 1.05.05 - only included lighting columns. The other parts are assumed to have a negligible impact on total carbon.
- Security systems - embodied carbon has been largely neglected as it will be non-significant compared to the overall embodied carbon on the project.
- Lifts excluded. No method for assessing these in the tool.
- No tool input for contaminated land, all land assumed non-contaminated.
- Power supply excluded. No method for assessing these in the tool.
- Cable chambers excluded.
- Gullies, grating…etc…excluded.
- Indirect costs not carbon quantified.
- No option for DNO supply in assessment tool, not included.
- Temporary earthworks required to place drainage is neglected.

Substitutions

- 1 SEU is assumed to be equivalent to 1 highway traffic signal in the carbon portal tool.
- For turnouts, softwood sleepers are the only option and so have been used.
- Existing turnouts specified as C20 as only available.

- MDPE water supply pipe of appropriate length assumed equivalent to drainage.
- Assume removal of boundary fencing is length x 0.5m of general clearing.
- Decommissioning of signalling equipment - equivalent area of general clearance has been calculated pro-rata.
- Take up of strail crossings and cattle creeps assumed equivalent to taking up buffers.
- Removing a level crossing assumed equivalent to removing 4 buffers.
- New level crossing assumed equivalent to 2 way traffic signal + diamond crossing.
- Tram junctions equivalent to 4 way highway signals.
- Assume acoustic barriers have equivalent carbon to palisade fence.

U. ORR Meeting Minutes

MOTT MACDONALD

Meeting minutes

Project: March-Wisbech Transport Corridor

Our reference: 398128AA01

Prepared by: Robert Leather **Date:** 03 June 2019

Approved by: Robert Leather

Subject: ORR Wisbech Rail Meeting

1 Introductions

Office of Rail and Road: Ian Prosser (IP), Ian Raxton (IR)

Cambridgeshire & Peterborough Combined Authority: Kate Beirne (KB)

Cambridgeshire County Council: Chris Poultney (CP), Jack Eagle (JE)

Mott MacDonald: Robert Leather (RL), Jon Foy (JF), Sue Tilbrook (ST)

2 Discussion and Actions

Item	Discussion/Action	Action by	Timing
1	Introductions led by CP CP provided a summary of the status of the March Wisbech project and the broader socio-economic context. CP also updated on interfacing transport projects and plans for development in Cambridgeshire (Garden Town, M11, A47).	Note only	
2	Slide Pack prepared by MM was presented by RL and discussed.	Note only	
3	IP noted that station site no. 7 appears to be a favourable location from a feasibility point of view. Sites further North will incur significant additional cost due to land acquisition and urban road crossings. IP noted that a crossing of Weasenham Lane may be difficult due to volume of traffic on the road and potential crossing requirements and barrier downtime.	Note only	

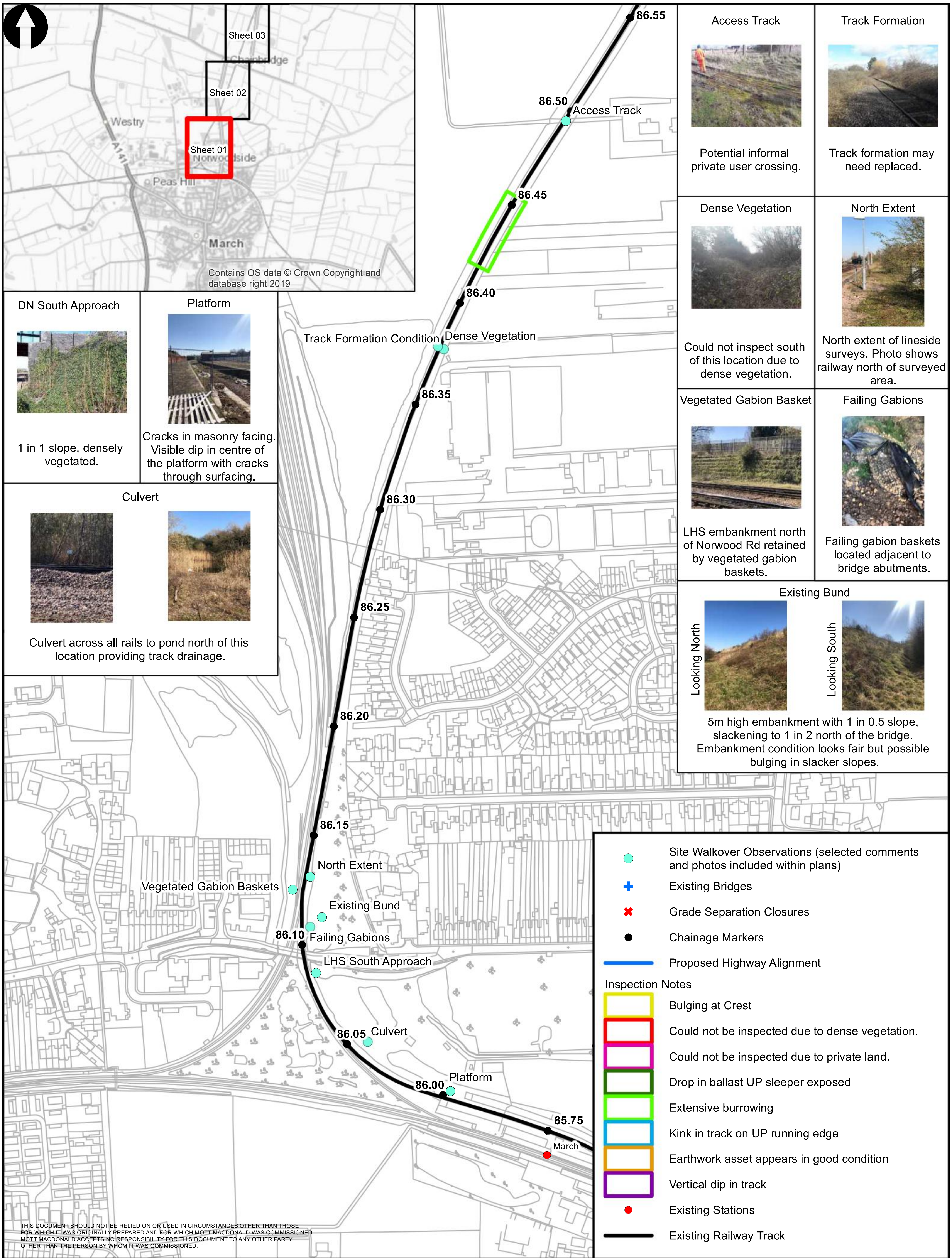
Item	Discussion/Action	Action by	Timing
4	IP noted that rail over road grade separation of A47 could potentially be cheaper to build than road over rail. Rail over road could potentially could have reduced land-take, reduced disruption to highway. RL noted that approach gradient would be far shallower for rail over road – potentially negating the above benefits.	Note only	
5	IP and IR noted that a March Wisbech shuttle service would reduce cost by simplifying requirements (e.g. for interoperability, ticketing, rolling stock potential for D train, compensation for delay/cancelled services). IP – there would be benefits in keeping the scheme simple initially and building demand before embarking on more challenging aspects (through running): Single model of rolling stock No or low-tech signalling	Note only	
6	IP and IR noted that the default ORR position would be to consider any re-opened level crossings as new crossings from a safety risk perspective. Justifying re-opening level crossing solutions will therefore be difficult	Note only	
7	IP – Suggested it should be possible to justify upgraded level crossings for lower traffic volume rural roads around middle of line. Unlikely that level crossing solution will be acceptable for road crossings at Weasenham lane, A47, March end of the line. IR- Clarified that whilst ORR doesn't have a "no new level crossings" policy crossings are viewed as a huge and ongoing safey risk. This means that there is a very high bar to set in demonstrating that there is no reasonably practicable alternative. Justification would be on a site by site basis and that might include closure and conolidation of sites and new technology etc. It should be noted that the ORR are not giving any apporaval to new rural crossing as a principle. In juding what is reasonably practicable there has to be a gross disproportion between the cost of the practiable alternative and a crossing. For information: in determining what is Gross Disproportion ORR would normally follow the guidance of	Note only	

Item	Discussion/Action	Action by	Timing
	the HSE in this which can be found on their website page http://www.hse.gov.uk/risk/theory/alarpcba.htm		
8	IP offered meeting to review road/rail crossing solutions in more detail once GRIP 3 design has been developed.	Note only	
9	IR asked how safety will be considered in options appraisal and business case CP noted that DfT framework for business case is economics led KB noted that we would not wish to build a scheme that is inherently unsafe	Note only	
10	IR asked if a gross measure of safety was being used as part of the mode selection work RL/JF noted that while safety will not form part of economic assessment it will be considered as part of engineering feasibility studies that define our options (safety in design risk assessments and reasonable practicability)	Note only	
11	IR mentioned emerging level crossing technology that may provide good engineering solutions for less trafficked crossings/accommodation crossings. Schweitzer VaMoS Overlay Miniature Stop Light is one such technology. Noted that pioneering new systems would be a maintenance cost risk	Note only	
12	RL noted that tram-train is being considered as an alternative to heavy rail. A tramway between March and Wisbech would be subject to different requirements to heavy rail at crossings and the design will be based on signalised junctions at road crossings, closures/diversions or priority junctions for minor crossings. Grade separation of A47 would still be required.	Note only	
13	IP suggested that NR (Peter Hendy) would be happy to hand over the disused line for no/nominal cost to CCC/CPCA. It was however also stated that NR are under pressure to make the best use of their assets which might overtake this low cost aspiration. At this stage it is hard to assess what value NR would put on the line.	Note only	

Item	Discussion/Action	Action by	Timing
14	IR – precedent for transfer orders from NR to local authorities exists. Most commonly heritage railways. Welsh Valleys project is a current example. Welsh government ownership of lines. ORR has an interest in any disposal by NR. ORR responsibility for economic regulation includes ensuring NR is using assets appropriately. ORR would normally support if the line is staying in public use with suitable protections on the transfer. This means that the ORR would want to see the route remaining as a public transport corridor and not be a backdoor route for alternative use if the scheme ultimately proved unsustaitnable. It's also worth noting that the Welsh Valleys example is a sale to the Welsh Government, those lines will no longer be Network Rail's asset. There are other models where Network Rail leases the line to an operator – the Wensleydale Railway is a good example, and then a 'transfer order' using the Transport and Works Act is used to pass powers to the new operator.	Note only	
15	RL to extend invite to Mode Selection Workshop to IR	RL	Complete

V. GRIP 3 Visual Survey Observations

V.1 Geotechnical

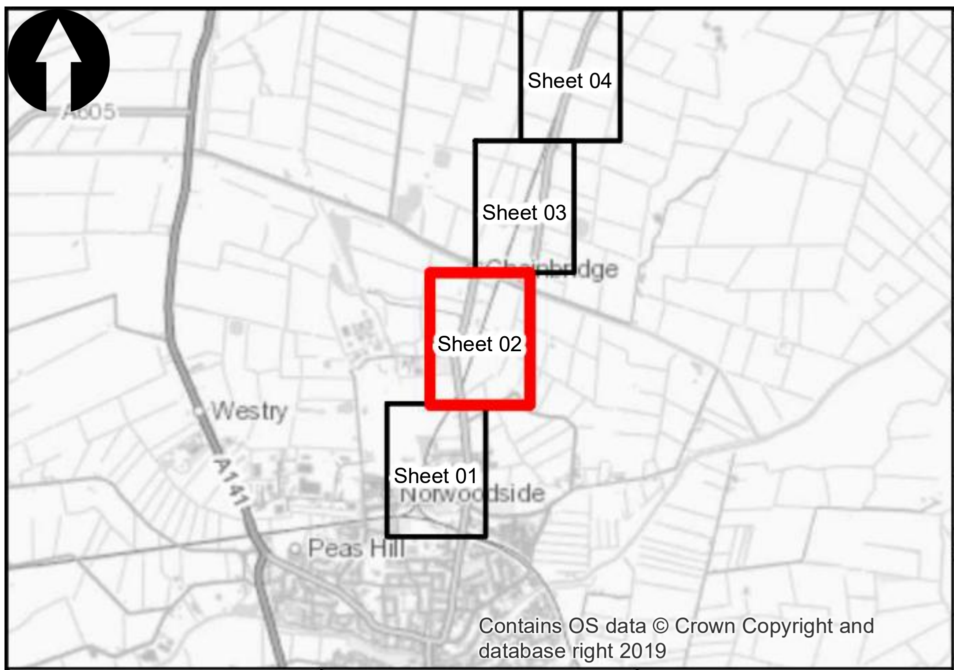


Title

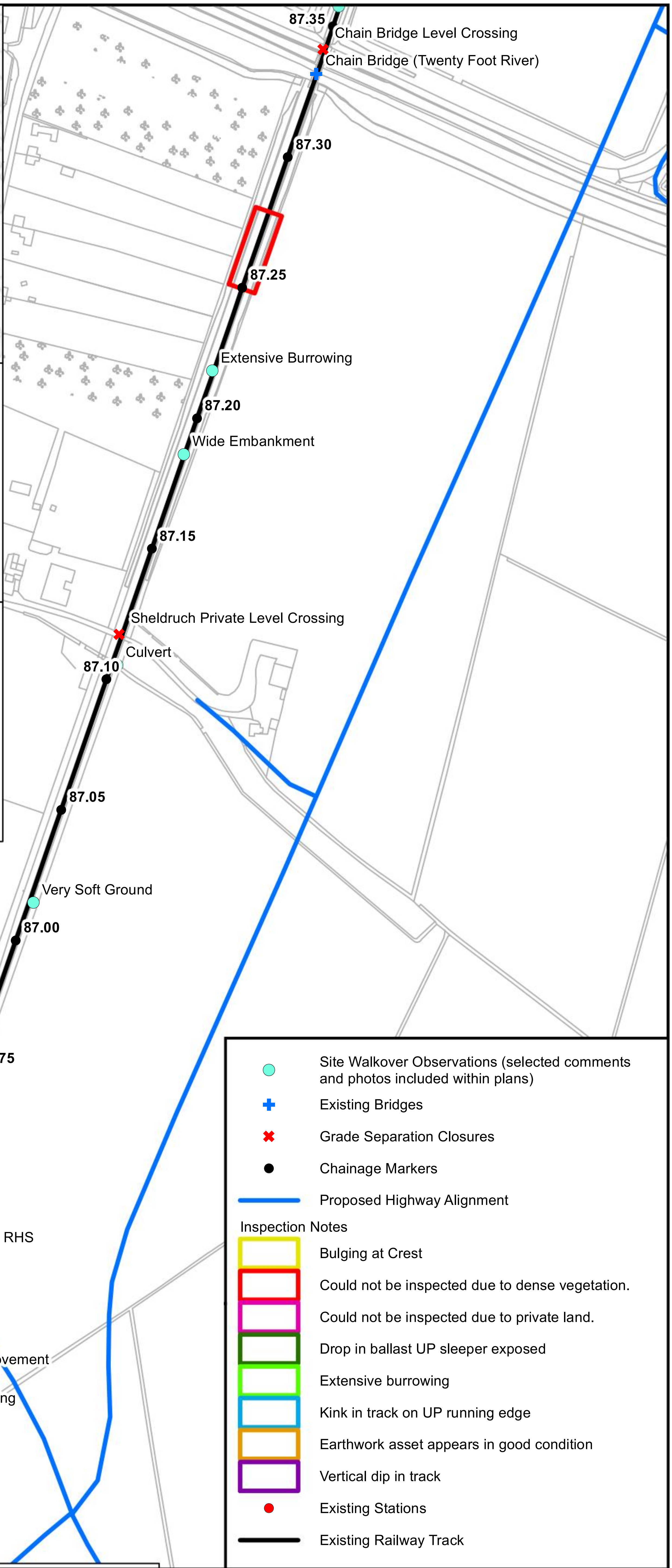
March to Wisbech Transport Corridor
Site Walkover Observation Plan
Sheet 01

MOTT MACDONALD
Mott MacDonald
4th Floor
Derwent House
150 Arundel Gate
Sheffield S1 2JY
United Kingdom

Date	Drawn	Chkd	Appvd	Scale	Drawing	Rev	Status
09/04/2020	AC	RS	AW	1:3,000	Sheet 01	01	PRE



Dense Veg on Slopes	Twenty Foot Bridge	Dense Vegetation
 Dense vegetation on both embankment slope faces, unable to inspect condition.	 New bridge deck required. Foundations could not be inspected due to dense vegetation.	 UP embankment could not be inspected due to dense vegetation.
Sheldruch Private Level Crossing  Existing private level crossing.	**Culvert**  Existing culvert could not be inspected due to dense vegetation. Very boggy ground noted adjacent to culvert.	**Very Soft Ground** Very soft ground identified in this area with burrowing evident. Innundated ditch located at UP embankment toe.
Track Formation Movement  Movement of track formation observed including drop in ballast under sleepers and sleepers displaced.		



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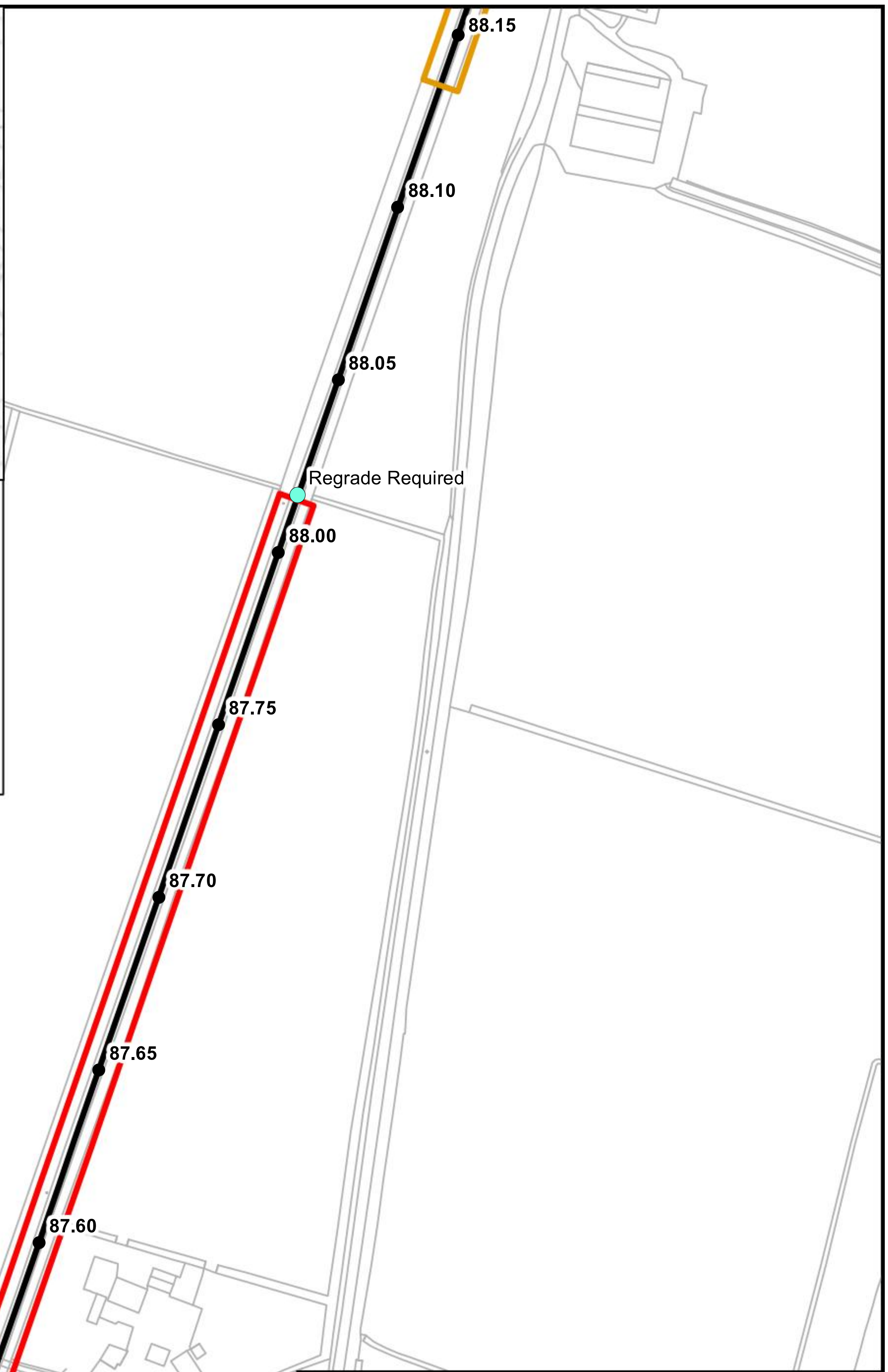

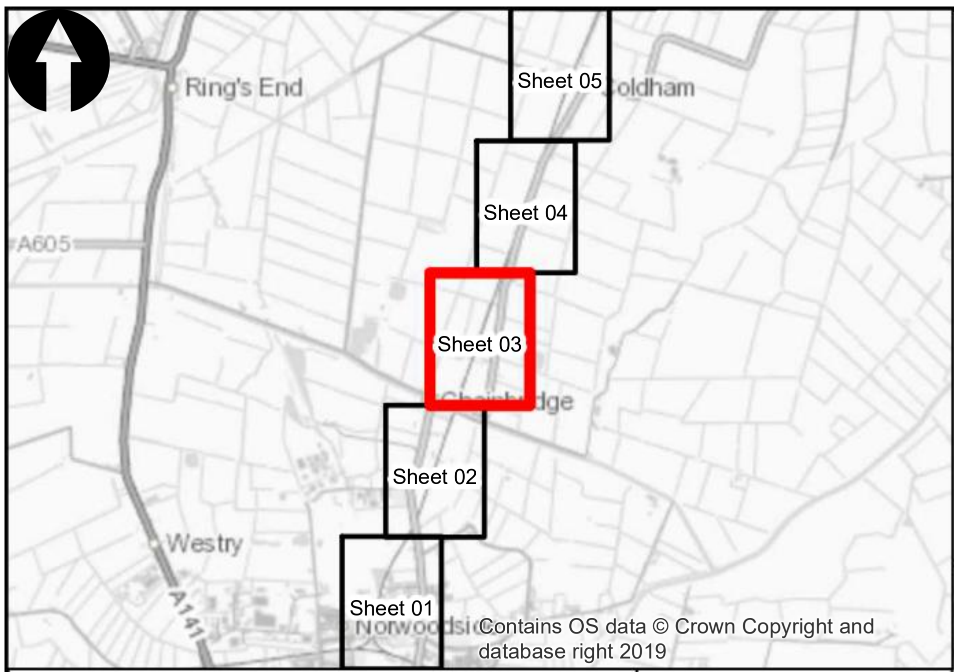

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Regrade Required	Dense Veg on Slopes
Ground beneath sleeper dropped 200-300mm at embankment crest at culvert. Seepage observed through informal concrete bag headwall flowing east to west. Embankment may need to be excavated and culvert replaced to prevent further movement.	Dense vegetation on both embankment slope faces, unable to inspect condition.



Uneven Profile	DN Ditch
Hummocky uneven ground with dense vegetation on embankment slope faces.	Deep ditch at toe of embankment on DN with standing water.

- Site Walkover Observations (selected comments and photos included within plans)
- Existing Bridges
- Grade Separation Closures
- Chainage Markers
- Proposed Highway Alignment

Inspection Notes

- Bulging at Crest
- Could not be inspected due to dense vegetation.
- Could not be inspected due to private land.
- Drop in ballast UP sleeper exposed
- Extensive burrowing
- Kink in track on UP running edge
- Earthwork asset appears in good condition
- Vertical dip in track
- Existing Stations
- Existing Railway Track

Title

March to Wisbech Transport Corridor
Site Walkover Observation Plan
Sheet 03

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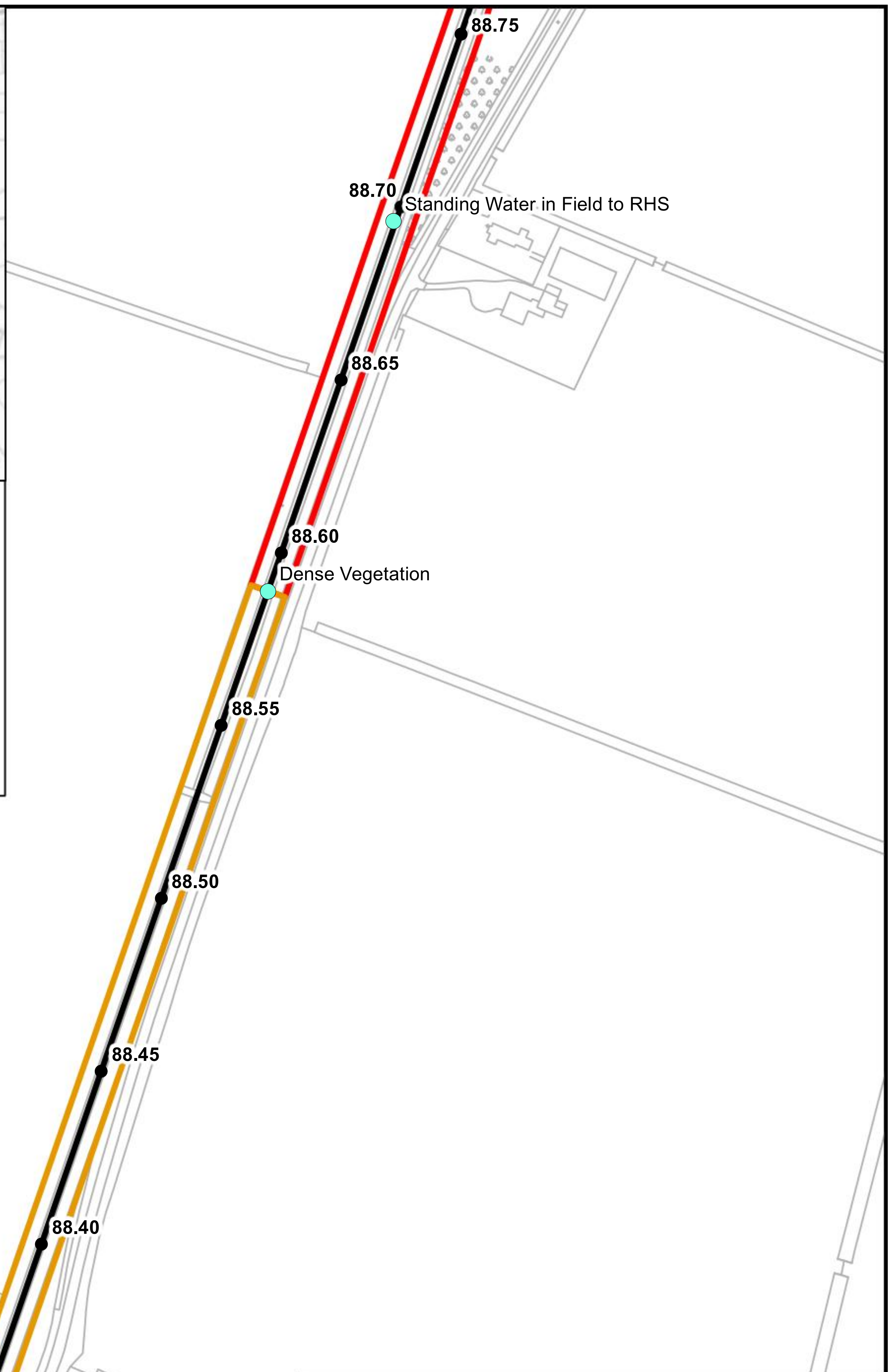

Standing Water	Dense Vegetation	No Regrade Required
 Standing water observed in field on UP located 2.5m from running edge. Potential softening below track formation.	 Railway could not be inspected north of this location due to dense vegetation.Track appears to be at grade.	Track at grade throughout this section with no visual evidence of any geotechnical issues.

Site Walkover Observations (selected comments and photos included within plans)
Existing Bridges
Grade Separation Closures
Chainage Markers
Proposed Highway Alignment

Inspection Notes
Bulging at Crest
Could not be inspected due to dense vegetation.
Could not be inspected due to private land.
Drop in ballast UP sleeper exposed
Extensive burrowing
Kink in track on UP running edge
Earthwork asset appears in good condition
Vertical dip in track
Existing Stations
Existing Railway Track

Title
March to Wisbech Transport Corridor
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Sheet 04

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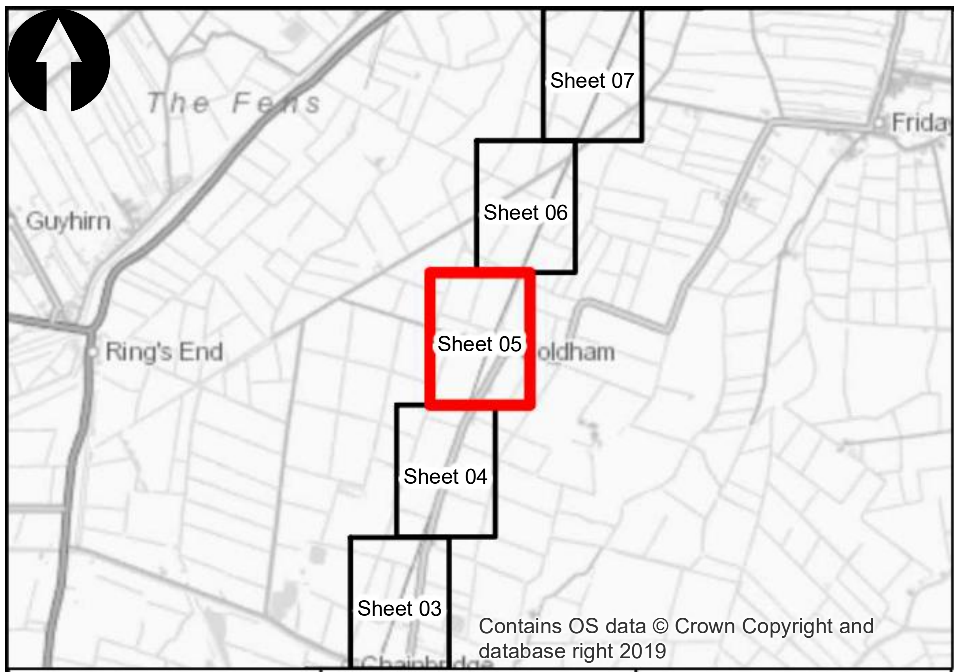


Culvert

Concrete headwall 1m from rail on UP and 4m from DN. DN headwall leaning west 5 degrees. Replacement required.

DN Steep Ditch

Steep ditch located at toe of DN embankment. Probably not to EC7 requirements.

No Regrade Required

Wide crest 2-2.5m on UP and 4m on DNS. No visual evidence of embankment instability. No regrade required.

Brickwork Culvert

Possible brickwork headwall culvert along track drainage ditch to flow east to west. Could not be inspected due to dense vegetation. Inspection required to determine EC7 compliance for use as possible retaining structure for track.

Extensive Burrowing

Extensive burrowing on UP. Very shallow embankment with lateral spreading. Instability noted on slopes with leaning signs. Potential localised shallow regrade required.

Bulging at Crest

Ditch on UP located closer to running edge with more noticeable buging at crest towards running edge and dipping to embankment crest. Possibly due to settlment or slope migrating into ditch.

Track Formation

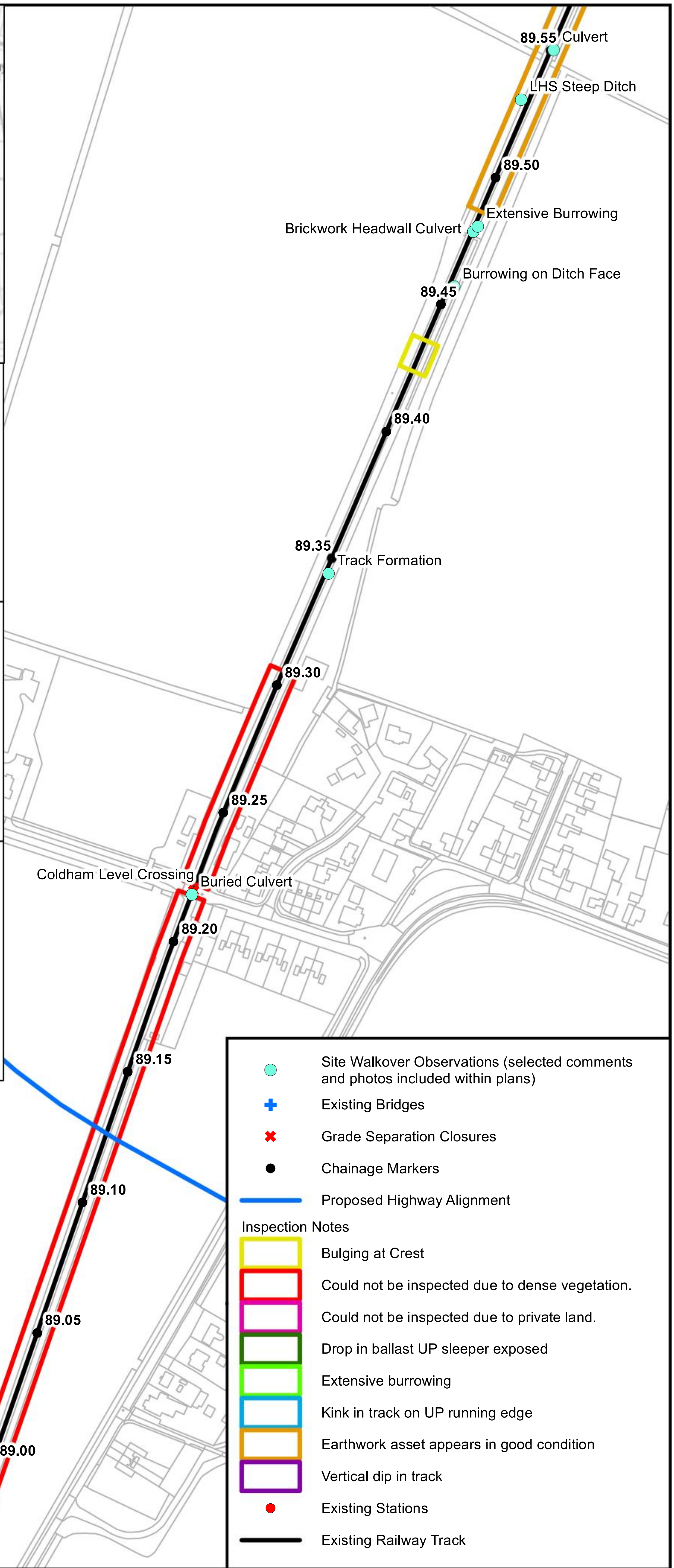
100mm drop in ballast below track formation.

Buried Culvert

Potential concrete bag headwall buried culvert. Headwall retaining approximately 2m height above dtich.

Drop in Crest

Potential ditch at toe of rhs slope, needs reprofiling. Extensive burrowing. Slight drop in crest at a maximum 100mm vertical displacement with sleeper ends exposed along this 5m section.



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March to Wisbech Transport Corridor
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Sheet 05

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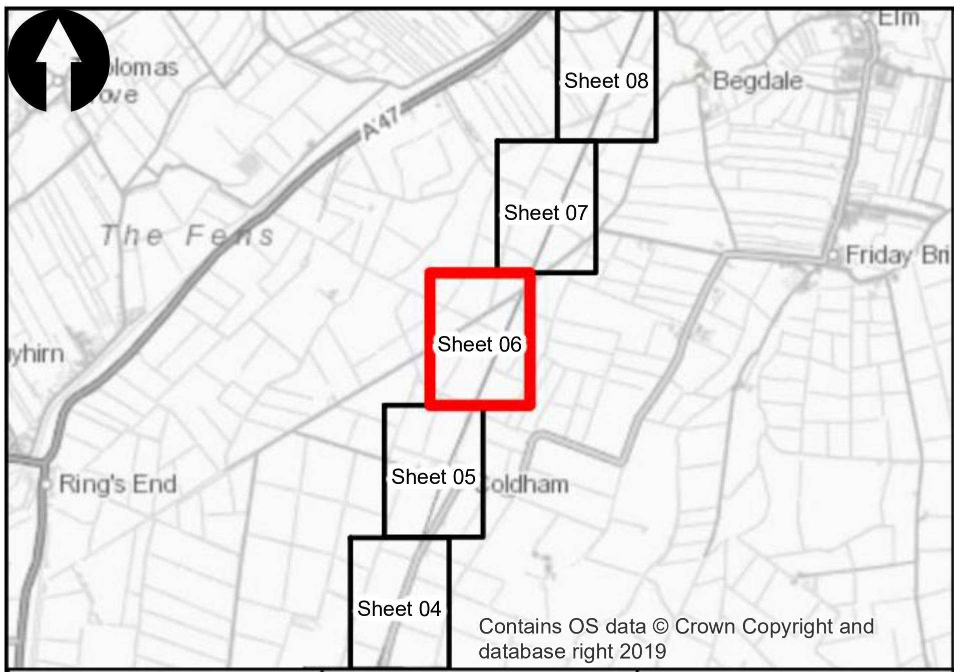
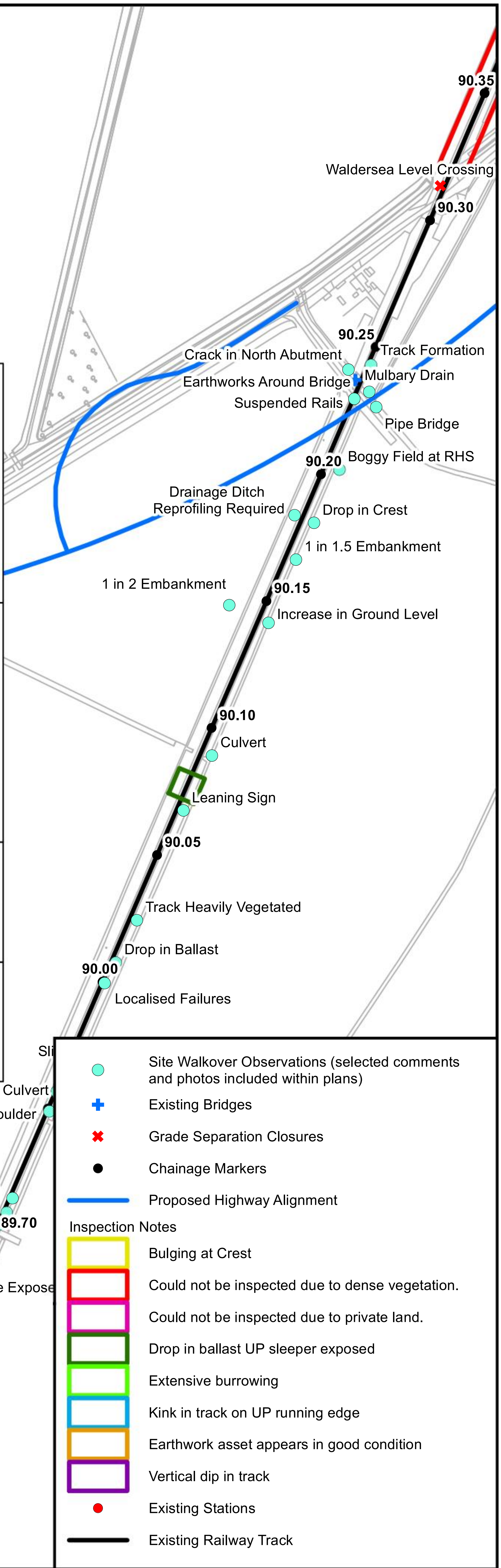


Track Formation Settled  Track formation settled either side of bridge exposing sleepers. With suspended rails on south approach.	**Crack in North Abutment**  Crack identified on face of north abutment.	**Drop in Crest** Potential ditch at toe of UP slope, needs reprofiling. Extensive burrowing. Slight drop in crest at a maximum 100mm vertical displacement with sleeper ends exposed along this 5m section.	**Increase in Ground Level**  Increase in ground level either side of embankment, potentially informal user crossing or buried services.
Earthworks Around Bridge  Ditch with 1 in 1 slopes either side with dense vegetation at bridge. Possible regrade required.		**1 in 2 Embankment**  1 in 2 slopes, 0.5m between rail and embankment crest. No visual evidence of instability.	**Culvert**  Cracks identified in UP and DN concrete headwall. Embankment condition unknown due to dense vegetation.
Leaning Sign  Leaning sign observed but embankments unable to be inspected due to dense vegetation.	**Drop in Ballast**  100mm drop in ballast recorded below UP sleeper.	**Localised Failures**  Regrade required in this location on UP embankment slope.	**Slip** 2m embankment with heavily vegetated slope faces. Slip identified to be eating back under sleepers. Regrade required. **Leaning Culvert** Culvert headwall leaning on the UP side. Minor repairs required either side of culvert.
Ballast Shoulder  Very narrow cess. No ballast shoulder present. Possible migration down slope.	**Bulging Crest**  Bulging crest located for 5m around this location.Sleepers exposed on UP.	**Local Bank Slip** 1.5m embankment with probable local bank slip along 10m. Sleepers exposed on UP. **Rail Movement** Visual evidence of UP rail movement for 100m north of this location.	
Kink in Track 	Kink in alignment potentially due to slips in bank. Possible lateral spread or localised failures with areas of exposed sleepers.		



Legend	
●	Site Walkover Observations (selected comments and photos included within plans)
✚	Existing Bridges
✖	Grade Separation Closures
●	Chainage Markers
—	Proposed Highway Alignment
Inspection Notes	
☐	Bulging at Crest
☐	Could not be inspected due to dense vegetation.
☐	Could not be inspected due to private land.
☐	Drop in ballast UP sleeper exposed
☐	Extensive burrowing
☐	Kink in track on UP running edge
☐	Earthwork asset appears in good condition
☐	Vertical dip in track
●	Existing Stations
—	Existing Railway Track

Title
March to Wisbech Transport Corridor
Site Walkover Observation Plan
Sheet 06

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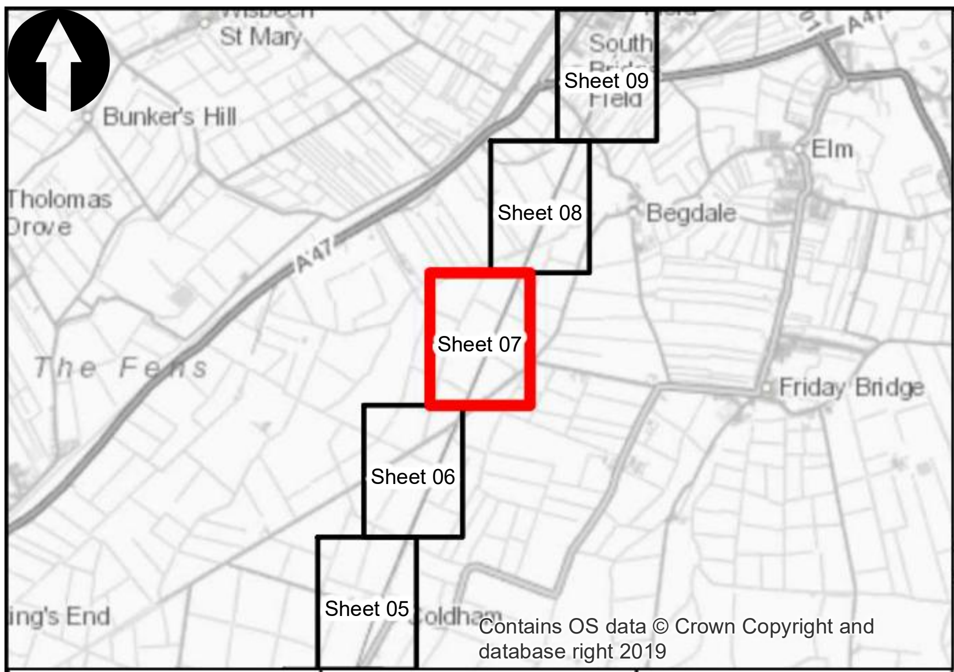
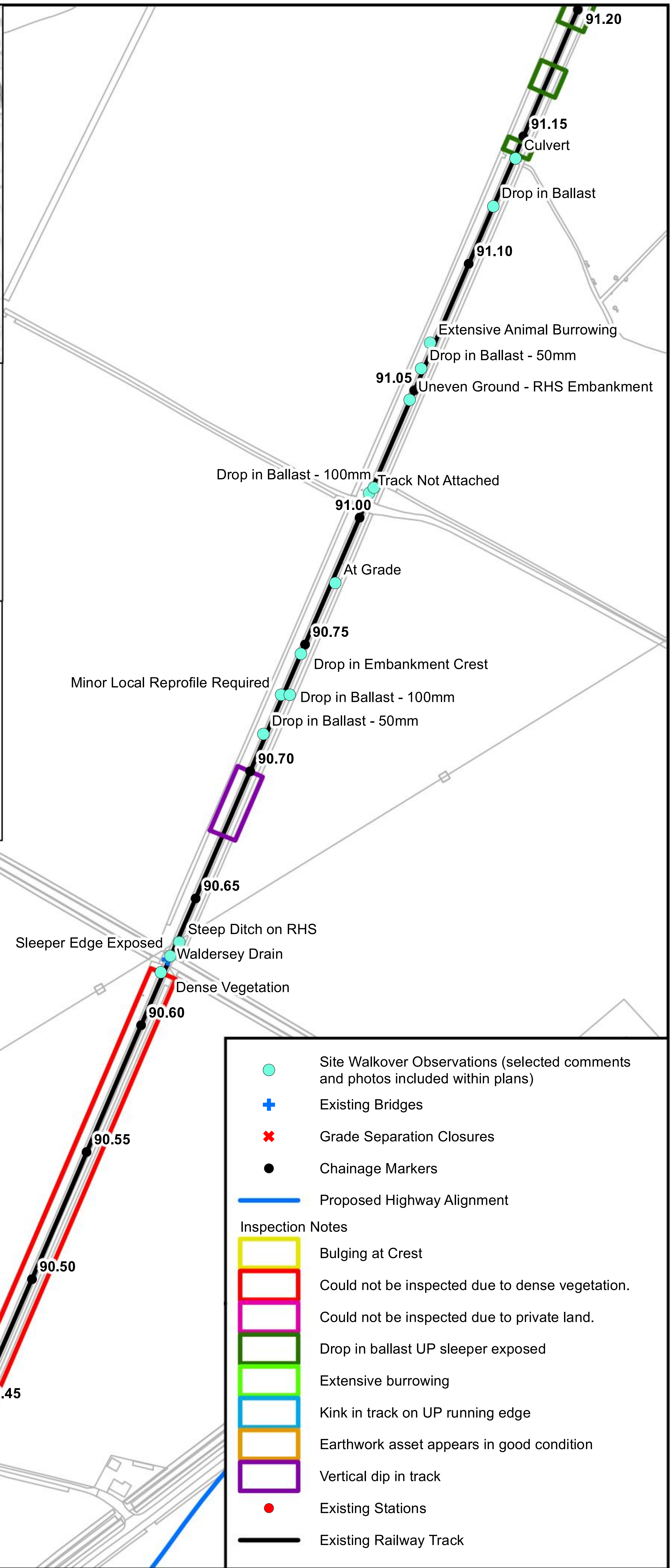


Drop in Ballast	Animal Burrowing	Track Not Attached
		
50-100mm drop in ballast. Possible kink in track. 1:1 embankment.	Extensive animal burrowing in cess.	Tracks not attached in this location. Wide embankment.
Minor Local Reprofile	Vertical Dip in Track	Sleeper Edge Exposed
		
Hummocky uneven ground noted on UP embankment. Soft ground observed and extensive burrowing.	Identified in Grip 2 and confirmed on site. No evidence of instability at crest.	Exposed on UP north of bridge. Embankment condition unknown due to dense vegetation.
Dense Vegetation		
		
Leaning sign on rhs embankment, unknown condition. Blocked ditch at toe.		



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March to Wisbech Transport Corridor
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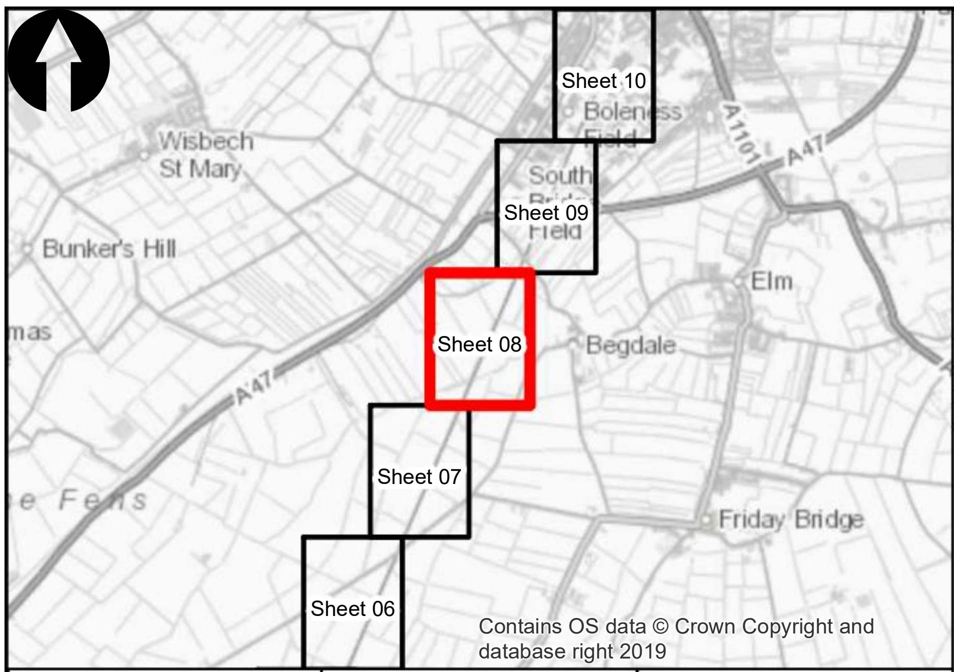
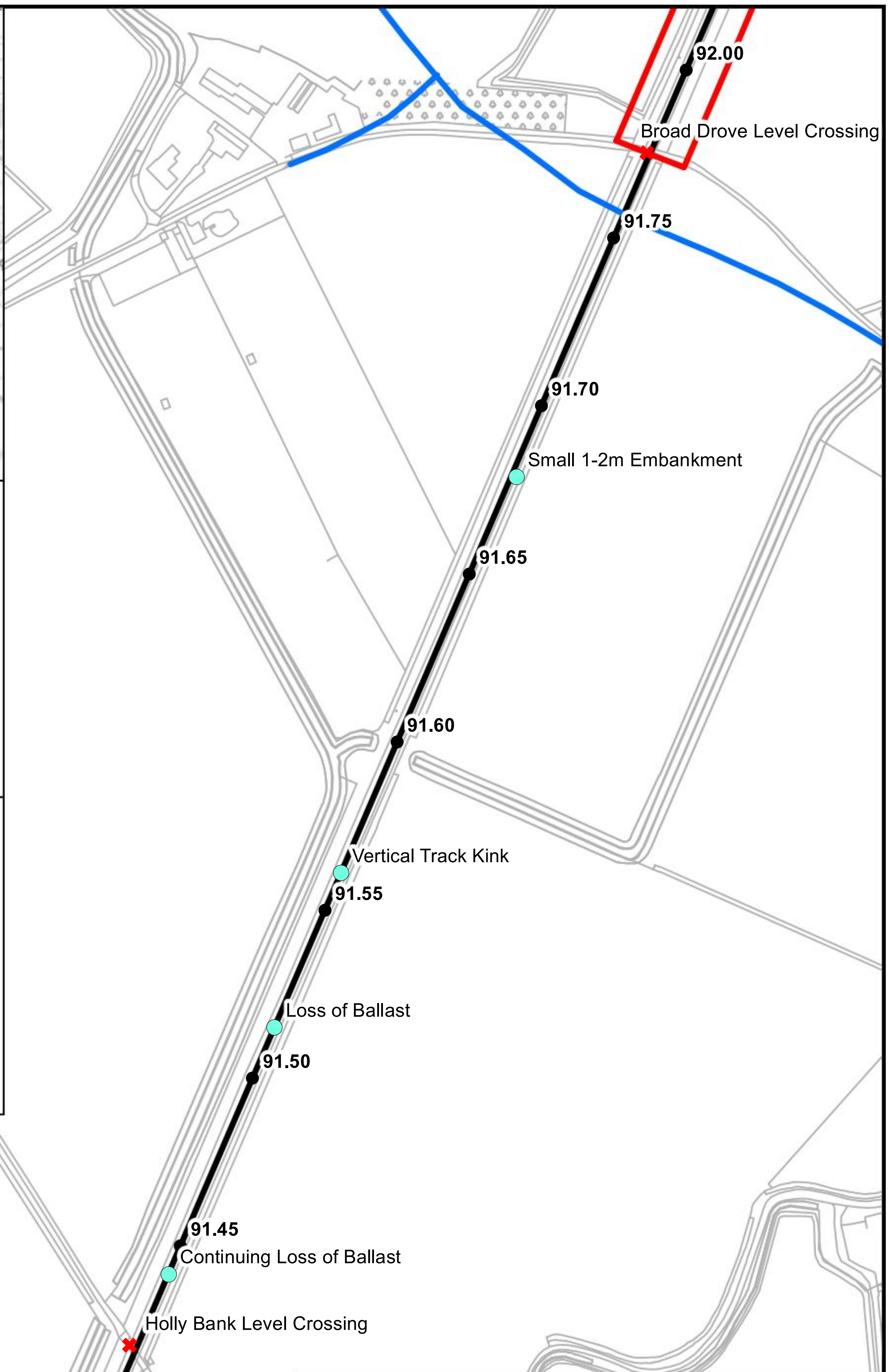
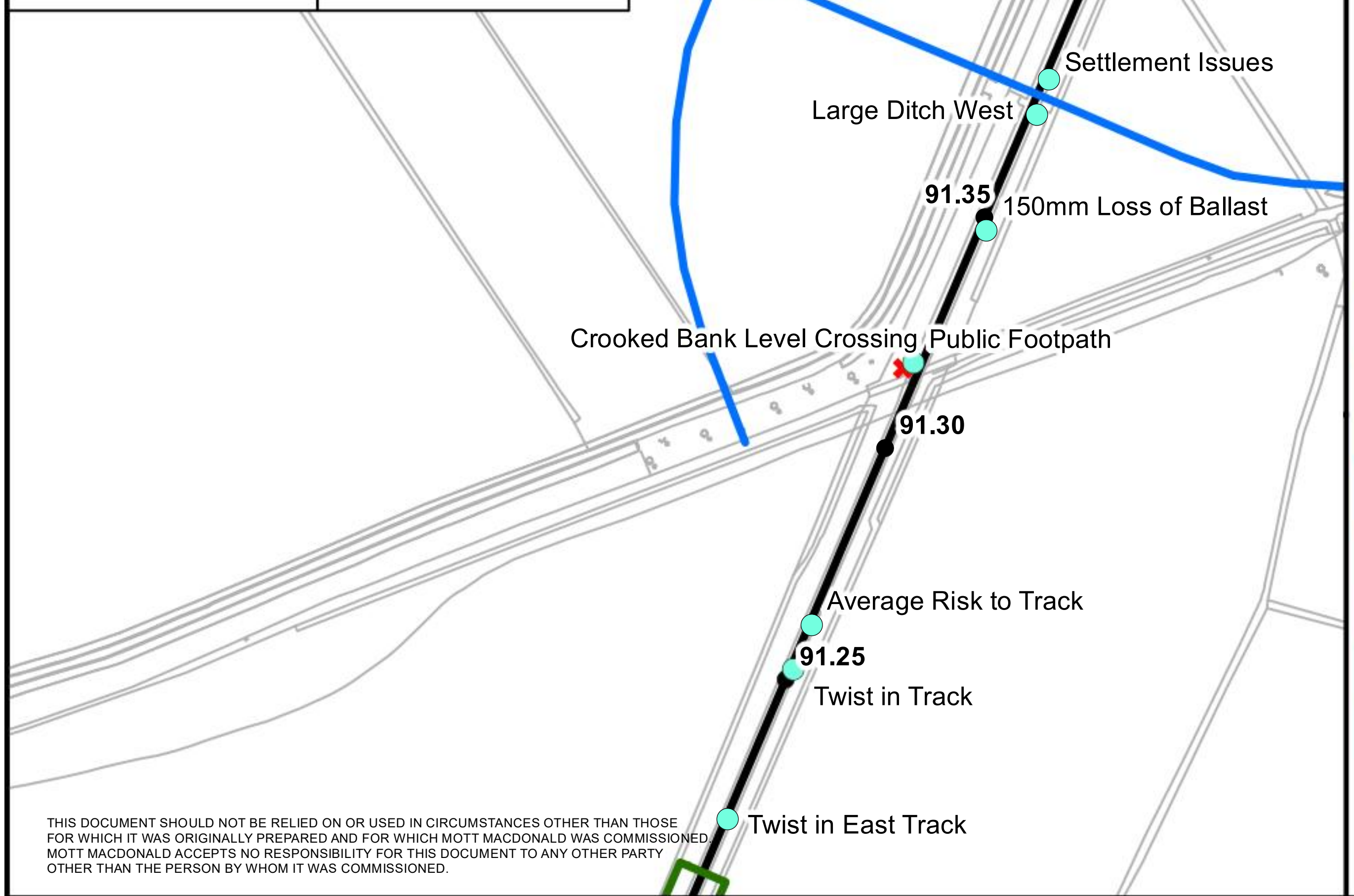




Vertical Track Kink	Loss of Ballast	Settlement Issues
		
Vertical track kink identified. Loss of ballast approximately 200mm.	100mm lost of ballast around sleepers. Animal burrowing within the cess.	Ballast dropping indicating potential settlement issues in this location.
150mm Loss of Ballast	Public Footpath	Average Risk to Track
		
150mm lost of ballast around sleepers due to settlement problems.	Track has be removed in this location and used as a public footpath.	Average risk to track for slips, earthflow and burrowing by NR and agreed on site.
Twist in Track	Twist in UP Track	
		
Twist in track and loss of ballast. Hummocky ground evidence of burrowing.	Twist in track with drop in east rail. No slips but possible lateral spreading.	



- Site Walkover Observations (selected comments and photos included within plans)
- Existing Bridges
- Grade Separation Closures
- Chainage Markers
- Proposed Highway Alignment

Inspection Notes
- Bulging at Crest
- Could not be inspected due to dense vegetation.
- Could not be inspected due to private land.
- Drop in ballast UP sleeper exposed
- Extensive burrowing
- Kink in track on UP running edge
- Earthwork asset appears in good condition
- Vertical dip in track
- Existing Stations
- Existing Railway Track

Title
March to Wisbech Transport Corridor
Site Walkover Observation Plan
Sheet 08

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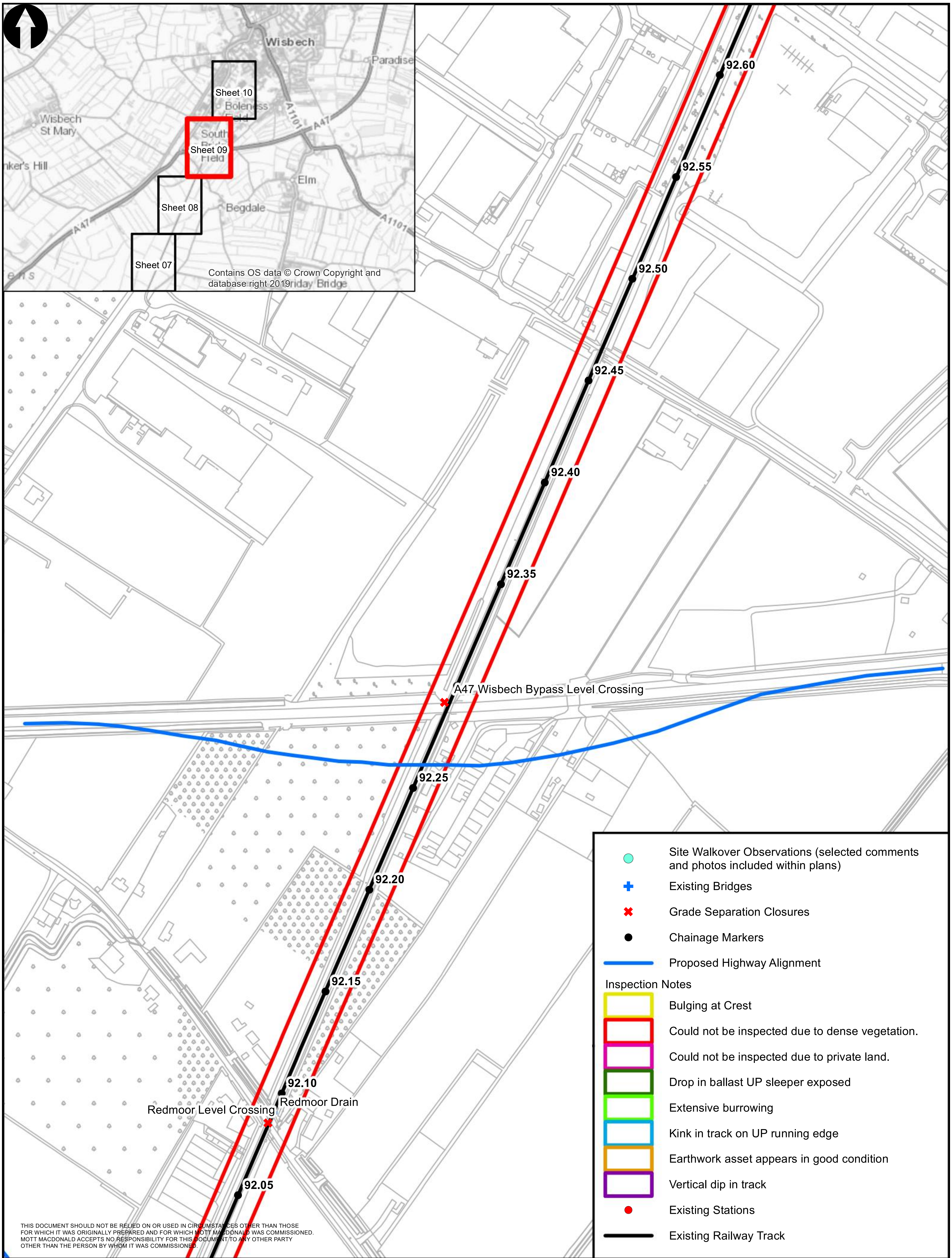

Title

March to Wisbech Transport Corridor
Site Walkover Observation Plan
Sheet 09

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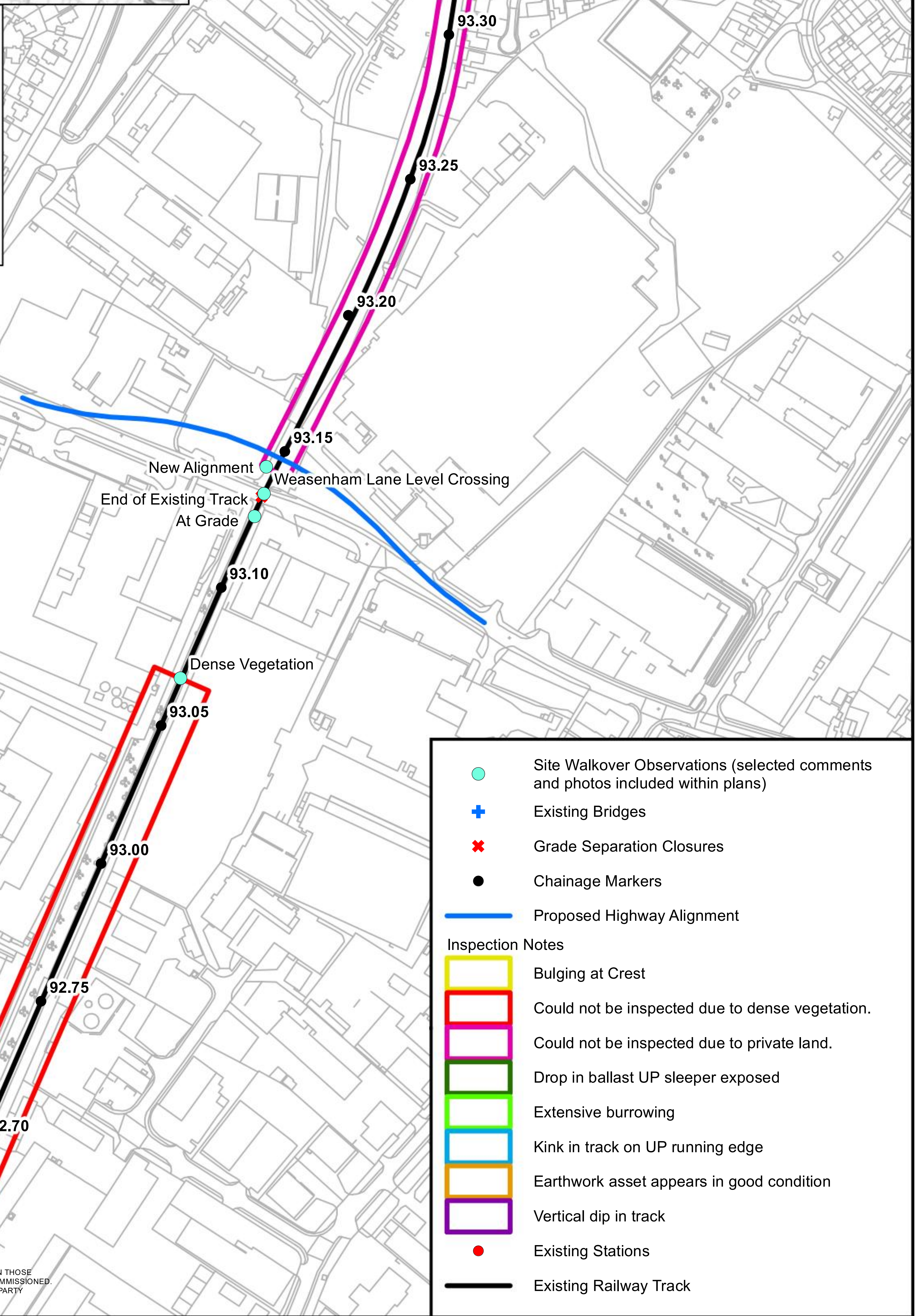

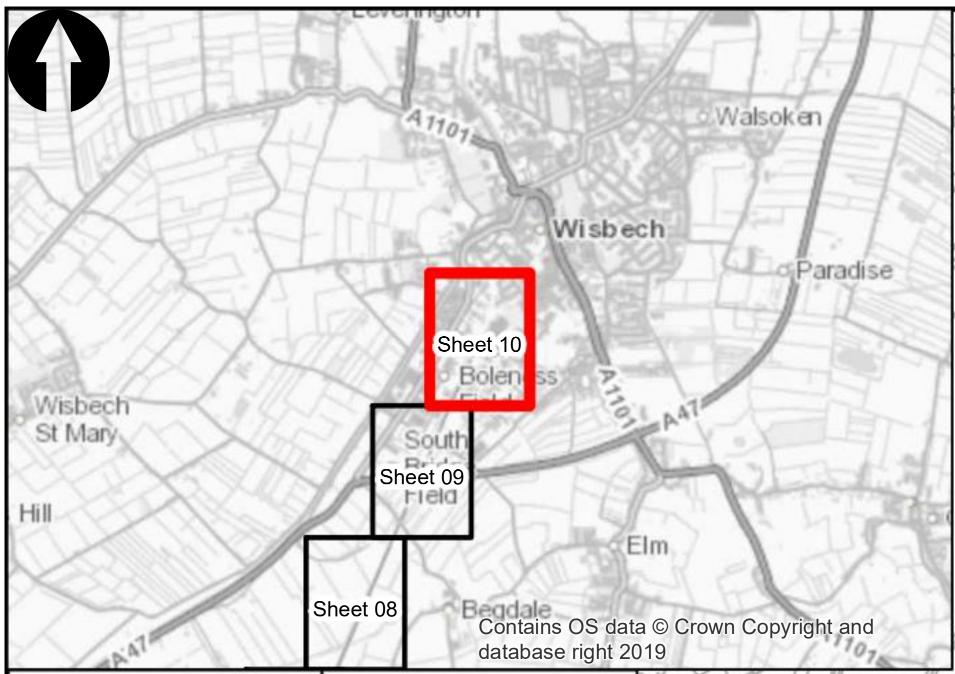

New Alignment

Existing track at grade. Dense vegetation. North of this location blocked by private fence.

End of Existing Track

South of Weasenham Lane shows the end of the existing track

Dense Vegetation

Dense vegetation south of this point and could not be inspected further.

Cyan dot	Site Walkover Observations (selected comments and photos included within plans)
Blue cross	Existing Bridges
Red cross	Grade Separation Closures
Black dot	Chainage Markers
Blue line	Proposed Highway Alignment

Inspection Notes

Yellow box	Bulging at Crest
Red box	Could not be inspected due to dense vegetation.
Magenta box	Could not be inspected due to private land.
Dark green box	Drop in ballast UP sleeper exposed
Light green box	Extensive burrowing
Light blue box	Kink in track on UP running edge
Orange box	Earthwork asset appears in good condition
Purple box	Vertical dip in track
Red dot	Existing Stations
Black line	Existing Railway Track

Title

March to Wisbech Transport Corridor
Site Walkover Observation Plan
Sheet 10

MOTT MACDONALD

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Date	Drawn	Chkd	Appvd	Scale	Drawing	Rev	Status
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V.2 Track Drainage

Project Title: March to Wisbech Transport Corridor - Site Walkover Observation Plan
Project No: 398128
Author: C Meade
Approved by: T Chung

Chainage	Location	Site Notes
138+200km	120451	
	120415	No drainage visible on existing platform 4 or canopy. No downpipes from staircase onto platform.
	120400	
	120331	
	120237	
	120230	
	120219	Downpipes on existing platform building. Gravel pits present at the base on the downpipes. No visible outlet pipes from the platform into track area. Short channel present with grating at the back of platform taking flows from single downpipe. 
	120200	
	120148	

RED Site photos included

138+275km	120121	Old style concrete catchpit with iron grating approx. 30m spacing. No close access to catchpit but no visible defects excepted rusted iron grating. 
	120106	
	120022	
	120012	
138+315km	120002	Old style concrete catchpit with iron grating approx. 30m spacing. No close up visual of catchpit but no obvious defects excepted rusted iron grating. Platform front wall noted to be in poor condition. 
	115804	
	115754	
	115504	
	115457	Old style concrete catchpit with iron grating approx. 30m spacing. Dense vegetation in catchpit and grating barely visible 
	115322	
	115233	Existing catchpit on EMP line
	115137	Old sediment filled grating at end of platform ramp 

		
138+340km	March Station	Platform 4
	111920	Existing platform 4 has no visible drainage. Level platform with shallow falls towards coping edge
	111959	
	112058	
	112114	
	112147	Old style concrete catchpit with iron grating in middle of track area with catchpit located near the end of platform 4 with standing water inside catchment. No sign of concrete sleepers but area filled with gravel. 
	112152	
	112211	
	112332	
	112340	Broken concrete manhole and the end of platform 4 ramp. Standing water visible. Couldn't see outgoing pipes 
138+440km	112730	Existing culvert marker (WIG 86w 0110y) on site between ponds. Approx. 20m long between markers and approx. 110m south of existing Norwood Road Overbridge   
	112800	

	112844	  
	112850	
	112858	
	112909	112730 112800 112909
138+550km	113251	Norwood Road Overbridge
	113358	
	113522	
	113618	
	113648	Existing embankment encroaching towards the railway
	114154	Noise fence with embankment immediately behind. No visible space for proposed ditch track drainage system for approx. 100m
		

Project Title: March to Wisbech Transport Corridor - Site Walkover Observation Plan
Project No: 398128
Author: C Meade
Approved by: T Chung

Chainage	Location	Site Notes
End Point 139+150	March Station to Elm Road	Dense vegetation. No visuals of railway boundary - Potential to have existing ditch up to 139+200km. After Boundary become visible. Looking north (Left) flat with wide boundary 115744, (Right) low point at toe of track formation 115753. Short section of earthbund (right) locally followed by low point with the adjacent land falling towards railway. Consistent flat ground (left), no interception between adjacent land and boundary fence. Catchpit (left) photo 121508 located approx. 50m from Elm road. Outgoing 225mm dia. pipe, 375mm depth to crown. no other signs of track drainage.
	114438	 
	114455	
	115211	
	115225	
	115231	
	115348	
	115404	
	115417	
	115454	
	115501	
	115728	
139+200km photos shown	115744	Left - 115744
	115753	
	115756	
	115803	Right - 115753
	115819	
	115822	
	115828	
	120137	
	120143	
	120158	
	120236	
	120456	
	120500	
	120524	
139+360km	120621	
	121339	
	121356	Left - 121404 Right - 120143
139+500km (see AC photo)	121404	Track at ground level. No ditches visible but small earthbund long the rail boundary (left). Adjacent land generally flat with wide boundary and slight fall towards track
	121508	
	121513	
		 Left - 121508
139+600km Elm Road	Elm Road to Twenty Foot River	
	121707	Stone Headwall visible with ditch running adjoining road. Standing water observed. Dense vegetation (left) so ditch and existing culvert at 139.593km not visible. Short section of kerb drainage visible on Elm Road. Existing 450mm dia. culvert observed at 140+192, 1.5m high brick headwall photo 124608.
	121844	

RED Site photos included
No site observations

	121851	
	122110	
	122213	
	122220	
	122656	
	123513	
	123530	Track on 0.5m high embankment
	123533	
	123632	Ditch partially visible (right) within boundary along fenceline with standing water. Small earthbund (left) with land outside of boundary lower than crest. Heavy ponding in adjacent fields.
	123648	
	123655	
	123910	
	123916	
	124110	End of earthbund but ground along fenceline higher than adjacent ground
	124113	
	124120	
	124139	
	124148	
	124224	
	124349	
	124356	
	124441	
	124445	
	124450	
	124559	Left - 124608
Existing culvert 140+192km	124608	1.5m high brick headwall, 375mm dia. culvert with outfall to IDB. Left - stream watercourse
	124627	
	124653	
	125209	
	125221	
	125439	
	125751	
Existing culvert 140+215km	125802	Left - ditch with standing water observed. Right - IDB drain running parallel to track immediately outside boundary fence
	131300	
	131319	
Existing underbridge 140+650km	131354	
	Twenty Foot River to Station Road	
	161431	
	161435	
	161441	
Existing culvert 140+700km (HP)	161503	2.5m deep 1 in 1.5 ditch, 4m top width, (left) 15m away from track 300m length outside boundary along rail fenceline. Standing water observed. No ditch (right). Agricultural land falls towards track.
	161932	 
	162223	
	162432	
	161503	
	161503	
	162520	
	162525	
	162750	
	162914	
	162937	
		Right - 162432 Left - 162520
141+000km		No track access between 141+000 and 141+630km (630m). No safe access points

Existing culvert 141+630km		
	143500	Culvert submerged with concrete bag headwall (143500). Very slow flow east to west with IDB outfall. 4m wide embankment from rail. From LC north of culvert very shallow ditch visible (left). B101 road approx. 10m from rail and track on embankment. IDB 3m deep, 2m bottom width. From LC approx. 142+800 (moving south), long stretch of water in shallow ditch (informal) along road. TWL 0.5m below rail level, approx.300m long. Survey stop in line with IDB on opposite side of the road.
	143444	 Right - 143500
	143307	
	143202	
	143142	
	142919	
	142722	
	142717	Left - No ditch. Right - IDB drain running parallel to track immediately outside boundary fence
	142526	
	141951	
	141945	
	141942	
142+080km - LC (starting point)	145041	
	145500	
	145506	
	150037	
	150103	
	150608	
	150754	
	150838	
	151216	
	151220	
142+800km	151712	No track access between 142+800 and 143+65km (850m). Dense vegetation and no safe access points
	Station Road to Long Drove	
143+650km		
	101032	Start near 143+750 – Track at ground level. No visible drains with boundary fence approx. 5m from track. Dense vegetation (right).
	102811	Approx. 100m north ditch visible (right)
	102830	  Left - 101032 Right - 102922
	102922	
	102930	
	103239	
Existing culvert 144+171km - DRY	103247	1.5m deep 1 in 1 ditch (right) 3m away from track 200m length along rail fenceline continues towards dry culvert filled with debris, no visible water. 1.2m high headwall. Ditch transfers to left side 5m away from track continuing 150m north. Large IDB visible approx. 30m from track outside of rail boundary. Dense vegetation (right).
	103606	
	103711	
	104336	

	104357	
Existing culvert 144+312km	104434	IDB 3m deep, 1m bottom width and 6m top width. 2m top width shallow ditch on both sides of track inside boundary along fenceline. Rail on embankment. 5m long stone headwall (right) 1.5m away from track and 5m (left) from track. Headwall 2.5m below rail level with 525mm dia. culvert. Outfall to IDB but difficult to determine flow direction.
	104450	 Right - 104450
	104456	
	105939	
	105958	
144+630km	110421	Culvert used to transfer ditch transfer to left side, 525mm dia. with no outfall. Difficult to see extent of ditch (right) but visible. No visual of left side to view potential ditch
	110651	
Existing culvert 144+715km	110701	
	110731	Culvert with timber headwall and handrail outfall to IDB. Approx. top width 3m. Connecting ditches running parallel to fenceline at a high level to land drain. Visible standing water near connection of all 3 drains. Right - 110731. 
	110755	
	111913	
Existing culvert 145+006km	112853	Heavy structural damage to brick head wall. Severe cracking. Visible shallow ditches (heavily vegetated) observed either side within boundary along fenceline leading towards 525mm dia culvert. Left - 112853 
	113216	
	113237	
	113546	
	113613	
	94507	
	94452	
	93517	
	93244	
	93236	
	92612	

	92208	
	92149	
	92136	
Existing underbridge 145+300km (Mulbary Drain)	91858	No access to track, dense vegetation. IDB beneath underbridge approx. 2.5m high, 1 in 1 slope and top width 7.5m. No visible drains into IDB. Underside of the bridge approx. 3m above top of water level.   Left - 91858 Right - 92149
	91558	
	91550	
	Long Drove to Broad Drove	
	87415	
	84722	
	84745	
	90425	
	90703	 Right - 90703 Dense vegetation and no safe access points. Rail in very poor condition and no visible drains.Acces through waldersea depot.
	90708	
	93517	
	95722	
145+450km Waldersea Depot		No track access (640m).
Existing Underbridge 146+090km (Waldersay Drain)		
	124628	Track on approx. 2m high embankment. Small signs of 1m wide ditch on both sides of track. Ditch (left) ends at 250m
	131703	
	131821	
	131842	
	131910	
	132016	 Right - 132016
	132338	
	132410	
Existing culvert 146+445km	132416	No culvert visible - Dense vegetation. Ditch on both sides of track visible after suspected culvert leading to the next culvert. Ditch (left) approx. 7m away from track and (right) 5m away.
	133806	
	133814	
	134716	

	135346	
Existing culvert 146+725km	135412	
	135450	 Brick headwall with 900mm dia. culvert, soffit 1.5m below rail level. Right - 135450
	135656	
	140253	
	140257	
	140311	
	141205	 Ditch (Both sides) top width 2.5m. Approx. 250m long with short section of standing water (0.2 to 0.4m high). Right -141205
	141230	
	141236	
	141337	At level crossing wide land drains (10m top width) visible in the distance approx. 30m away from track (left).
	141230	
Existing culvert 147+196km	141804	
	141810	 Heavy structural damage to brick head wall. Severe cracking. No obvious shows of outfall of 650mm dia culvert. Left - 141810
	141944	
	141948	
	142405	
	142410	
	142414	
	143351	
	143450	
Existing culvert 147+646km	143505	
	143557	 Multiple land drains (10m top width) visible in the distance approx. 20m away from track. Culvert submerged (Right - 143557) with visible discharging land drains from adjacent agricultural lands discharging into IDB. No visible flow east to west with IDB outfall. Track on 20m wide embankment.
	143632	
	143658	Ditch visible on both sides
148+000km	Broad Drove	No track access between Broad Drove and Weasnham Lane (1.85km). Dense vegetation and no safe access points
148+220km	Existing Underbridge Redmoor Lane	

149+000km	New Bridge Lane	
149+850km		
149+950km	Weasenham Lane	No existing ditches. No visible signs of track drainage (115m). Proposed ditch to the east side
	153103	
	153206	
	153600	
	154022	
150+410km	Wisbech (New Track)	
		Total missed track visual survey - 4.430km due the dense vegetation and no safe access, including 460m new proposed track
		Completed 6.83km track length

W. C3 Budget Estimates

W.1 Anglian Water

Anglian Water Services Ltd.
Thorpe Wood House
Peterborough
Cambridgeshire
PE3 6WT

Tel: 03457 145145
www.anglianwater.co.uk

Our Ref: March to Wisbech

Naomi Ward
Mott MacDonald
Mott MacDonald House
8-10 Sydenham Road
Croydon
CR20 2EE

14 May 2020

For the attention of Naomi Ward

Dear Sirs,

National Infrastructure – March to Wisbech – Budget Offer Letter

Further to your recent enquiry and request for a desktop study quotation of the impact on the existing Anglian Water network, we are pleased to enclose details of our offer.

Scope of Works:
To provide budget estimates comprising all necessary Supervision, People, Equipment and Materials to undertake the activities briefly described as the Anglian Water asset diversionary works.

This Work includes:

- Desktop study of potential clashes
- Modelling of the affected assets
- Engagement with Anglian Water (AWS) stakeholders
- Engagement with non-AWS stakeholders (in agreement with yourselves)
- Land Referencing, notification to affected parties and indicative assessment of compensation
- On Site investigation works – boreholes / trial holes and soil sample analysis
- Identification only of additional specialist survey works, for example, structural surveys
- Design of diversions (construction / detailed design / as-built)
- Production of estimate, including the identification of general risks with information provided by yourselves.

Works Summary:

Below is the asset summary of each diversion.

PROJECT NAME	March To Wisbech			SAP REF		
			Quantity		**Output**	
Baseline	Commentary		Length	Nr	Std	
AW01	160 - OC		470		40	£ 162,696.77
AWF01	355 - OC		499		40	£ 325,547.60
AW02	90 - OC		78		40	£ 23,388.18
AW03	250 - OC		559		40	£ 236,171.91
AW03	500 - OC		31		30	£ 30,331.64
AW03	250 - SL		31		100	£ 4,317.06
AW04	90 - OC		52		40	£ 15,592.12
AW05	90 - OC		42		40	£ 12,593.64
AW05	180 - OC		13		40	£ 4,698.59
AW05	90 - SL		13		100	£ 1,332.81
AW06	400 - SL		95		100	£ 16,330.50
AW06	500 - OC		95		30	£ 92,951.80
AW06	400 - SL		95		100	£ 16,330.50
AW06	500 - OC		95		30	£ 92,951.80
AW07	400 - OC		203		40	£ 157,122.00
AW08	400 - OC		243		40	£ 188,082.00
AW09	90 - OC		293		40	£ 87,855.61
AW10	90 - SL		30		100	£ 3,075.72
AW10	180 - OC		33		40	£ 11,927.19
AW10	90 - SL		30		100	£ 3,075.72
AW10	180 - OC		33		40	£ 11,927.19
AW11	500 - OC		61		30	£ 59,684.84
AW11	400 - SL		61		100	£ 10,485.90
AW11	500 - OC		61		30	£ 59,684.84
AW11	400 - SL		61		100	£ 10,485.90
AW12	500 - OC		135		30	£ 132,089.40
AW12	400 - SL		135		100	£ 23,206.50
AW12	500 - OC		135		30	£ 132,089.40
AW12	400 - SL		135		100	£ 23,206.50
AW13	90 - OC		162		40	£ 48,575.46
AW14	90 - OC		190		40	£ 56,971.22
AW15	315 - OC		344		40	£ 218,660.16
AW16	400 - OC		357		40	£ 276,318.00
AW17	315 - OC		297		40	£ 188,785.08
AW17	180 - OC		120		40	£ 43,371.60
AW18	400 - OC		289		40	£ 223,686.00
AW19	90 - OC		106		40	£ 31,783.94
Upfront Butt Fusion (Field Work Only)			5682		600	£ 38,637.60
Services				2		£ 9,451.48
Connections				50	3	£ 114,343.00
Connections	Decommissioning			0		£ -
Manholes				0		£ -
Commissioning				5682	1000	£ 15,739.14
Rate per m (Connections)						
Non-Core Items						
Trial Holes (Nr) Upfront Done Before Construction Work				42	3	£ 87,736.74
Utility Crossings (Nr)				10		£ 5,361.20
Additional/Non-Standard Items						
Traffic Management				15000		£ 15,000.00
UPT's				0		£ -
Construction Staff						
Construction Manager		1 days for 49 wks				£ 19,192.32
Site Manager		5 days for 49 wks				£ 74,683.35
Site Supervisor		5 days for 49 wks				£ 74,683.35
Site Engineer		5 days for 49 wks				£ 70,251.30
Construction Support						£ 21,492.93
Site Set-up						
Site Setup & Demob						£ 50,098.92
Accommodation						£ 193,860.00
SubTotal (Construction)						**£ 3,827,916.41**

Non-construction costs						***£***	***803,862.45***
Plan for Stage (Non-Construction Costs)		*18%*					
	Anglian Water Staff (Incl Operations)					*£*	*45,935.00*
	Delivery Management Support					*£*	*275,609.98*
	Delivery Design Management					*£*	*321,544.98*
	Construction Management Support					*£*	*45,935.00*
	Savills					*£*	*68,902.50*
	Surveys					*£*	*45,935.00*
	Other					*£*	*-*
Risk			*20%*	*of construction*		*£*	*765,583.28*
SubTotal						***£***	***5,397,362.14***
Overhead	*LAO*		*2.85%*			*£*	*153,824.82*
	DR		*5.34%*			*£*	*296,433.38*
	COH		*5.16%*			*£*	*286,441.25*
	OC		*0.86%*			*£*	*47,740.21*
	Fee		*12.50%*			*£*	*693,898.37*
Overall Scheme Cost						***£***	***6,875,700.17***

STANDARD TERMS AND CONDITIONS

- Prices are subject to the addition of VAT.
- The above pricing is based upon desktop study only and is to be used for forecast budget purposes only. We can provide detailed C3 submission upon request, and after collaborative design and commercial workshops have been undertaken.
- Detailed assessments and liaison with statutory authorities (such as local highways / Cadent etc.) will need to be carried out to determine their requirements.
- We have allowed for a full site setup
- We have not allowed for any arboreal / archaeological / ecological / structural etc. surveys or associated enabling works.
- Principals of reasonable cost and expenses recovery applies for works.
- Our Prices include for our standard overhead and fee percentages, which are applied to defined cost – i.e. cost to employ (CTE) rates of designers plus overhead and fee; which offers best value.

We trust that our offer and meets with your requirements, we look forward to hearing from you in the near future.

If you have any questions in connection with this offer, please do not hesitate to contact the undersigned.

Yours faithfully,
For and behalf of Anglian Water Services Limited

[redacted]

Colin Isles
Head of Asset Delivery

W.2 Cadent Gas

Cadent Gas Limited
Brunel House, Uxbridge Road
Slough SL2 5NA
Cadentgas.com

Amir Ansari
Triio, C/O Cadent Gas
Brunel House
Uxbridge Road
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SAMUEL KAIL
CAMBRIDGESHIRE COUNTY COUNCIL
C/O MOTT M
MOTT MACDONALD HOUSE
8-10 SYDENHAM ROAD
CROYDON
CR0 2EE

Cadent
Your Gas Network

Estimate Produced Date 29/05/2020

Estimate of Cost for the Diversion of Cadent Plant

Thank you for your enquiry. We've produced your C3 estimate for the diversionary works at the site location you requested. We based this on the information you provided and our assumptions (which we've set out below).

Price	**£1,764,226.25**	Inclusive of £294,037.70 VAT charged at 20%

Estimate Details	
Project Title / Site Address:	EAGD210011 - MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP
Description of works:	1 – Please see caveats enclosed. 2 - PLEASE SEE ASSUMPTIONS AND ADDITIONAL SPECIAL CONDITIONS.

Assumptions

1. All information relating to the requested work has been read and fully understood prior to a firm C4 estimate being requested.
2. The correct site details have been identified using the information you have provided to us.

Here's a breakdown of your estimate:
It shows you the estimated costs involved for the work we're proposing to undertake:

Estimated Costs		
Contractors		£1,245,013.42
Materials		£56,038.39
PMC		£0.00
Fixed Costs		£0.00
Direct Labour		£0.00
Permit Scheme Fees (Excludes all Overheads)		£0.00
Cadent Gas Ltd Overheads 13%		£169,136.73
Easement		£0.00
Applicable Discounts		
Betterment		-£0.00
Deferment of Renewal		-£0.00
NRSWA*	18%	**-£0.00**
MCP	25%	-£0.00
Total Estimated Cost	100%	£1,470,188.54
Advance Payment Due	100%	£00.00
VAT	20%	£294,037.70
Total Payment due with Order		£1,764,226.25

** NRSWA – Discount is only applicable when 75% of the costs are paid in advance.*

Additional / Special Conditions

DUE TO THE COVID-19, WE HAVE ONLY CARRIED OUT A DESK TOP SURVEY AND ANY CHANGES TO OUR ASSUMPTIONS FOR COSTING MAY RESULT IN A VARIATION. NO ALLOWANCE FOR ANY IMPACT TO PRICING FROM COVID-19 RELATED ISSUES.
Assumed clear route and sufficient space for proposed mains diversions, connections & disconnections
Client has confirmed that existing 6" Steel MP, attached to the Rail bridge over Twenty Foot River will not be affected by proposed works (more details of works required).
CLIENT TO ARRANGE ANY NECESSARY LEGAL/EASEMENTS REQUIRED PRIOR TO WORK STARTING
NORMAL WORKING HOURS. NO ALLOWANCE FOR OUT OF HOURS WORKING
NO ALLOWANCE FOR NON STANDARD TRIIO PPE/INDUCTION TIME
NO ALLOWANCE FOR HAVING TO DEVIATE FROM OR BEING UNABLE TO ACHIEVE THE DESIGNED ROUTE
NO ALLOWANCE FOR OVER-BANDING/SPECIALIST REINSTATEMENT/SECTION 58/FULL WIDTH REINSTATEMENT
NO ALLOWANCE FOR TIME/COSTS ASSOCIATED WITH WORKING UNDER/WITH CLIENT PERMIT SYSTEMS
NO ALLOWANCE FOR LOSS OF EARNINGS/COMPENSATION CLAIMS
NO ALLOWANCE FOR REMOVING HAZARDOUS WASTE OR REMOVING/GROUTING DECOMMISSIONED MAINS
ASSUME CONTINGENCY VALVES ARE COMPLIANT AND OPERABLE - NO ALLOWANCE FOR ANY REMEDIAL WORKS
ALL QUOTES ARE VALID AT TIME OF ISSUE AND MAY BE SUBJECT TO MARKET PRICE CHANGES

The Daily Liquidated Damages will be £563.79

The Liquidated Damages Cap will be £16,913.67

The Estimated cost is made of number elements as shown in the breakdown including Actual Works Overheads (as referenced in our Terms and Conditions) which shall mean an amount equal to:

a) 49% of that part of the Actual Works Cost that relates to any part of the works performed by Cadent Gas Ltd internally (e.g. direct labour); b) 13% of that part of the Actual Works Cost that relates to any part of the works performed by a Subcontractor (e.g. contract labour); and the remainder of the Actual Works Cost (e.g. materials and bought in services).

A budget (C3) estimate cannot form a basis of a Contract, Any works or advance payment can only be agreed upon once a Firm (C4) estimate has been accepted and Cadent diversionary billing office receiving payment and signed Acceptance Form.

After the issue of a Firm estimate, lead-time before the work can commence on site is 16 weeks, following receipt of your Payment and Signed Acceptance Form.

Further information appertaining to the Company's Terms and Conditions can be found online:

https://cadentgas.com/getattachment/Get-connected/Promo-Our-terms-and-conditions/Cadent_SWTs_for_Below_7_barg_Infrastructure_Works_v11_May_2017.pdf

Please be aware that where "Quotation" has been stated "within the Terms & Conditions" it must be referred to as an "Estimate".

If you have any questions please do not hesitate to contact me.

[redacted]

Amir Ansari

Design Officer

Job Description and Caveat/Assumptions EAGD210011 Design 1 – 7 March to Wisbech Rail Line, Long Drove, Elm, Fenland, cambs.. PE14 0NP

DUE TO THE COVID-19, WE HAVE ONLY CARRIED OUT A DESK TOP SURVEY AND ANY CHANGES TO OUR ASSUMPTIONS FOR COSTING MAY RESULT IN A VARIATION. NO ALLOWANCE FOR ANY IMPACT TO PRICING FROM COVID-19 RELATED ISSUES

CLIENT TO ARRANGE ANY NECESSARY LEGAL/EASEMENTS REQUIRED PRIOR TO WORK STARTING

NORMAL WORKING HOURS. NO ALLOWANCE FOR OUT OF HOURS WORKING

NO ALLOWANCE FOR NON STANDARD TRIIO PPE/INDUCTION TIME

NO ALLOWANCE FOR HAVING TO DEVIATE FROM OR BEING UNABLE TO ACHIEVE THE DESIGNED ROUTE

NO ALLOWANCE FOR OVER-BANDING/SPECIALIST REINSTATEMENT/SECTION 58/FULL WIDTH REINSTATEMENT

NO ALLOWANCE FOR TIME/COSTS ASSOCIATED WITH WORKING UNDER/WITH CLIENT PERMIT SYSTEMS

NO ALLOWANCE FOR LOSS OF EARNINGS/COMPENSATION CLAIMS

NO ALLOWANCE FOR REMOVING HAZARDOUS WASTE OR REMOVING/GROUTING DECOMMISSIONED MAINS

ASSUME CONTINGENCY VALVES ARE COMPLIANT AND OPERABLE - NO ALLOWANCE FOR ANY REMEDIAL WORKS

ALL QUOTES ARE VALID AT TIME OF ISSUE AND MAY BE SUBJECT TO MARKET PRICE CHANGES

Assumed clear route and sufficient space for proposed mains diversions, connections & disconnections

Client has confirmed that existing 6” Steel MP, attached to the Rail bridge over Twenty Foot River will not be affected by proposed works (more details of works required).

DESIGN 1A

3 MAN MAINLAYING TEAM

LAY 46.22M OF 180MM MP PE OPEN CUT IN ROAD, TYPE 2

LAY 187.99M OF 180MM MP PE OPEN CUT IN VERGE

LAY 39.39M OF 250MM MP PE OPEN CUT IN ROAD TYPE 2

LAY 65.51M OF 250MM MP PE OPEN CUT IN VERGE

LAY 10.85M OF 180MM LP PE OPEN CUT IN VERGE

LAY 21.13M OF 180MM LP PE IN 200MM STEEL SLEEVE, INSTALLED BY CLIENT

ABANDON 239.37M OF 180MM MP PE

ABANDON 91.62M OF 250MM MP PE

2 X 6" STEEL X 180MM LP CONN

2 X 6" STEEL X 150MM UPT'S – RADIUS PRICE, PREV. QUOTE

4 X 180MM X 180MM MP CONN'S + 4 X 180MM CUT AND CAPS + 1 X 180MM PURGE POINT

4 X 181MM X 150MM BRANCH DRILLINGS – RADIUS PRICE, PREV. QUOTE

1 X 180MM MP CUT AND CAP

2 X 250MM X 250MM MP CONN + 2 X 250MM CUT AND CAPS

2 X 250MM X 250MM BRANCH DRILLINGS – RADIUS PRICE, PREV. QUOTE

2 X 250MM MP DOUBLE STOPPLES – RADIUS PRICE, PREV. QUOTE

INSTALL 2 X 180MM INLINE VALVES C/W 1"/2" BYPASS/PRESSURE POINTS, VALVE CHAMBERS & LIDS

RISK POT – VAC EXC – 9 DAYS; MANNED TM DURING PEAK HOURS

ALLOWANCE FOR 2 WAY T/LIGHTS - 74 DAYS – MANNED DURING PEAK HOURS

NO ALLOWANCE FOR BAPA

NO ALLOWANCE FOR DEEP EXC

NO ALLOWANCE FOR ANY SERVICE WORK

DESIGN 1B

3 MAN MAINLAYING TEAM

LAY 28.34M OF 125MM LP PE OPEN CUT IN ROAD, TYPE 4

LAY 7.19M OF 125MM LP PE OPEN CUT IN ROAD, TYPE 4

ABANDON 23.84M OF 150MM LP DI

ABANDON 1.93M OF 180MM LP PE

2 X 150MM X 125MM LP CONN + 2 X 150MM CUT AND CAPS

2 X 150MM X 100MM LP UPTS - RADIUS QUOTE

1 X 180MM X 125MM LP CONN + 1 X 180MM CUT AND CAP

1 X 180MM X 100MM LP BRANCH DRILLING - RADIUS QUOTE

RISK POT – VAC EXC - 2 DAYS

ALLOWANCE FOR 2 WAY T/LIGHTS - 19 DAYS TO MAINTAIN ACCESS TO TARMAC PLANT

ALLOWANCE FOR EA CONSENT

NO ALLOWANCE FOR DE-WATERING

ALLOWANCE FOR ADDITIONAL ROAD PLATES X 4

ALLOWANCE FOR CAMERA SURVEY - 1 DAY - NO ALLOWANCE FOR ANY WORK FOUND AS A RESULT

NO ALLOWANCE FOR ANY SERVICE WORK

NO ALLOWANCE FOR DEEP EXC

DESIGN 2

3 MAN MAINLAYING TEAM

LAY 129.96M OF 180MM MP PE OPEN CUT IN VERGE

LAY 8.9M OF 180MM MP PE OPEN CUT IN ROAD, TYPE 4 – (2 X RD XINGS)

ABANDON 114.42M OF 6" MP STEEL

2 X 6" STEEL X 180MM MP CONN + 2 X 6" STEEL CUT AND CAPS

2 X 6" STEEL X 150MM MP UPT'S – RADIUS PRICE, PREV. QUOTE

2 X 6" MP DOUBLE BOLTED STOPPLES – RADIUS PRICE, PREV. QUOTE

WELDER FOR 2 X 6" SLIP/BLANK FLANGES FOR CAPS – RADIUS PRICE, PREV. QUOTE

RISK POT – VAC EXC – 2 DAYS

PROVISIONAL ALLOWANCE FOR NEW CABLE & ANODES

ALLOWANCE FOR ROAD CLOSURE – APPROX 150M – LONG DROVE – 25 DAYS

ALLOWANCE FOR EA CONSENT

NO ALLOWANCE FOR DE-WATERING

NO ALLOWANCE FOR ANY SERVICE WORK

NO ALLOWANCE FOR DEEP EXC

NO ALLOWANCE FOR REMOVING TREES, HEDGING, FENCING, POSTS, SIGNAGE – ASSUME CLEAR ROUTE, LINE & LEVELS PROVIDED BY CLIENT

DESIGN 3

4 MAN MAINLAYING TEAM

LAY ONLY 46.68M OF 180MM MP PE IN 200MM DUCT, PROVIDED BY CLIENT

LAY 101.64M OF 180MM MP PE OPEN CUT IN FIELD

LAY 24.58M OF 180MM MP PE BY DIRECTIONAL DRILLING

ABANDON 105.15M OF 6" MP STEEL

2 X 6" STEEL X 180MM MP CONN + 2 X 6" STEEL CUT AND CAPS

2 X 6" STEEL X 150MM MP UPT'S – RADIUS PRICE, PREV. QUOTE

2 X 6" MP DOUBLE BOLTED STOPPLES – RADIUS PRICE, PREV. QUOTE

WELDER FOR 2 X 6" SLIP/BLANK FLANGES FOR CAPS – RADIUS PRICE, PREV. QUOTE

INSTALL 4 X 180MM INLINE VALVES INCL. 1"/2" BYPASS/PRESSURE POINTS

RISK POT – VERTISHORE EV. 2.4M FOR MAINS LAY (EXCL. DUCTED & HDD LENGTHS)

PROVISIONAL ALLOWANCE FOR NEW CABLE & ANODES

ALLOWANCE FOR DEEP EXC ON CONNECTIONS (2 X) 8 X 1.5 X 1.4M

ALLOWANCE FOR EXCAVATING, BACKFILL AND STEPPED EXCAVATION TO ACCESS DUCT (2 X) 2 X 1.5 X 1.4M

ALLOWANCE FOR EXCAVATING, BACKFILL AND STEPPED EXCAVATION FOR HDD LAUNCH/RECEIVE PITS (2 X) 5 X 2 X 1.4M

ALLOWANCE FOR EA CONSENT

ALLOWANCE FOR CADENT LAND SERVICES

NO ALLOWANCE FOR REMOVING TREES, HEDGING, FENCING, POSTS, SIGNAGE – ASSUME CLEAR ROUTE, LINE & LEVELS PROVIDED BY CLIENT

NO ALLOWANCE FOR DRAINAGE REPAIR, LOSS OF CROP, STOCK-PROOF FENCING, DE-WATERING, TRENCH COMPACTOR, TRACKWAY

NO ALLOWANCE FOR BAPA

ASSUME DEPTH OF SLEEVE IS NO MORE THAN 1.2M OF COVER

DESIGN 4

3 MAN MAINLAYING TEAM

LAY 68.51M OF 180MM MP PE OPEN CUT IN ROAD, TYPE 4

ABANDON 50.72M OF 6" MP STEEL

2 X 6" STEEL X 180MM MP CONN + 2 X 6" CUT AND CAPS

2 X 6" STEEL X 150MM MP UPT'S – RADIUS PRICE, PREV. QUOTE

2 X 6" MP DOUBLE BOLTED STOPPLES – RADIUS PRICE, PREV. QUOTE

WELDER FOR 2 X 6" SLIP/BLANK FLANGES FOR CAPS – RADIUS PRICE, PREV. QUOTE

NO ALLOWANCE FOR REMOVING TREES, HEDGING, FENCING, POSTS, SIGNAGE – ASSUME CLEAR ROUTE, LINE & LEVELS PROVIDED BY CLIENT

PROVISIONAL ALLOWANCE FOR NEW CABLE & ANODES

ALLOWANCE FOR EA CONSENT

ALLOWANCE FOR ROAD CLOSURE – APPROX 100M – MARCH ROAD – 21 DAYS

CLIENT ADVISED TO CARRY OUT TRIAL HOLES TO DETERMINE DEPTH & LOCATION

DESIGN 5

3 MAN MAINLAYING TEAM

LAY 116.84M OF 32MM MP PE OPEN CUT IN ROAD, TYPE 3

LAY 70.46M OF 32MM MP PE OPEN CUT IN VERGE

LAY 20.51M OF 180MM MP PE OPEN CUT IN FOOTPATH

LAY 91.1M OF 180MM MP PE OPEN CUT IN VERGE

ABANDON 63.36M OF 180MM MP PE

ABANDON 73.64M OF 125MM MP PE

ABANDON 118.17M OF 32MM MP PE

1 X 32MM X 32MM MP CONN + 1 X 32MM CUT AND CAP – ASSUME 2" BYPASS SUFFICIENT

1 X 125MM X 180MM MP CONN + 1 X 125MM MP CUT AND CAP + 1 X 32MM TOP TEE CONN – ASSUME 2" BYPASS SUFFICIENT

1 X 180MM X 180MM MP CONN + 1 X 180MM MP CUT AND CAP + 1 X 180MM PURGE POINT

1 X 180MM X 150MM BRANCH DRILLING – RADIUS PRICE, PREV. QUOTE

RISK POT – VAC EXC – 3 DAYS; MANNED 3 WAY T/LIGHTS DURING PEAK HOURS

NO ALLOWANCE FOR REMOVING TREES, HEDGING, FENCING, POSTS, SIGNAGE – ASSUME CLEAR ROUTE, LINE & LEVELS PROVIDED BY CLIENT

NO ALLOWANCE FOR DRAINAGE REPAIRS/DE-WATERING

ALLOWANCE FOR EA CONSENT

ALLOWANCE FOR CADENT LAND SERVICES

ALLOWANCE FOR FOOTPATH CLOSURE ON ELM ROAD FOR 180MM MAINS LAY & CONN

ALLOWANCE FOR 1 X BUS STOP SUPSENSION

ALLOWANCE FOR 3 WAY T/LIGHTS ELM ROAD/LONGHILL ROAD – 32 DAYS

DESIGN 6

3 MAN MAINLAYING TEAM

LAY 73.79M OF 180MM MP PE INSERTED IN 200MM RIGID SLEEVE, INSTALLED BY CLIENT

LAY 18.27M OF 180MM MP PE OPEN CUT IN FIELD

LAY 27.8M OF 180MM MP PE OPEN CUT IN FIELD

LAY 25.38M OF 180MM MP PE INSERTED IN 200MM RIGID SLEEVE TO 3M DEPTH, INSTALLED BY CLIENT – **RISK POT** (DEPENDS ON EXISTING DEPTH – CUSTOMER TO COMPLETE TRIAL HOLES TO CONFIRM)

LAY 19.38M OF 180MM MP PE OPEN CUT IN FIELD

LAY 39.69M OF 180MM MP PE OPEN CUT IN FIELD

ABANDON 90.84M OF 6” MP STEEL

ABANDON 10.1M OF 180MM MP PE

1 X 180MM X 180MM MP CONN + 1 X 180MM CUT AND CAP

1 X 180MM X 150MM BRANCH DRILLING – RADIUS PRICE, PREV. QUOTE

1 X 180MM MP CUT AND CAP

2 X 6” STEEL X 180MM MP CONN + 2 X 6” CUT AND CAPS

2 X 6” STEEL X 150MM UPT’S – RADIUS PRICE, PREV. QUOTE

RISK POT – VERTISHORE EV. 2.4M FOR MAINS LAY (EXCL. DUCTED LENGTHS); INSERTING 25.38M FOR RAIL XING & ASSOCIATED COSTS INCL. DEEP EXC

NO ALLOWANCE FOR REMOVING TREES, HEDGING, FENCING, POSTS, SIGNAGE – ASSUME CLEAR ROUTE, LINE & LEVELS PROVIDED BY CLIENT

NO ALLOWANCE FOR DRAINAGE REPAIR, LOSS OF CROP, STOCK-PROOF FENCING, DE-WATERING, TRENCH COMPACTOR, TRACKWAY

NO ALLOWANCE MADE FOR PARKING – ASSUME VEHICLES CAN PARK ON SITE

ASSUME ACCESS FOR PLANT/VEHCILES AVAILABLE TO SITE AT ALL TIMES TO COMPLETE WORKS

NO ALLOWANCE FOR ANY DOWNTIME OR REMOBILIZATION DUE TO STEEL SLEEVES NOT BEING READY FOR TRIIO TEAM

NO ALLOWANCE FOR GROUTING THE ANNULUS ON THE NEW INSERTED MAIN

NO ALLOWANCE FOR WORKING ON RAILWAY LAND

CLIENT TO CARRY OUT TRIAL HOLES TO ASSESS IF EXISTING SLEEVE IS DEEP ENOUGH

CLIENT TO INSTALL ALL SLEEVES REQUIRED

ALLOWANCE FOR BAPA

ALLOWANCE FOR CADENT LAND SERVICES

DESIGN 7

3 MAN MAINLAYING TEAM

LAY 210.89M OF 180MM MP PE OPEN CUT IN ROAD, TYPE 3

ABANDON 190.46M OF 6” MP STEEL

ABANDON 10.17M OF 32MM MP SERVICE

ABANDON 10.6M OF 32MM MP SERVICE

ABANDON 8.44M OF 32MM MP SERVICE

ABANDON 9.27M OF 32MM MP SERVICE

4 X 32MM MP SERVICES

2 X 6” STEEL X 180MM MP CONN + 2 X 6” CUT AND CAPS

2 X 6” STEEL X 150MM UPT’S – RADIUS PRICE, PREV. QUOTE

RISK POT – VAC EXC – 2 DAYS; MANNED T/LIGHTS DURING PEAK HOURS 07.00-09.30 15.30-18.30 MON – FRI

NO ALLOWANCE FOR REMOVING TREES, HEDGING, FENCING, POSTS, SIGNAGE – ASSUME CLEAR ROUTE, LINE & LEVELS PROVIDED BY CLIENT

ASSUMED CLEAR ROUTE AND SUFFICIENT SPACE FOR PROPOSED MAINS DIVERSIONS, CONNECTIONS & DISCONNECTIONS

CLIENT HAS CONFIRMED THAT EXISTING 6” STEEL MP, ATTACHED TO THE RAIL BRIDGE OVER TWENTY FOOT RIVER WILL NOT BE AFFECTED BY PROPOSED WORKS

NO ALLOWANCE MADE FOR ANY DRAINAGE REPAIRS

WE ASSUME THAT OUR VEHICLES CAN BE PARKED ALONGSIDE THE WORKS WITHIN THE TRAFFIC MANAGEMENT ZONE

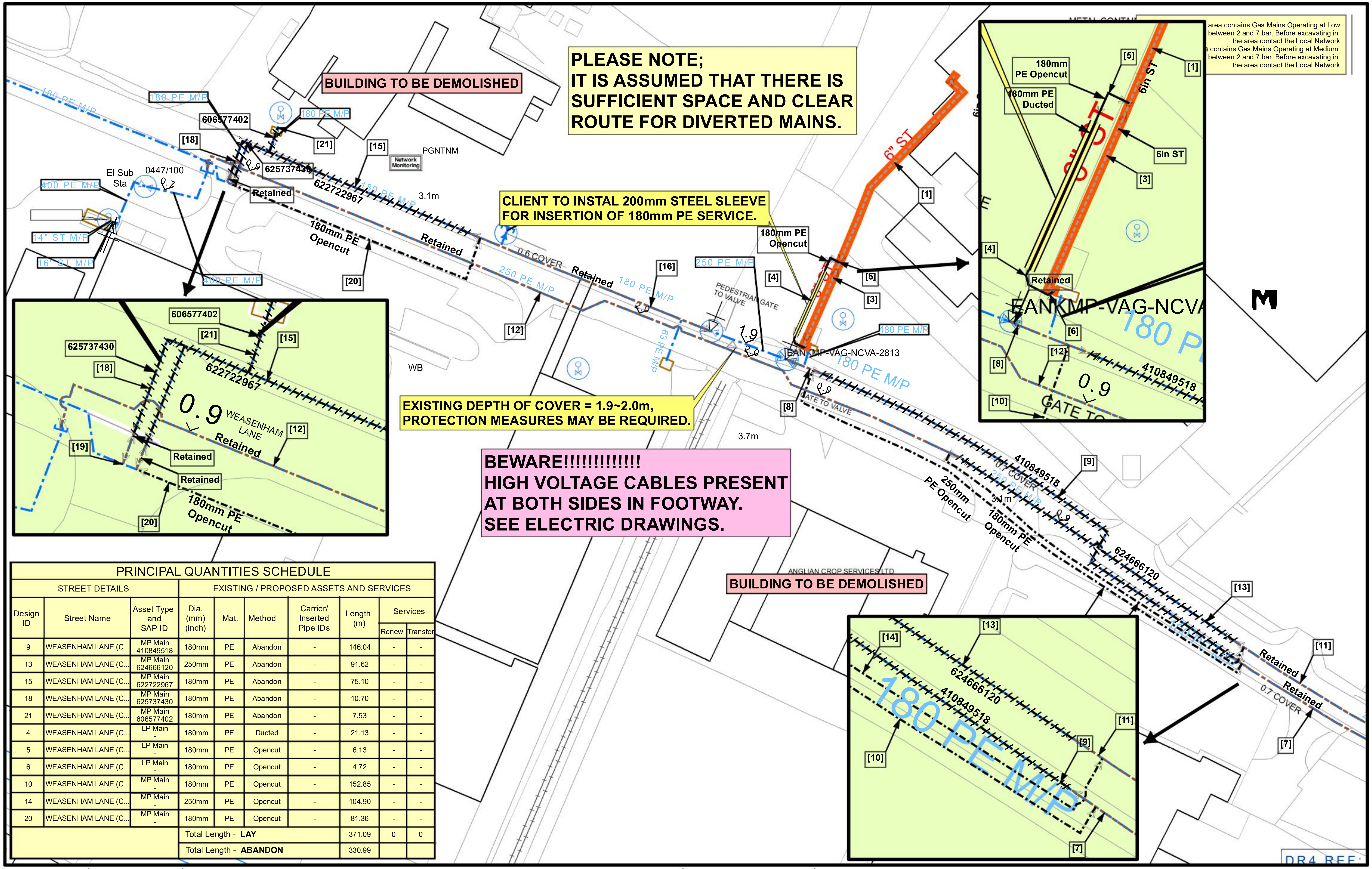
ALLOWANCE FOR 2 WAY T/LIGHTS - ELM ROAD – 13 DAYS, ALLOWANCE FOR 3 WAY T/LIGHTS – ELM ROAD JCT FLAGGRASS HILL ROAD – 25 DAYS – TM MANNED DURING PEAK HOURS 07.00-09.30 – 15.30-18.30 MON – FRI

ALLOWANCE FOR SPEED LIMIT REDUCTION APPLICATION

ALLOWANCE FOR DEEP EXC ON 6” STEEL CONN’S (2 X) 8 X 1.5 X 1.4M

ALLOWANCE FOR CAMERA SURVEY – 2 DAYS – NO ALLOWANCE FOR ANY WORK FOUND AS A RESULT

ALLOWANCE FOR FITTER TO RESET GOVERNORS AND RELIGHT 4 X SERVICES



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
9	WEASENHAM LANE (C...	MP Main 410849518	180mm	PE	Abandon	-	146.04	-	-
13	WEASENHAM LANE (C...	MP Main 624666120	250mm	PE	Abandon	-	91.62	-	-
15	WEASENHAM LANE (C...	MP Main 622722967	180mm	PE	Abandon	-	75.10	-	-
18	WEASENHAM LANE (C...	MP Main 625737430	180mm	PE	Abandon	-	10.70	-	-
21	WEASENHAM LANE (C...	MP Main 606577402	180mm	PE	Abandon	-	7.53	-	-
4	WEASENHAM LANE (C...	LP Main -	180mm	PE	Ducted	-	21.13	-	-
5	WEASENHAM LANE (C...	LP Main -	180mm	PE	Opencut	-	6.13	-	-
6	WEASENHAM LANE (C...	LP Main -	180mm	PE	Opencut	-	4.72	-	-
10	WEASENHAM LANE (C...	MP Main -	180mm	PE	Opencut	-	152.85	-	-
14	WEASENHAM LANE (C...	MP Main -	250mm	PE	Opencut	-	104.90	-	-
20	WEASENHAM LANE (C...	MP Main -	180mm	PE	Opencut	-	81.36	-	-
			Total Length - **LAY**				371.09	0	0
			Total Length - **ABANDON**				330.99		

SCALE: 1:500 @ A3
USER ID: am009
DATE: 07/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 545748, 308612
Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes: LP GAS MAIN, M/P GAS MAIN, I/P GAS MAIN, H/P GAS MAIN, N/H/P GAS MAIN

Proposed Pipes: PROPOSED PIPE - LP, PROPOSED PIPE - MP, PROPOSED PIPE - IP, ABANDON - LP, ABANDON - MP, RELAY SERVICE, TRANSFER SERVICE

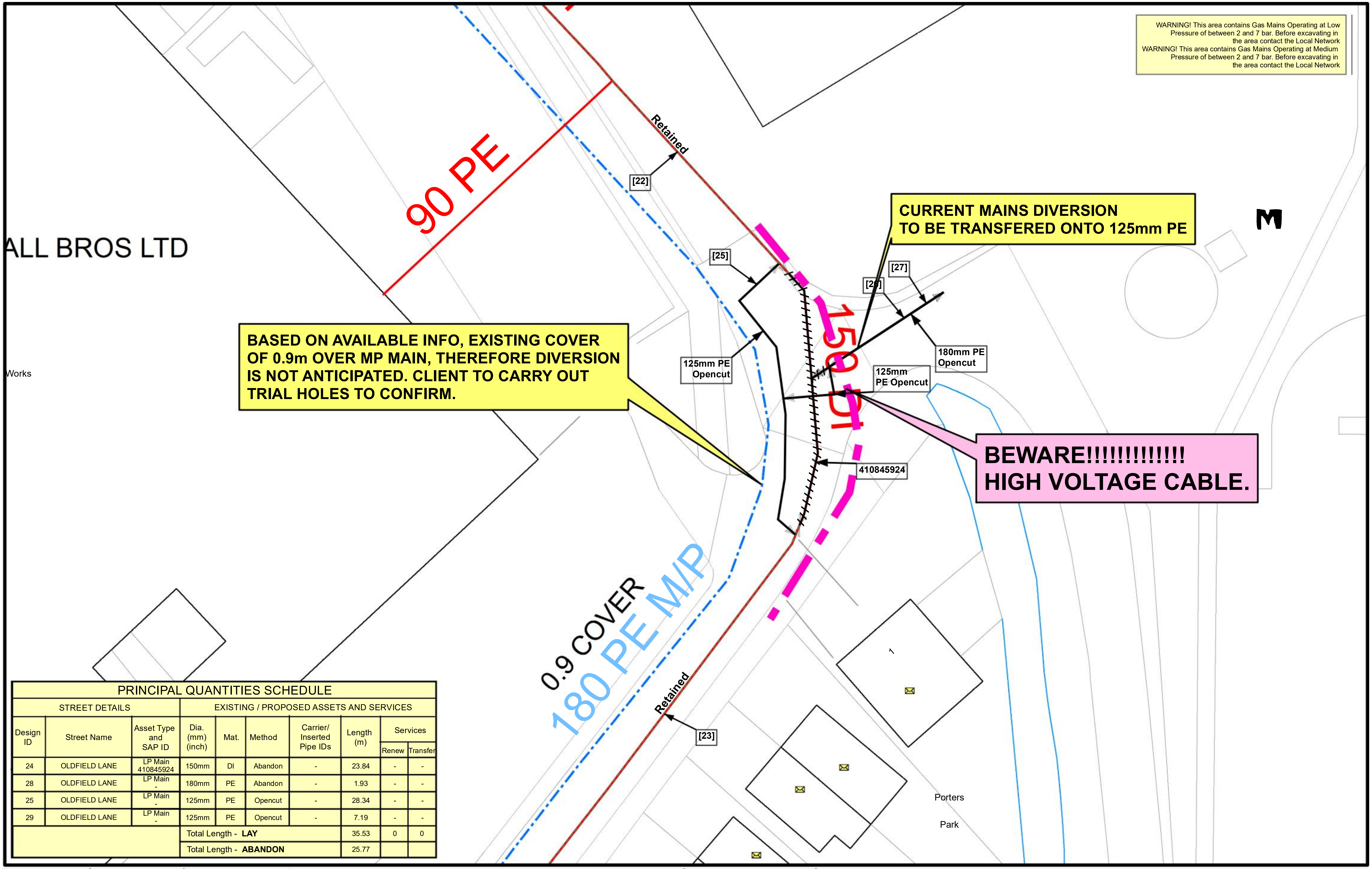
This plan shows those pipes owned by Cadent Gas Ltd in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 1A**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services: Renew	Services: Transfer
24	OLDFIELD LANE	LP Main 410845924	150mm	DI	Abandon	-	23.84	-	-
28	OLDFIELD LANE	LP Main -	180mm	PE	Abandon	-	1.93	-	-
25	OLDFIELD LANE	LP Main -	125mm	PE	Opencut	-	28.34	-	-
29	OLDFIELD LANE	LP Main -	125mm	PE	Opencut	-	7.19	-	-
			Total Length - **LAY**				35.53	0	0
			Total Length - **ABANDON**				25.77		

SCALE:	1:500 @ A3
USER ID:	am009
DATE:	07/05/2020
INTERNAL USE ONLY	
MAP REF:	
CENTRE:	545822, 309132

Existing Pipes

- L/P GAS MAIN
- M/P GAS MAIN
- I/P GAS MAIN
- H/P GAS MAIN
- N/H/P GAS MAIN

Proposed Pipes

- PROPOSED PIPE - LP
- PROPOSED PIPE - MP
- PROPOSED PIPE - IP
- ABANDON - LP
- ABANDON - MP
- RELAY SERVICE R
- TRANSFER SERVICE T

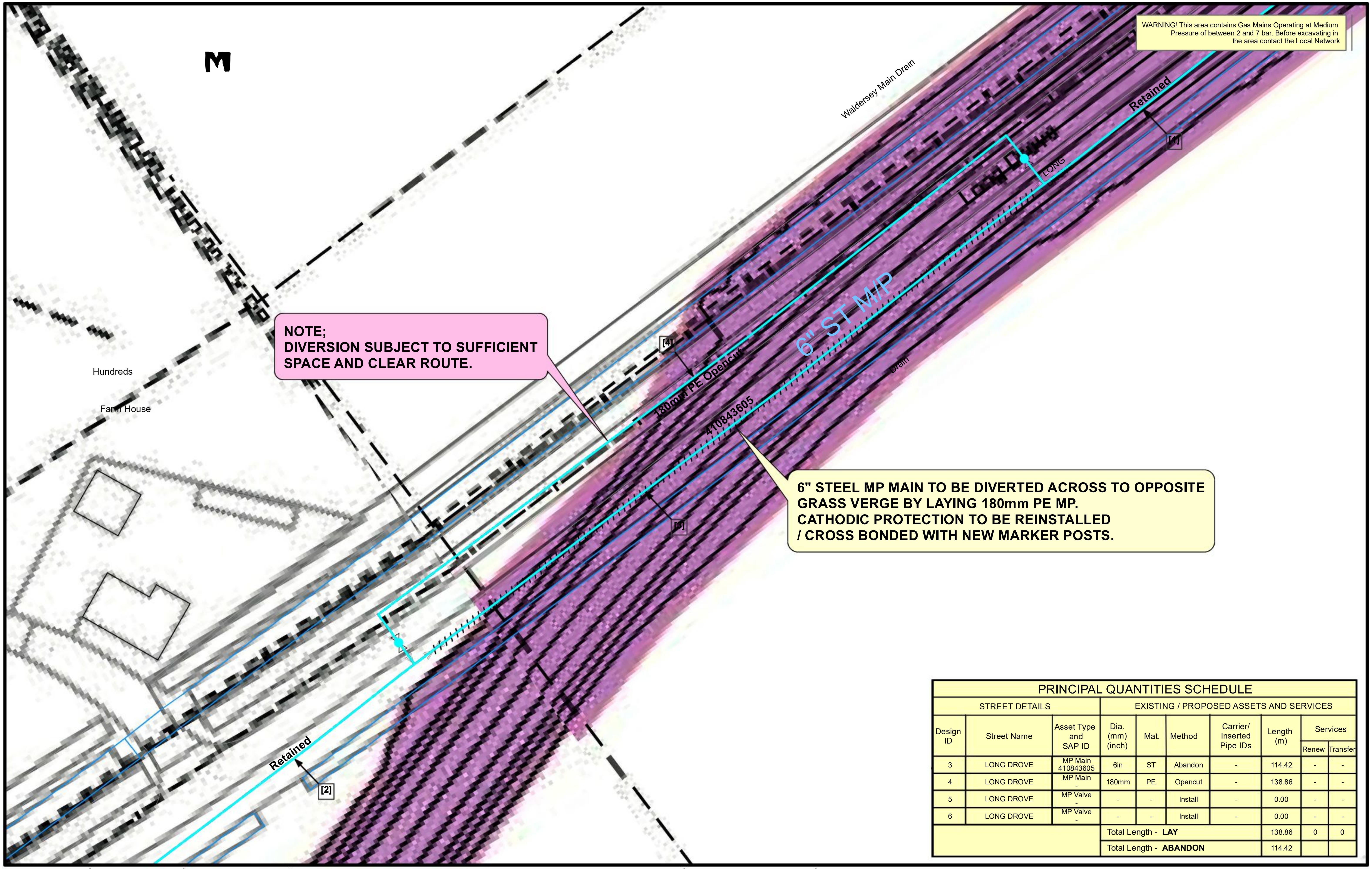
Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 1B**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
3	LONG DROVE	MP Main 410843605	6in	ST	Abandon	-	114.42	-	-
4	LONG DROVE	MP Main -	180mm	PE	Opencut	-	138.86	-	-
5	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
6	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
			Total Length - **LAY**				138.86	0	0
			Total Length - **ABANDON**				114.42		

SCALE: 1:500 @ A3
USER ID: am009
DATE: 12/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 544285, 304736

Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes
- L/P GAS MAIN
- M/P GAS MAIN
- I/P GAS MAIN
- H/P GAS MAIN
- N/H/P GAS MAIN

Proposed Pipes
- PROPOSED PIPE - LP
- PROPOSED PIPE - MP
- PROPOSED PIPE - IP
- ABANDON - LP
- ABANDON - MP
- RELAY SERVICE (R)
- TRANSFER SERVICE (T)

This plan shows those pipes owned by Cadent Gas Ltd in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and any other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

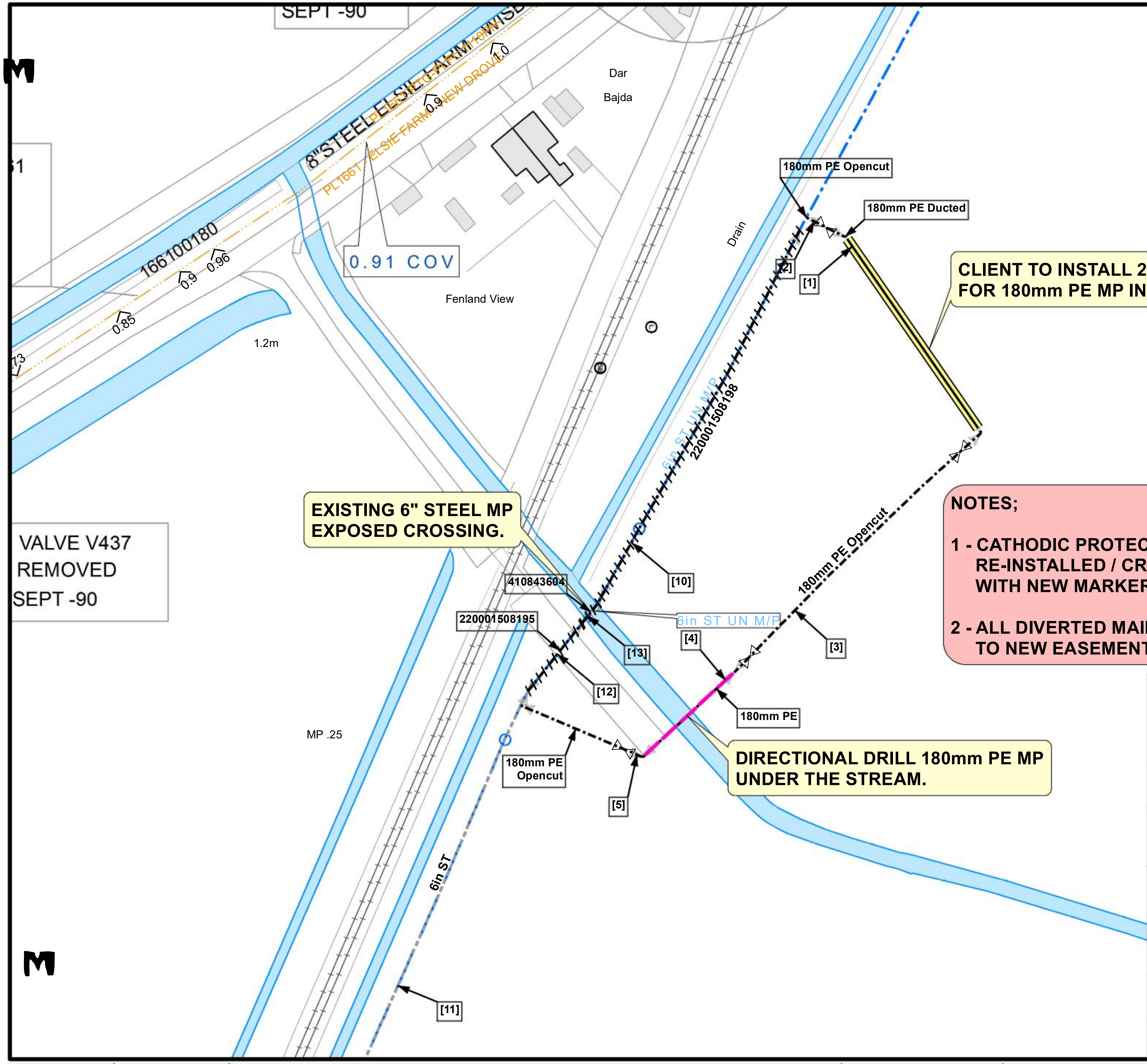
Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 2**

Project Location:
MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP

WARNING! This area contains Gas Mains Operating at Medium Pressure of between 2 and 7 bar. Before excavating in the area contact the Local Network
WARNING! This area contains Gas Mains Operating at High Pressure (in excess of 7 bar) and Intermediate Pressure (between 2 and 7 bar). Before excavating in the area contact the Local Network



CLIENT TO INSTALL 200mm SLEEVE / DUCTING FOR 180mm PE MP INSERTION.

NOTES;

1 - CATHODIC PROTECTION TO BE RE-INSTALLED / CROSS BONDED WITH NEW MARKER POSTS.

2 - ALL DIVERTED MAINS ARE SUBJECT TO NEW EASEMENT AGREEMENTS.

PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS		EXISTING / PROPOSED ASSETS AND SERVICES							
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
10	LONG DROVE	MP Main 220001508198	6in	ST	Abandon	-	81.79	-	-
12	LONG DROVE	MP Main 220001508195	6in	ST	Abandon	-	17.01	-	-
13	LONG DROVE	MP Main 410843604	6in	ST	Abandon	-	6.35	-	-
1	LONG DROVE	MP Main -	180mm	PE	Ducted	-	46.68	-	-
2	LONG DROVE	MP Main -	180mm	PE	Opencut	-	8.46	-	-
3	LONG DROVE	MP Main -	180mm	PE	Opencut	-	67.23	-	-
4	LONG DROVE	MP Main -	180mm	PE	Dirdrill	-	24.56	-	-
5	LONG DROVE	MP Main -	180mm	PE	Opencut	-	25.95	-	-
6	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
7	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
8	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
9	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
			Total Length - **LAY**				172.88	0	0
			Total Length - **ABANDON**				105.15		

SCALE: 1:500 @ A3
USER ID: am009
DATE: 12/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 543987, 304369
Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes: L/P GAS MAIN, M/P GAS MAIN, I/P GAS MAIN, H/P GAS MAIN, N/H/P GAS MAIN

Proposed Pipes: PROPOSED PIPE - LP, PROPOSED PIPE - MP, PROPOSED PIPE - IP, ABANDON - LP, ABANDON - MP, RELAY SERVICE, TRANSFER SERVICE

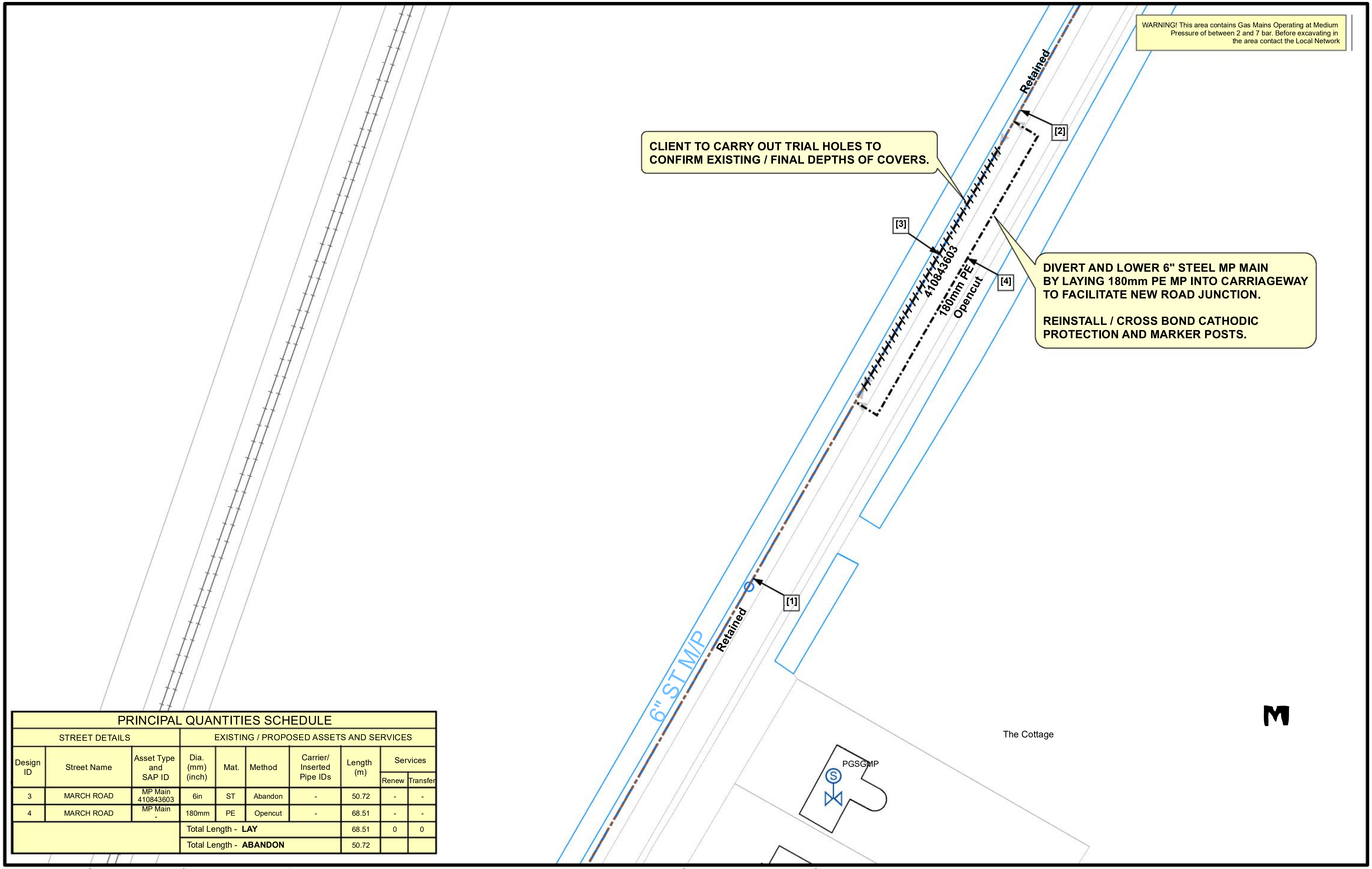
This plan shows those pipes owned by Cadent Gas Ltd in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and any other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 3**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
3	MARCH ROAD	MP Main 410843603	6in	ST	Abandon	-	50.72	-	-
4	MARCH ROAD	MP Main -	180mm	PE	Opencut	-	68.51	-	-
			Total Length - **LAY**				68.51	0	0
			Total Length - **ABANDON**				50.72		

SCALE: 1:500	@ A3
USER ID: am009	
DATE: 13/05/2020	
INTERNAL USE ONLY	
MAP REF:	
CENTRE: 543263, 302596	

Existing Pipes

- L/P GAS MAIN
- M/P GAS MAIN
- I/P GAS MAIN
- H/P GAS MAIN
- N/H/P GAS MAIN

Proposed Pipes

- PROPOSED PIPE - LP
- PROPOSED PIPE - MP
- PROPOSED PIPE - IP
- ABANDON - LP
- ABANDON - MP
- RELAY SERVICE (R)
- TRANSFER SERVICE (T)

Some examples of Plant Items:

Valve · Syphon · Depth of Cover · Change of Dia · Change of Material

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 4**

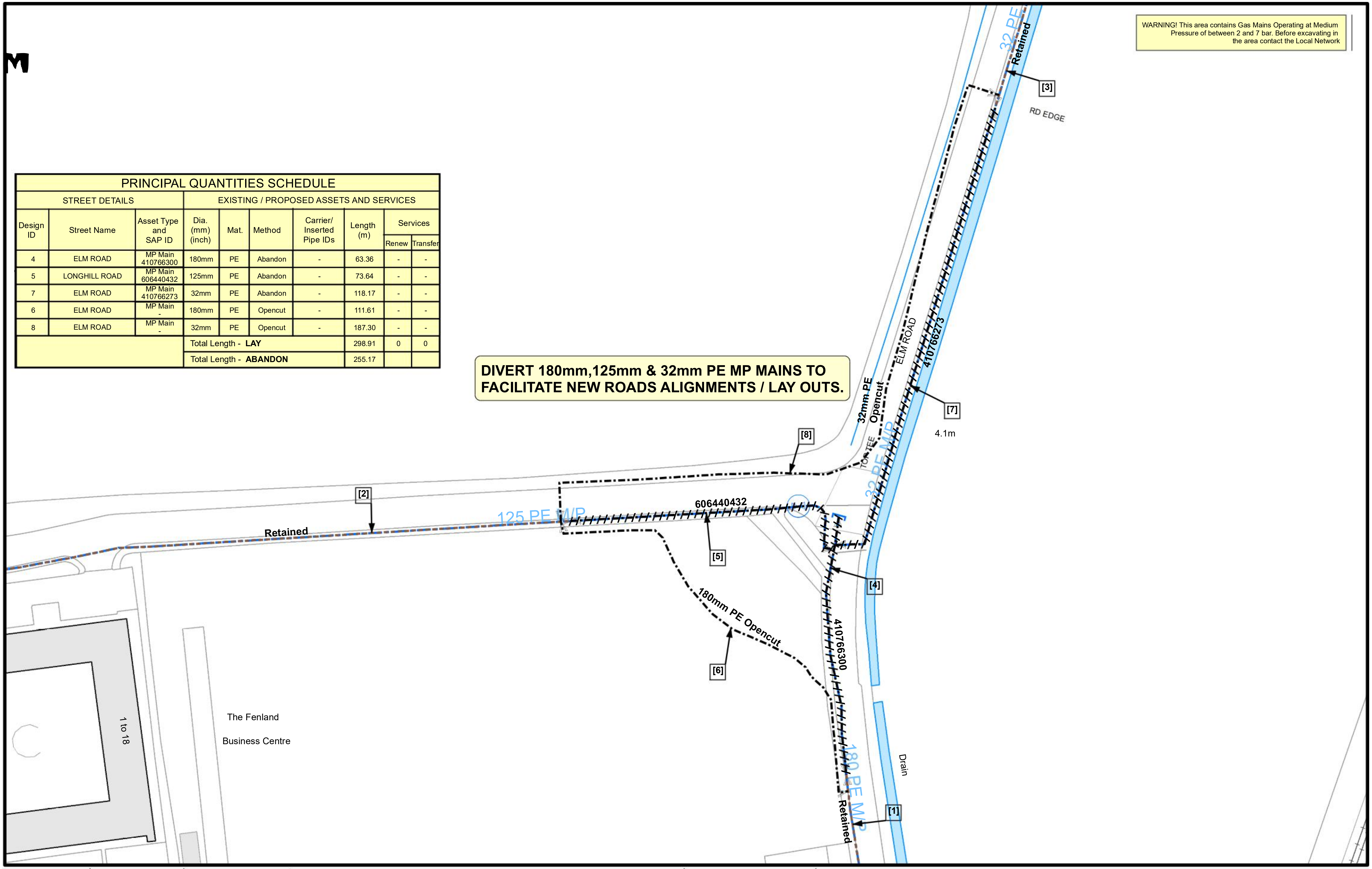
Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**

PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
4	ELM ROAD	MP Main 410766300	180mm	PE	Abandon	-	63.36	-	-
5	LONGHILL ROAD	MP Main 606440432	125mm	PE	Abandon	-	73.64	-	-
7	ELM ROAD	MP Main 410766273	32mm	PE	Abandon	-	118.17	-	-
6	ELM ROAD	MP Main -	180mm	PE	Opencut	-	111.61	-	-
8	ELM ROAD	MP Main -	32mm	PE	Opencut	-	187.30	-	-
			Total Length - **LAY**				298.91	0	0
			Total Length - **ABANDON**				255.17		

DIVERT 180mm,125mm & 32mm PE MP MAINS TO FACILITATE NEW ROADS ALIGNMENTS / LAY OUTS.

WARNING! This area contains Gas Mains Operating at Medium Pressure of between 2 and 7 bar. Before excavating in the area contact the Local Network



SCALE: 1:500	@ A3
USER ID: am009	
DATE: 13/05/2020	
INTERNAL USE ONLY	
MAP REF:	
CENTRE: 541864, 299365	

Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes: L/P GAS MAIN; M/P GAS MAIN; I/P GAS MAIN; H/P GAS MAIN; N/H/P GAS MAIN

Proposed Pipes: PROPOSED PIPE - LP; PROPOSED PIPE - MP; PROPOSED PIPE - IP; ABANDON - LP; ABANDON - MP; RELAY SERVICE; TRANSFER SERVICE

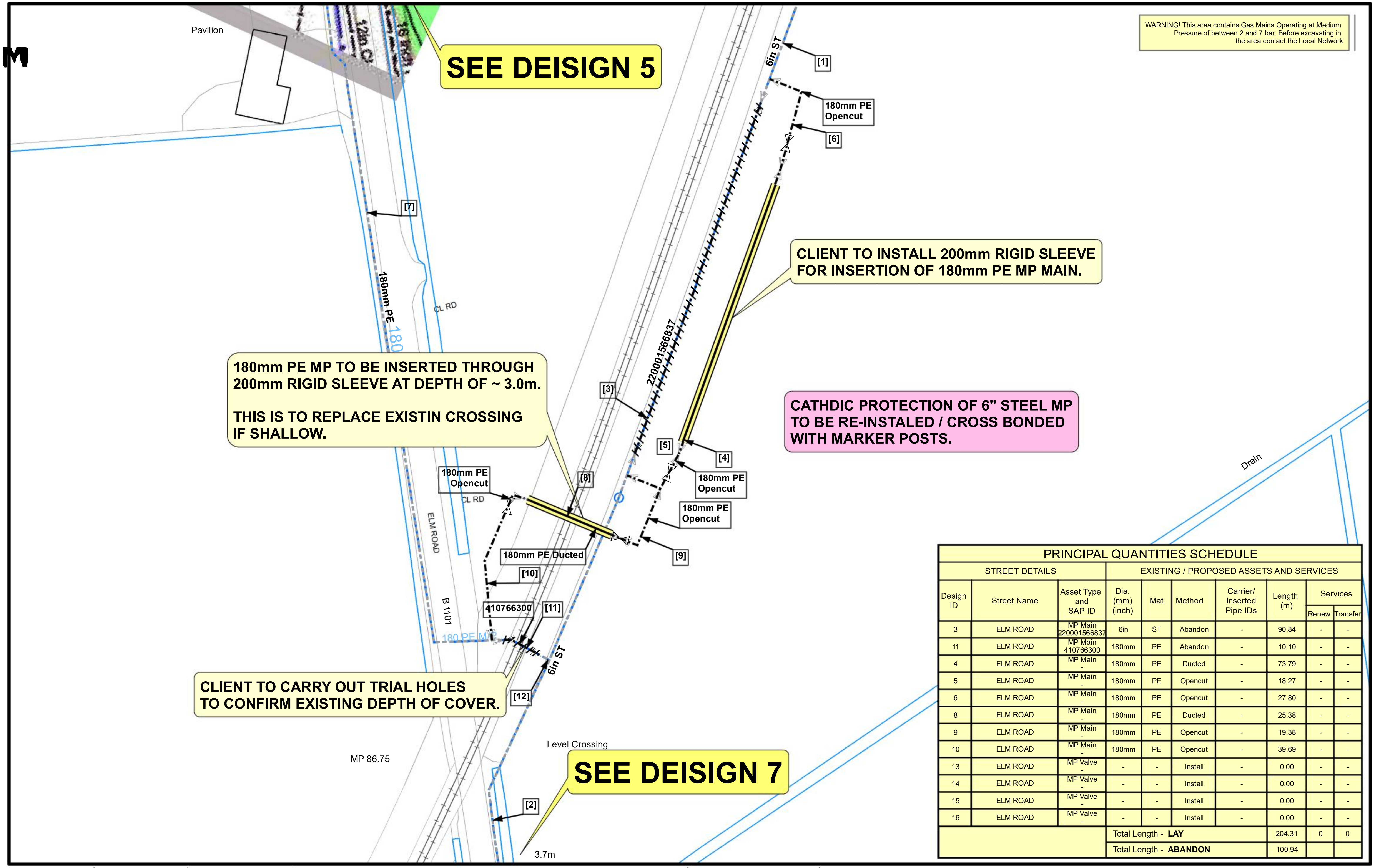
This plan shows those pipes owned by Cadent Gas Ltd in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and any other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 5**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services	
								Renew	Transfer
3	ELM ROAD	MP Main 220001566837	6in	ST	Abandon	-	90.84	-	-
11	ELM ROAD	MP Main 410766300	180mm	PE	Abandon	-	10.10	-	-
4	ELM ROAD	MP Main -	180mm	PE	Ducted	-	73.79	-	-
5	ELM ROAD	MP Main -	180mm	PE	Opencut	-	18.27	-	-
6	ELM ROAD	MP Main -	180mm	PE	Opencut	-	27.80	-	-
8	ELM ROAD	MP Main -	180mm	PE	Ducted	-	25.38	-	-
9	ELM ROAD	MP Main -	180mm	PE	Opencut	-	19.38	-	-
10	ELM ROAD	MP Main -	180mm	PE	Opencut	-	39.69	-	-
13	ELM ROAD	MP Valve -	-	-	Install	-	0.00	-	-
14	ELM ROAD	MP Valve -	-	-	Install	-	0.00	-	-
15	ELM ROAD	MP Valve -	-	-	Install	-	0.00	-	-
16	ELM ROAD	MP Valve -	-	-	Install	-	0.00	-	-
			Total Length - **LAY**				204.31	0	0
			Total Length - **ABANDON**				100.94		

SCALE: 1:500	@ A3
USER ID: am009	
DATE: 14/05/2020	
INTERNAL USE ONLY	
MAP REF:	
CENTRE: 541997, 299114	

Existing Pipes: L/P GAS MAIN; M/P GAS MAIN; I/P GAS MAIN; H/P GAS MAIN; N/H/P GAS MAIN

Proposed Pipes: PROPOSED PIPE - LP; PROPOSED PIPE - MP; PROPOSED PIPE - IP; ABANDON - LP; ABANDON - MP; RELAY SERVICE (R); TRANSFER SERVICE (T)

Some examples of Plant Items: Valve; Syphon; Depth of Cover; Change of Dia; Change of Material

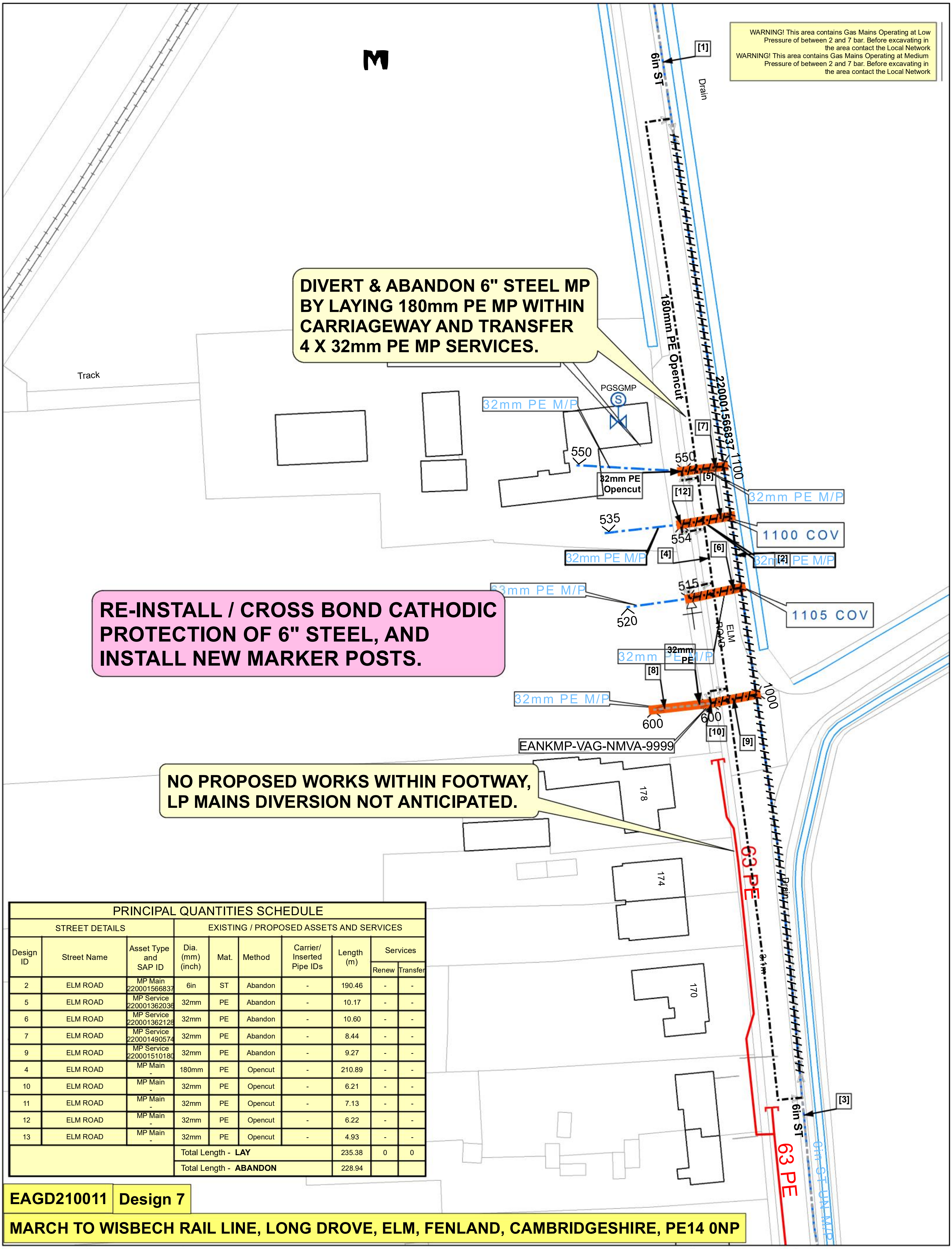
This plan shows those pipes owned by Cadent Gas Ltd in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and any other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 6**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES					Services	
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Renew	Transfer
2	ELM ROAD	MP Main 220001566837	6in	ST	Abandon	-	190.46	-	-
5	ELM ROAD	MP Service 220001362036	32mm	PE	Abandon	-	10.17	-	-
6	ELM ROAD	MP Service 220001362128	32mm	PE	Abandon	-	10.60	-	-
7	ELM ROAD	MP Service 220001490574	32mm	PE	Abandon	-	8.44	-	-
9	ELM ROAD	MP Service 220001510180	32mm	PE	Abandon	-	9.27	-	-
4	ELM ROAD	MP Main -	180mm	PE	Opencut	-	210.89	-	-
10	ELM ROAD	MP Main -	32mm	PE	Opencut	-	6.21	-	-
11	ELM ROAD	MP Main -	32mm	PE	Opencut	-	7.13	-	-
12	ELM ROAD	MP Main -	32mm	PE	Opencut	-	6.22	-	-
13	ELM ROAD	MP Main -	32mm	PE	Opencut	-	4.93	-	-
			Total Length - **LAY**				235.38	0	0
			Total Length - **ABANDON**				228.94		

EAGD210011 **Design 7**

MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP

SCALE: 1:650 @ A3
USER ID: am009
DATE: 19/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 541931, 298778
Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

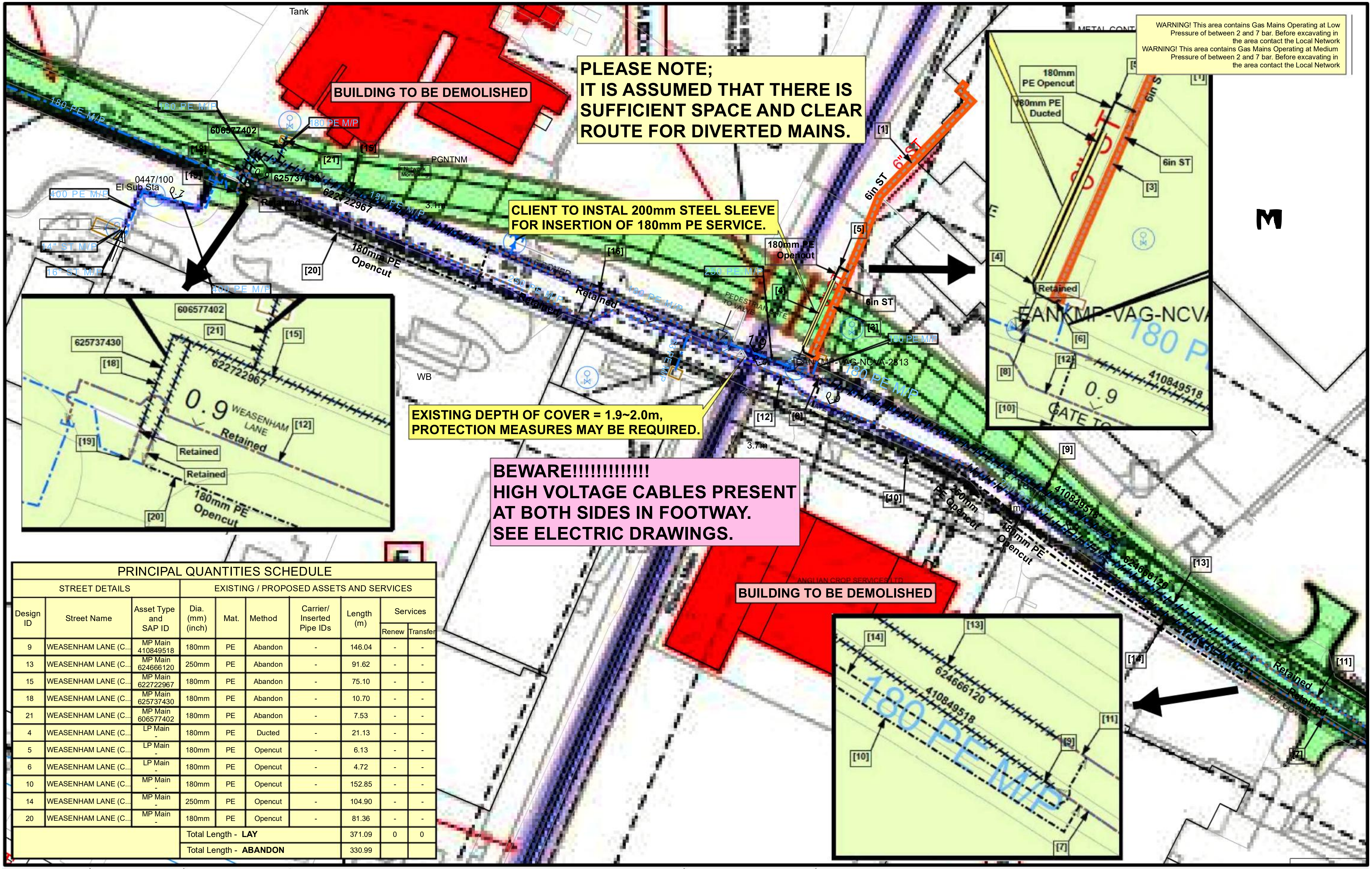
Existing Pipes: L/P GAS MAIN, M/P GAS MAIN, I/P GAS MAIN, H/P GAS MAIN, N/H/P GAS MAIN

Proposed Pipes: PROPOSED PIPE - LP, PROPOSED PIPE - MP, PROPOSED PIPE - IP, ABANDON - LP, ABANDON - MP, RELAY SERVICE, TRANSFER SERVICE

This plan shows those pipes owned by Cadent gas in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent gas or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and any other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**
Project and Drawing Ref:
Project Location:



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
9	WEASENHAM LANE (C...	MP Main 410849518	180mm	PE	Abandon	-	146.04	-	-
13	WEASENHAM LANE (C...	MP Main 624666120	250mm	PE	Abandon	-	91.62	-	-
15	WEASENHAM LANE (C...	MP Main 622722967	180mm	PE	Abandon	-	75.10	-	-
18	WEASENHAM LANE (C...	MP Main 625737430	180mm	PE	Abandon	-	10.70	-	-
21	WEASENHAM LANE (C...	MP Main 606577402	180mm	PE	Abandon	-	7.53	-	-
4	WEASENHAM LANE (C...	LP Main -	180mm	PE	Ducted	-	21.13	-	-
5	WEASENHAM LANE (C...	LP Main -	180mm	PE	Opencut	-	6.13	-	-
6	WEASENHAM LANE (C...	LP Main -	180mm	PE	Opencut	-	4.72	-	-
10	WEASENHAM LANE (C...	MP Main -	180mm	PE	Opencut	-	152.85	-	-
14	WEASENHAM LANE (C...	MP Main -	250mm	PE	Opencut	-	104.90	-	-
20	WEASENHAM LANE (C...	MP Main -	180mm	PE	Opencut	-	81.36	-	-
			Total Length - **LAY**				371.09	0	0
			Total Length - **ABANDON**				330.99		

SCALE: 1:500 @ A3
USER ID: am009
DATE: 07/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 545746, 308615

Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes
- L/P GAS MAIN
- M/P GAS MAIN
- I/P GAS MAIN
- H/P GAS MAIN
- N/H/P GAS MAIN

Proposed Pipes
- PROPOSED PIPE - LP
- PROPOSED PIPE - MP
- PROPOSED PIPE - IP
- ABANDON - LP
- ABANDON - MP
- RELAY SERVICE (R)
- TRANSFER SERVICE (T)

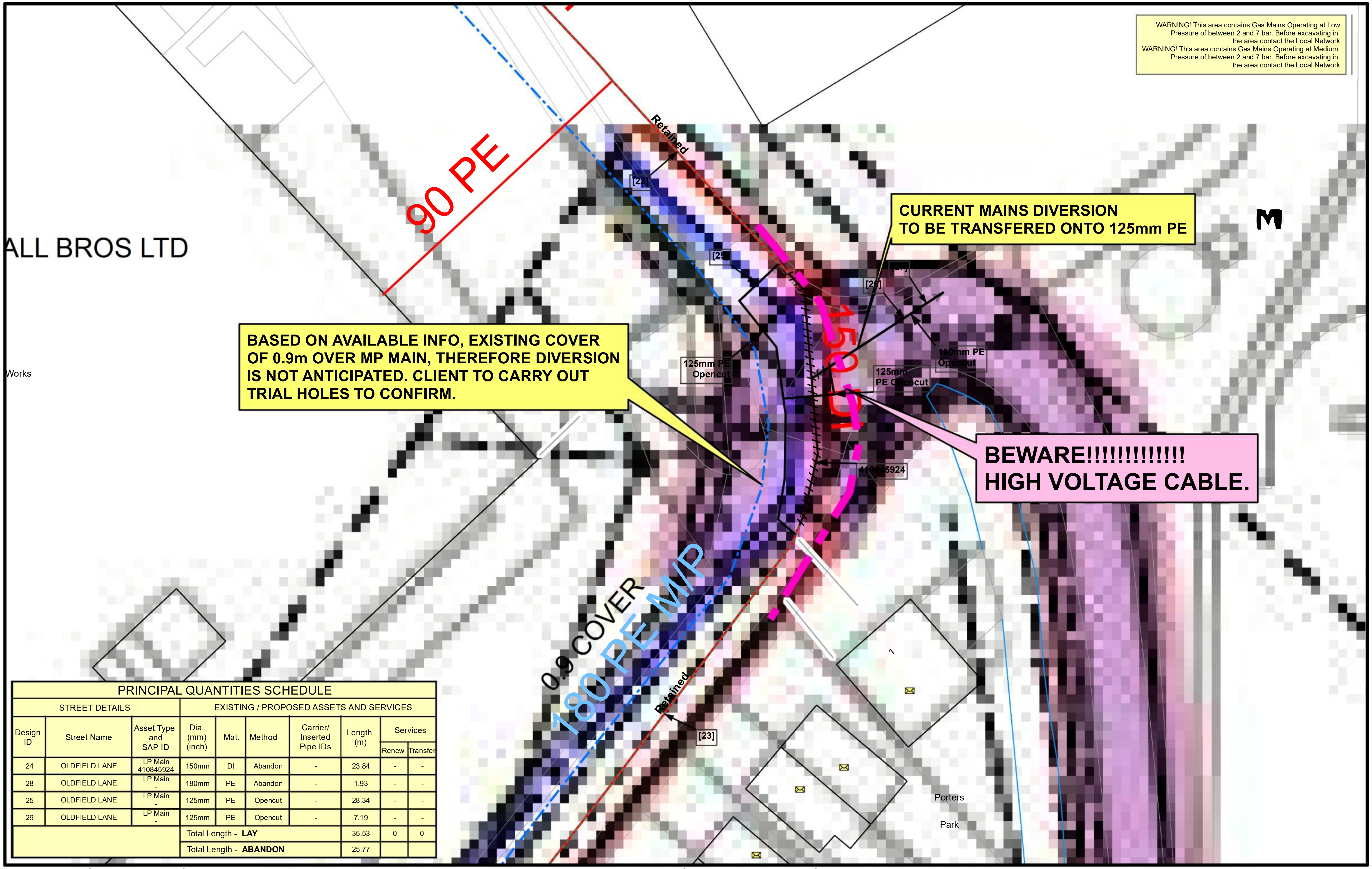
This plan shows those pipes owned by Cadent Gas Ltd in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and any other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 1A**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE										
STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES							
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
24	OLDFIELD LANE	LP Main 410845924	150mm	DI	Abandon	-	23.84	-	-
28	OLDFIELD LANE	LP Main -	180mm	PE	Abandon	-	1.93	-	-
25	OLDFIELD LANE	LP Main -	125mm	PE	Opencut	-	28.34	-	-
29	OLDFIELD LANE	LP Main -	125mm	PE	Opencut	-	7.19	-	-
			Total Length - **LAY**				35.53	0	0
			Total Length - **ABANDON**				25.77		

SCALE: 1:500 @ A3
USER ID: am009
DATE: 07/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 545822, 309132

Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes
- L/P GAS MAIN
- M/P GAS MAIN
- I/P GAS MAIN
- H/P GAS MAIN
- N/H/P GAS MAIN

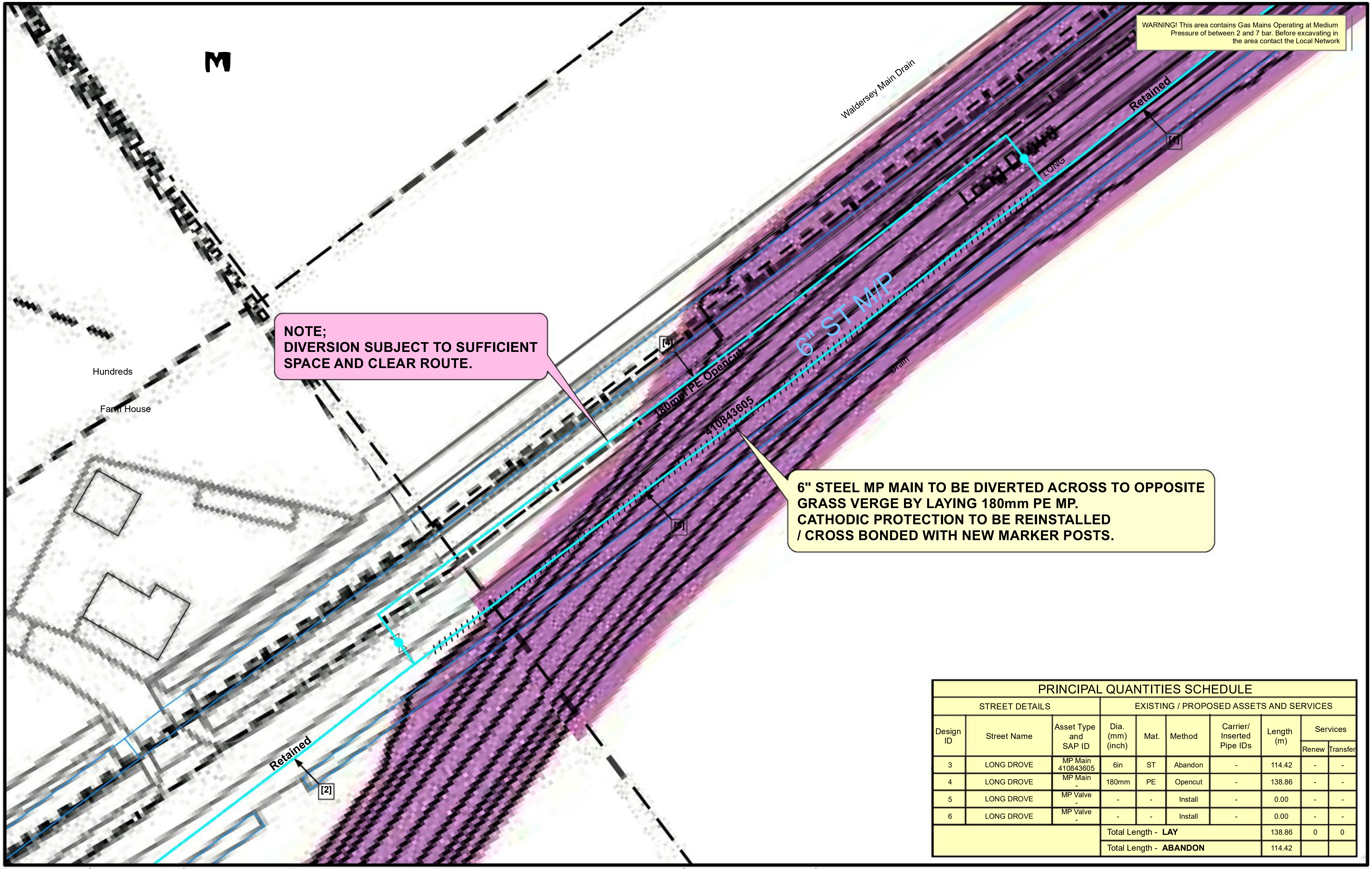
Proposed Pipes
- PROPOSED PIPE - LP
- PROPOSED PIPE - MP
- PROPOSED PIPE - IP
- ABANDON - LP
- ABANDON - MP
- RELAY SERVICE
- TRANSFER SERVICE

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 1B**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services: Renew	Services: Transfer
3	LONG DROVE	MP Main 410843605	6in	ST	Abandon	-	114.42	-	-
4	LONG DROVE	MP Main -	180mm	PE	Opencut	-	138.86	-	-
5	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
6	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
			Total Length - **LAY**				138.86	0	0
			Total Length - **ABANDON**				114.42		

SCALE:	1:500 @ A3
USER ID:	am009
DATE:	12/05/2020
INTERNAL USE ONLY	
MAP REF:	
CENTRE:	544285, 304736

Existing Pipes
- L/P GAS MAIN
- M/P GAS MAIN
- I/P GAS MAIN
- H/P GAS MAIN
- N/H/P GAS MAIN

Proposed Pipes
- PROPOSED PIPE - LP
- PROPOSED PIPE - MP
- PROPOSED PIPE - IP
- ABANDON - LP
- ABANDON - MP
- RELAY SERVICE
- TRANSFER SERVICE

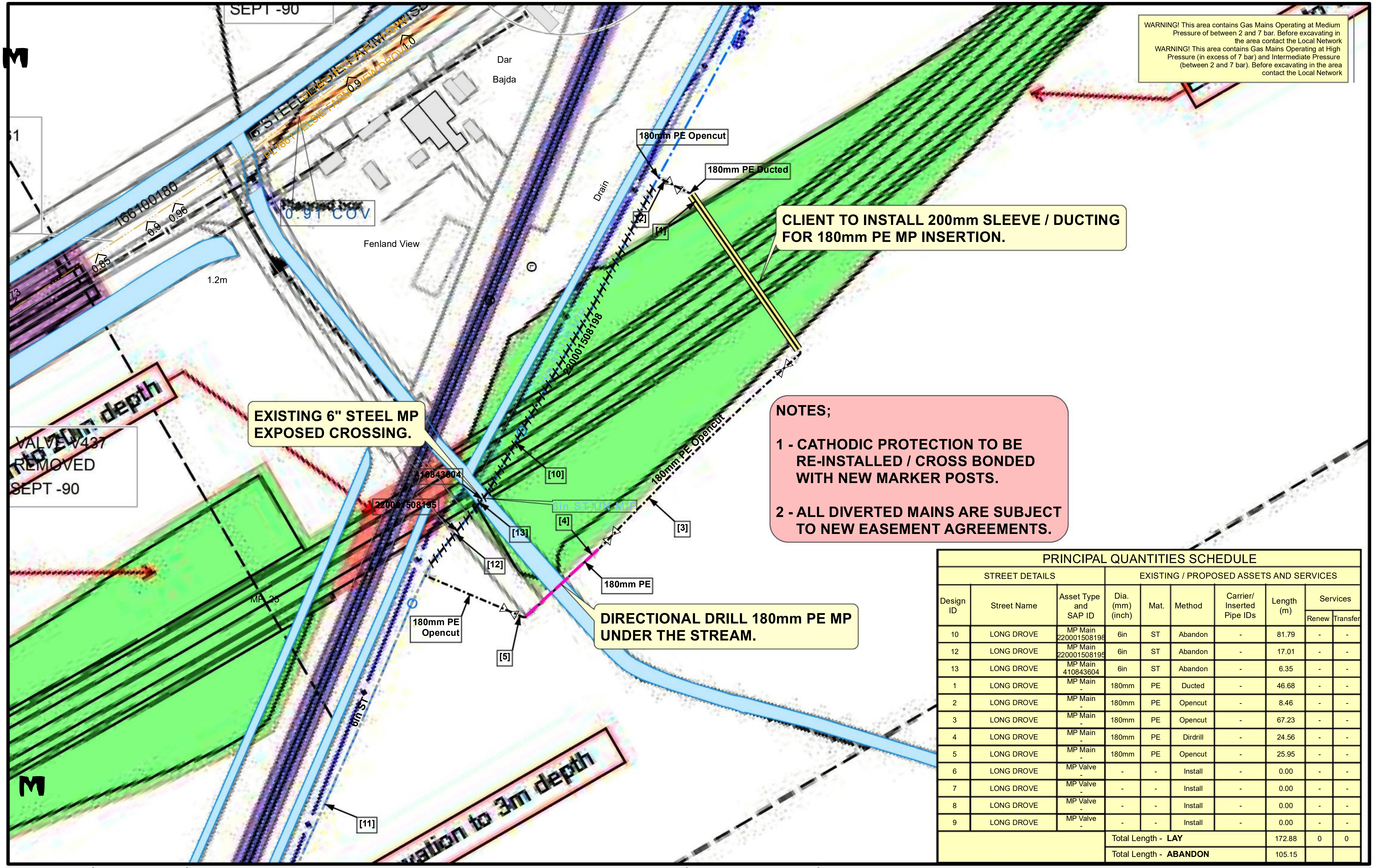
Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 2**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE										
STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES							
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services	
								Renew	Transfer
10	LONG DROVE	MP Main 220001508198	6in	ST	Abandon	-	81.79	-	-
12	LONG DROVE	MP Main 220001508195	6in	ST	Abandon	-	17.01	-	-
13	LONG DROVE	MP Main 410843604	6in	ST	Abandon	-	6.35	-	-
1	LONG DROVE	MP Main -	180mm	PE	Ducted	-	46.68	-	-
2	LONG DROVE	MP Main -	180mm	PE	Opencut	-	8.46	-	-
3	LONG DROVE	MP Main -	180mm	PE	Opencut	-	67.23	-	-
4	LONG DROVE	MP Main -	180mm	PE	Dirdrill	-	24.56	-	-
5	LONG DROVE	MP Main -	180mm	PE	Opencut	-	25.95	-	-
6	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
7	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
8	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
9	LONG DROVE	MP Valve -	-	-	Install	-	0.00	-	-
			Total Length - **LAY**				172.88	0	0
			Total Length - **ABANDON**				105.15		

SCALE: 1:500	@ A3
USER ID: am009	
DATE: 12/05/2020	
INTERNAL USE ONLY	
MAP REF:	
CENTRE: 543987, 304369	

Existing Pipes

- L/P GAS MAIN
- M/P GAS MAIN
- I/P GAS MAIN
- H/P GAS MAIN
- N/H/P GAS MAIN

Proposed Pipes

- PROPOSED PIPE - LP
- PROPOSED PIPE - MP
- PROPOSED PIPE - IP
- ABANDON - LP
- ABANDON - MP
- RELAY SERVICE (R)
- TRANSFER SERVICE (T)

Some examples of Plant Items:

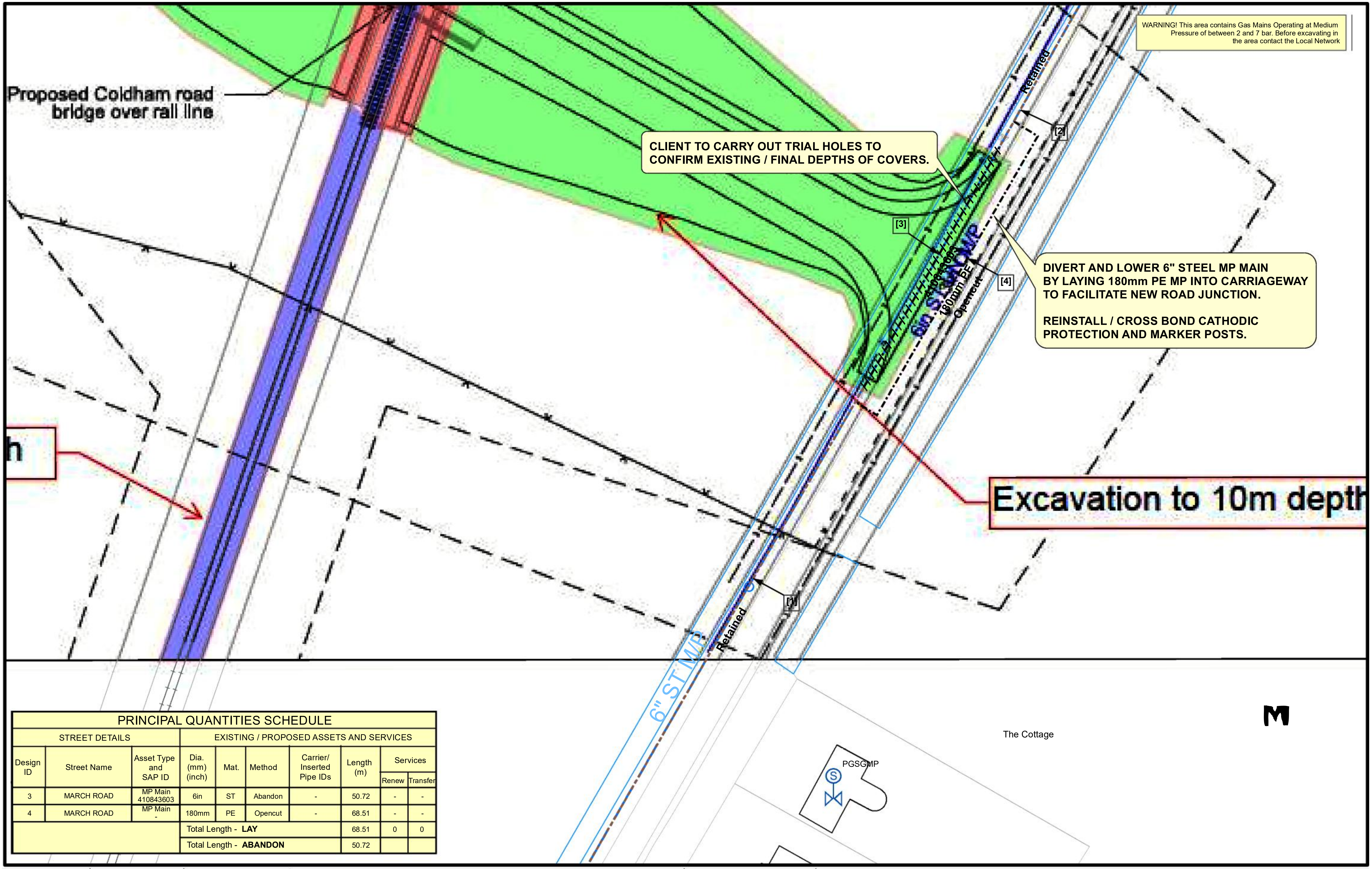
Valve · Syphon · Depth of Cover · Change of Dia · Change of Material

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 3**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
3	MARCH ROAD	MP Main 410843603	6in	ST	Abandon	-	50.72	-	-
4	MARCH ROAD	MP Main -	180mm	PE	Opencut	-	68.51	-	-
			Total Length - **LAY**				68.51	0	0
			Total Length - **ABANDON**				50.72		

SCALE: 1:500 @ A3
USER ID: am009
DATE: 13/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 543263, 302596

Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes: L/P GAS MAIN, M/P GAS MAIN, I/P GAS MAIN, H/P GAS MAIN, N/H/P GAS MAIN

Proposed Pipes: PROPOSED PIPE - LP, PROPOSED PIPE - MP, PROPOSED PIPE - IP, ABANDON - LP, ABANDON - MP, RELAY SERVICE, TRANSFER SERVICE

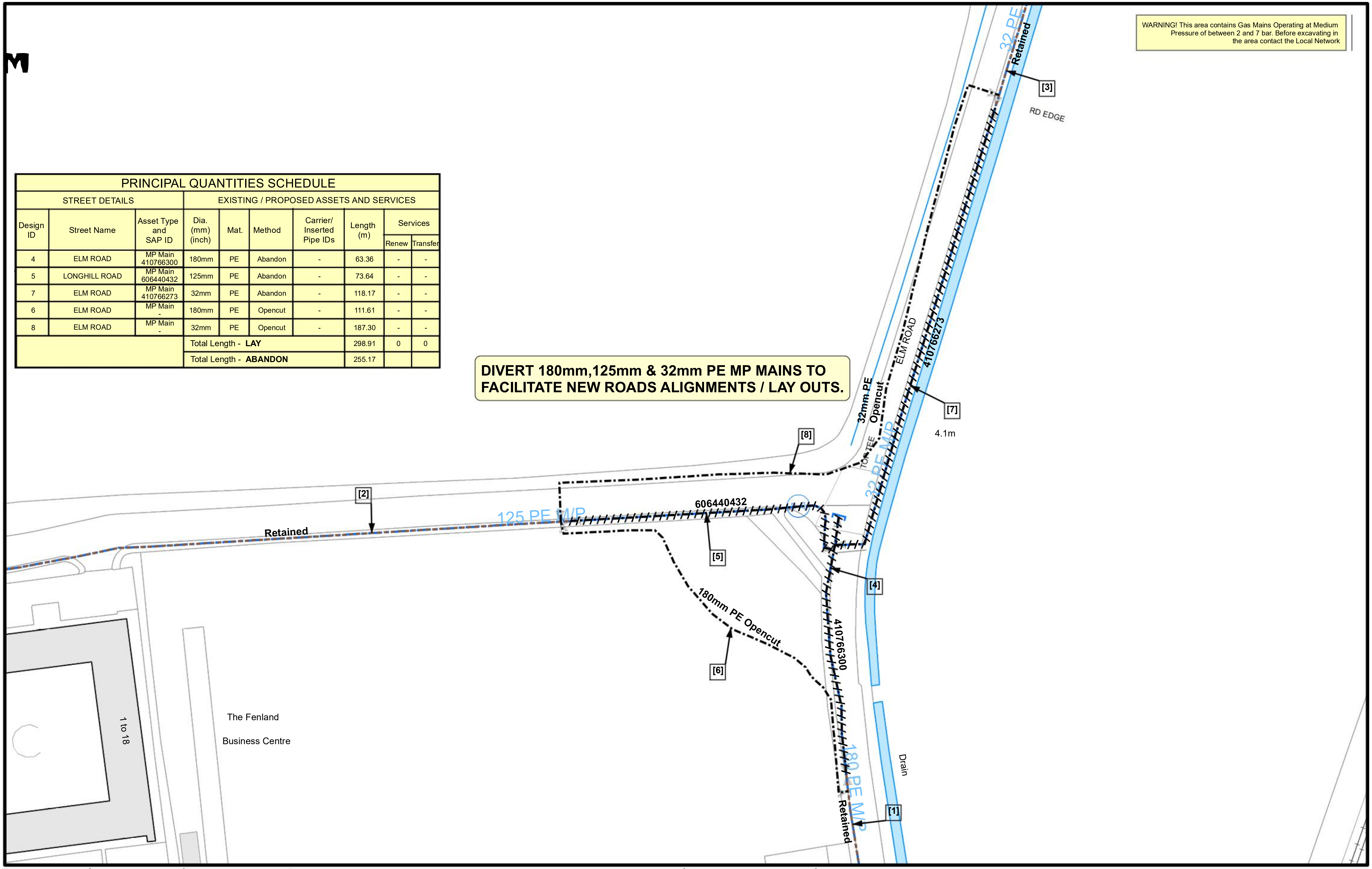
This plan shows those pipes owned by Cadent Gas Ltd in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent Gas Ltd or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and any other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 4**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE

STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES						
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
4	ELM ROAD	MP Main 410766300	180mm	PE	Abandon	-	63.36	-	-
5	LONGHILL ROAD	MP Main 606440432	125mm	PE	Abandon	-	73.64	-	-
7	ELM ROAD	MP Main 410766273	32mm	PE	Abandon	-	118.17	-	-
6	ELM ROAD	MP Main -	180mm	PE	Opencut	-	111.61	-	-
8	ELM ROAD	MP Main -	32mm	PE	Opencut	-	187.30	-	-
			Total Length - **LAY**				298.91	0	0
			Total Length - **ABANDON**				255.17		

SCALE: 1:500 @ A3	
USER ID: am009	
DATE: 13/05/2020	
INTERNAL USE ONLY	
MAP REF:	
CENTRE: 541864, 299365	

Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes
- L/P GAS MAIN
- M/P GAS MAIN
- I/P GAS MAIN
- H/P GAS MAIN
- N/H/P GAS MAIN

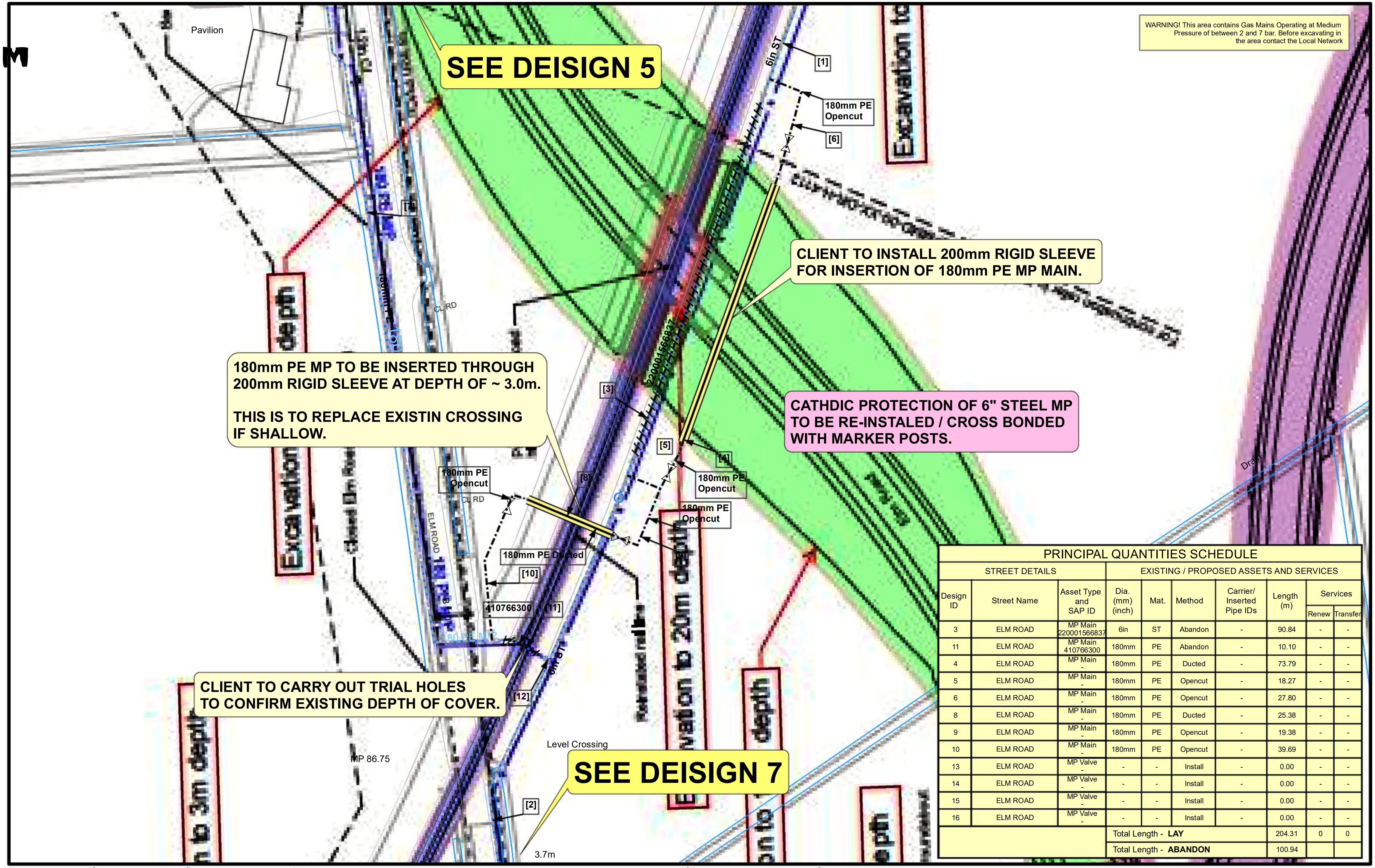
Proposed Pipes
- PROPOSED PIPE - LP
- PROPOSED PIPE - MP
- PROPOSED PIPE - IP
- ABANDON - LP
- ABANDON - MP
- RELAY SERVICE (R)
- TRANSFER SERVICE (T)

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 5**

Project Location:
MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP



PRINCIPAL QUANTITIES SCHEDULE										
STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES							
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services	
								Renew	Transfer
3	ELM ROAD	MP Main 220001566837	6in	ST	Abandon	-	90.84	-	-
11	ELM ROAD	MP Main 410766300	180mm	PE	Abandon	-	10.10	-	-
4	ELM ROAD	MP Main -	180mm	PE	Ducted	-	73.79	-	-
5	ELM ROAD	MP Main -	180mm	PE	Opencut	-	18.27	-	-
6	ELM ROAD	MP Main -	180mm	PE	Opencut	-	27.80	-	-
8	ELM ROAD	MP Main -	180mm	PE	Ducted	-	25.38	-	-
9	ELM ROAD	MP Main -	180mm	PE	Opencut	-	19.38	-	-
10	ELM ROAD	MP Main -	180mm	PE	Opencut	-	39.69	-	-
13	ELM ROAD	MP Valve -	-	-	Install	-	0.00	-	-
14	ELM ROAD	MP Valve -	-	-	Install	-	0.00	-	-
15	ELM ROAD	MP Valve -	-	-	Install	-	0.00	-	-
16	ELM ROAD	MP Valve -	-	-	Install	-	0.00	-	-
			Total Length - **LAY**				204.31	0	0
			Total Length - **ABANDON**				100.94		

SCALE: 1:500 @ A3
USER ID: am009
DATE: 14/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 541997, 299114

Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes: L/P GAS MAIN, M/P GAS MAIN, I/P GAS MAIN, H/P GAS MAIN, N/H/P GAS MAIN

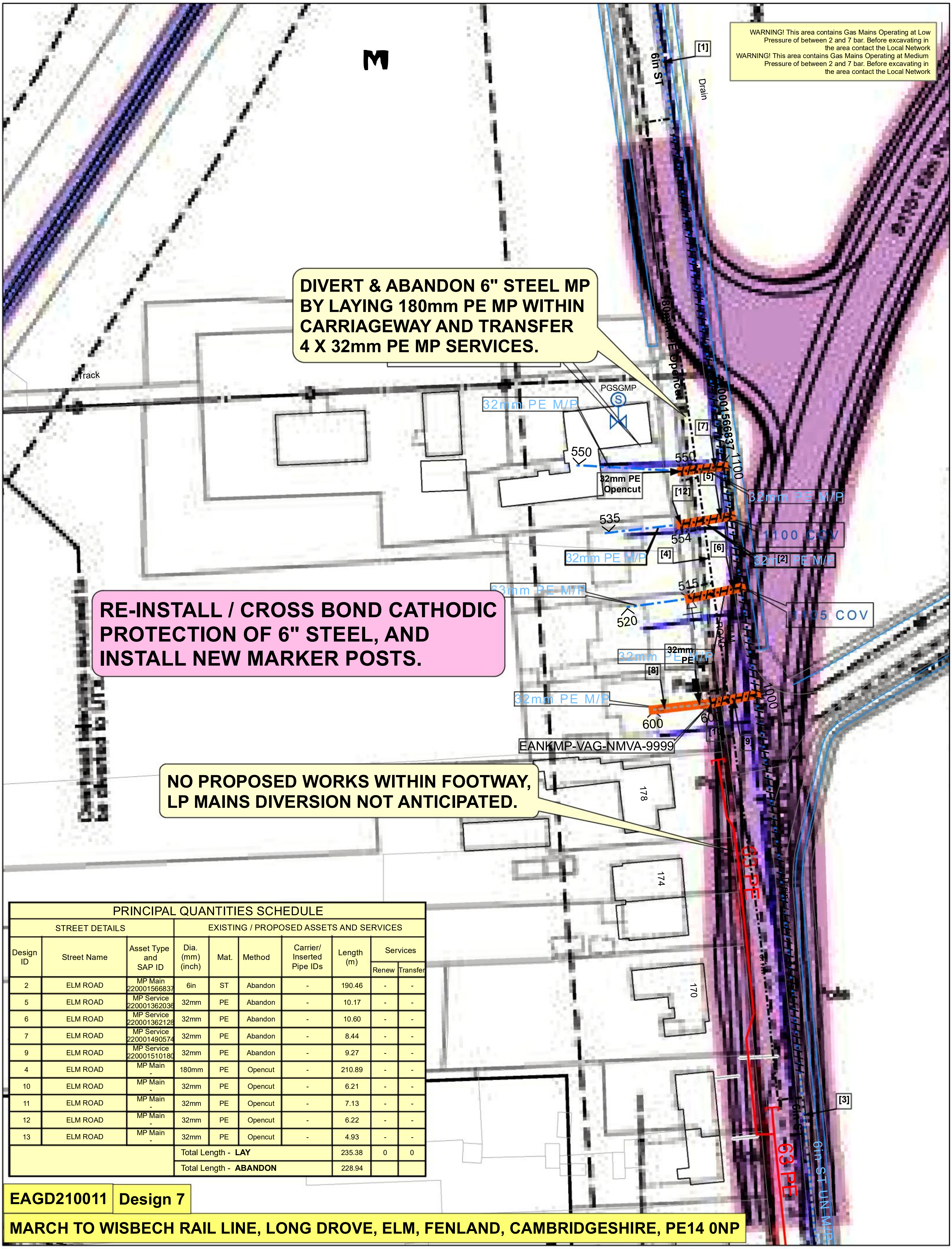
Proposed Pipes: PROPOSED PIPE - LP, PROPOSED PIPE - MP, PROPOSED PIPE - IP, ABANDON - LP, ABANDON - MP, RELAY SERVICE (R), TRANSFER SERVICE (T)

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**

Project and Drawing Ref: **EAGD210011 Design 6**

Project Location: **MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP**



PRINCIPAL QUANTITIES SCHEDULE										
STREET DETAILS			EXISTING / PROPOSED ASSETS AND SERVICES							
Design ID	Street Name	Asset Type and SAP ID	Dia. (mm) (inch)	Mat.	Method	Carrier/ Inserted Pipe IDs	Length (m)	Services Renew	Services Transfer
2	ELM ROAD	MP Main 220001566837	6in	ST	Abandon	-	190.46	-	-
5	ELM ROAD	MP Service 220001362036	32mm	PE	Abandon	-	10.17	-	-
6	ELM ROAD	MP Service 220001362128	32mm	PE	Abandon	-	10.60	-	-
7	ELM ROAD	MP Service 220001490574	32mm	PE	Abandon	-	8.44	-	-
9	ELM ROAD	MP Service 220001510180	32mm	PE	Abandon	-	9.27	-	-
4	ELM ROAD	MP Main -	180mm	PE	Opencut	-	210.89	-	-
10	ELM ROAD	MP Main -	32mm	PE	Opencut	-	6.21	-	-
11	ELM ROAD	MP Main -	32mm	PE	Opencut	-	7.13	-	-
12	ELM ROAD	MP Main -	32mm	PE	Opencut	-	6.22	-	-
13	ELM ROAD	MP Main -	32mm	PE	Opencut	-	4.93	-	-
			Total Length - **LAY**				235.38	0	0
			Total Length - **ABANDON**				228.94		

EAGD210011 **Design 7**

MARCH TO WISBECH RAIL LINE, LONG DROVE, ELM, FENLAND, CAMBRIDGESHIRE, PE14 0NP

SCALE: 1:650 @A3
USER ID: am009
DATE: 19/05/2020
INTERNAL USE ONLY
MAP REF:
CENTRE: 541931, 298778
Some examples of Plant Items: Valve, Syphon, Depth of Cover, Change of Dia, Change of Material

Existing Pipes: L/P GAS MAIN, M/P GAS MAIN, I/P GAS MAIN, H/P GAS MAIN, N/H/P GAS MAIN

Proposed Pipes: PROPOSED PIPE - LP, PROPOSED PIPE - MP, PROPOSED PIPE - IP, ABANDON - LP, ABANDON - MP, RELAY SERVICE, TRANSFER SERVICE

This plan shows those pipes owned by Cadent gas in its role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guranteed. Service pipes, valves, syphons, stub connections, etc., are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Cadent gas or their agents, servants or contractors for any error or omission. Safe digging practices, inaccordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and any other apparatus on site before any mechanical plant is used. It is your responsability to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Cadent
Your Gas Network

Work Type: **MAINS DIVERSIONS**
Project and Drawing Ref:
Project Location:

W.3 Openreach

openreach

Mott MacDonald
Mott MacDonald House
8-10 Sydenham Road
Croyden
CR20 2EE

FAO: Naomi Ward

Our Ref: W3/830218/20

5th February 2020 **Your Ref:**

Dear Sir

NEW ROADS AND STREET WORKS ACT 1991
DRAFT SCHEME AND BUDGET ESTIMATES

Appendix C3 of the Code of Practice
'Measures Necessary Where Apparatus Is Affected By Major Works
(Diversionary Works)'

Scheme Title	MARCH TO WISBECH RAILWAY
Location of Works	OR4
OS Grid Ref	Various
Road No/Street Name	Various
From	Wisbech
To	March
Description of Works	Rail Project
Expected Start Date	TBA
Expected Completion Date	TBA

Thank you for your draft scheme dated 31st January 2020 and copy of your drawing numbered .

It would appear from your proposals that alterations to our existing Openreach apparatus may be necessary.

I am returning a copy of your drawing marked up showing approximate positions of Openreach apparatus and our preliminary assessment of diversionary works necessary as a consequence of the scheme.

Trevor C Garrod
Repayment Projects Engineer

Repayments (Alterations)
ppW3 Telephone House,
Wentworth Street,
Peterborough
PE1 1BA

tel 0121 498 8075
fax 01733 343708
mob 07802 193601
Web https://www.openreach.co.uk
email trevor.garrod@openreach.co.uk

As requested a budget estimate of the possible cost of diverting our apparatus is attached It includes all direct costs and overheads likely to arise It is stressed that this is a budgetary figure and only intended as a guide, the actual amount could be significantly different (see form C3 Appendix G)

Prior to any works involving Openreach apparatus, we must agree a Specification and provide a Detailed Estimate of costs to the Principal or Promoter of this project The costs incurred in producing the Specification and Detailed Estimate are chargeable and for this scheme are estimated to be £76,140 00 excluding VAT The charge applies whether or not your works proceed to execution Your order, for the estimated cost of the design work, will be required before any works proceed on this scheme

None of the materials required has a lead time of greater than three months and therefore advance ordering should not be required

Notification to Openreach customers of circuit downtime will be required The normal arrangement period for this notification is 3 months

All orders and payments should be forwarded to me at the address shown below Please note that the order/letter should not have the words 'quote' or 'quotation' in them as we are providing you with an estimate of the possible works involved In addition, the order should not have any conditions attached to it If conditions are on the order please enclose a letter stating that these conditions do not apply to Openreach, as we have a statutory right to protect/divert our plant, and are therefore not acting as your sub-contractor

We offer a free site visit service to locate and mark the position of Openreach apparatus within your work area To arrange a site visit from a Network Protection Team call Fax Email cbyd@openreach co uk

For further information on this service please visit the following URL http //www ournetwork openreach co uk/locating-our-network/letting-us-know-about-streetworks aspx

Please be aware that any duct and poles owned and controlled by Openreach can be used by third party Communications Providers (CP) for the installation of their cables and apparatus if they have a contract with us for our Physical Infrastructure Access (PIA) product The CP must, however, place an order with us for PIA before they install their cables or apparatus If such CP cables or apparatus are identified in our network within your area of interest, I will identify a contact for the affected CP and advise them of your proposals I will pass these contact details on to you and liaise with the CP so that they are aware of any diversionary requirements relating to your proposals You will be contacted directly by the affected third party CP - they will advise you of any associated chargeable costs relating to their cable and apparatus diversions If you have any queries or concerns relating to this aspect of the Openreach operated network, please don't hesitate in contacting me Please note Openreach Limited will not be held liable for any delays, costs, losses or damage caused by the third party CP

Please note that no further action will be taken on this enquiry until we receive the appropriate notification of the Detailed Scheme from the promoting authority in accordance with Appendix C4 of the Code of Practice If you are not the promoting authority but will be acting as his Agent and deal with notices etc , then confirmation of this will be required, in writing, from the promoting authority (see Section 2 1)

Yours faithfully

[redacted]

Trevor C Garrod
Repayment Projects Engineer

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rebuild

Trevor C Garrod
Repayment Projects Engineer

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C3 BUDGET ESTIMATE		
NRSWA 1991: A CODE OF PRACTICE	**HA Ref No**	
'MEASURES NECESSARY WHERE APPARATUS IS AFFECTED BY MAJOR WORKS (DIVERSIONARY WORKS)'	(to be quoted in all correspondence)	
	Undertaker Ref	W3/830218/20
HA Name and Address	(to be quoted in all correspondence)	
Mott MacDonald Mott MacDonald House 8-10 Sydenham Road Croyden CR20 2EE	**Date of Estimate**	5th February 2020
Undertaker	Openreach	
Scheme	MARCH TO WISBECH RAILWAY	
Diversion Description	Diverting Openreach apparatus	
Budget Estimate Summary (Net of any discount/s)		
Direct Costs Inc overheads @ 84.85%	£254,146.00	
Contract Costs Inc overheads @ 40.51%	£383,900.59	
Stores Inc overheads @ 39.67%	£54,112.66	
Budget Estimate Project Cost	£692,159.25 excluding VAT	
Anticipated Duration	8 months	
Lead Times (Refer to Code)	12 weeks	
Is Design/Survey Work Required	Yes	
Anticipated cost of Design/Survey Work	£76,140.00 excluding VAT	
Possibility of		
Deferment of Renewal	No	
Betterment	No	
Materials Recovered	Yes	

Trevor C Garrod
Repayment Projects Engineer

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Web https://www.openreach.co.uk
email trevor.garrod@openreach.co.uk

Network Alterations Diversionary Works Payment Details

Please forward your order (free from contractual conditions) and the estimated sum of £91,368 00 (including VAT)

There are two ways to pay

1 By Cheque
- This is our preferred method of payment
- Please make cheques payable to **British Telecommunications Plc**
- Send your cheque with your order / letter of authorisation to proceed with the works to the Project Engineer shown below (order not to contain contractual conditions)
- Write your cheque number here ____________________
- Write the cheque amount here £__________

2 Using Bank Automated Clearing Services (BACS)
When your order / letter of authorisation to proceed with the works has been received an invoice for payment will be returned with the necessary BACS payment details

Please quote the Openreach reference number / invoice number otherwise payment may not be allocated to your job.

N.B. For either method of payment please complete this form and return with your order / letter of authorisation to the Project Engineer, address below. Please remember, however you pay, the works will not commence until this form and your payment have been received.

Title/Location of Work	MARCH TO WISBECH RAILWAY, OR4
Project Engineer Name	Trevor C Garrod
Postal Address	ppW3 Telephone House,, Wentworth Street,, Peterborough, PE1 1BA
Openreach Reference	W3/830218/20
Company Name	Mott MacDonald
Client Contact	Naomi Ward
Client Tel	020 8774 2989

For advice or assistance in completing this form please call Jane Goodison 0131 345 0016 for all other enquiries contact Trevor Garrod 0121 498 8075
Our VAT number is **245719348**

Trevor C Garrod
Repayment Projects Engineer

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rebuild

Legend

CAUTION AREA
BT CAUTION_AREA

EQUIPMENT
TABCD FIBRE, TCODE

COPPER, CABINET

476R COPPER, DP

DUCT
A/C AERIAL

TUNNEL

DUCT

PROPOSED
A/C AERIAL

DUCT

STRUCTURE
YCODE

CABINET SHELL

SPLIT COUPLING

POLE

KIOSKS

MANHOLE

JOINTBOX

CHANGE OF STATE

DUCT TEE

PROPOSED
MANHOLE

JOINTBOX

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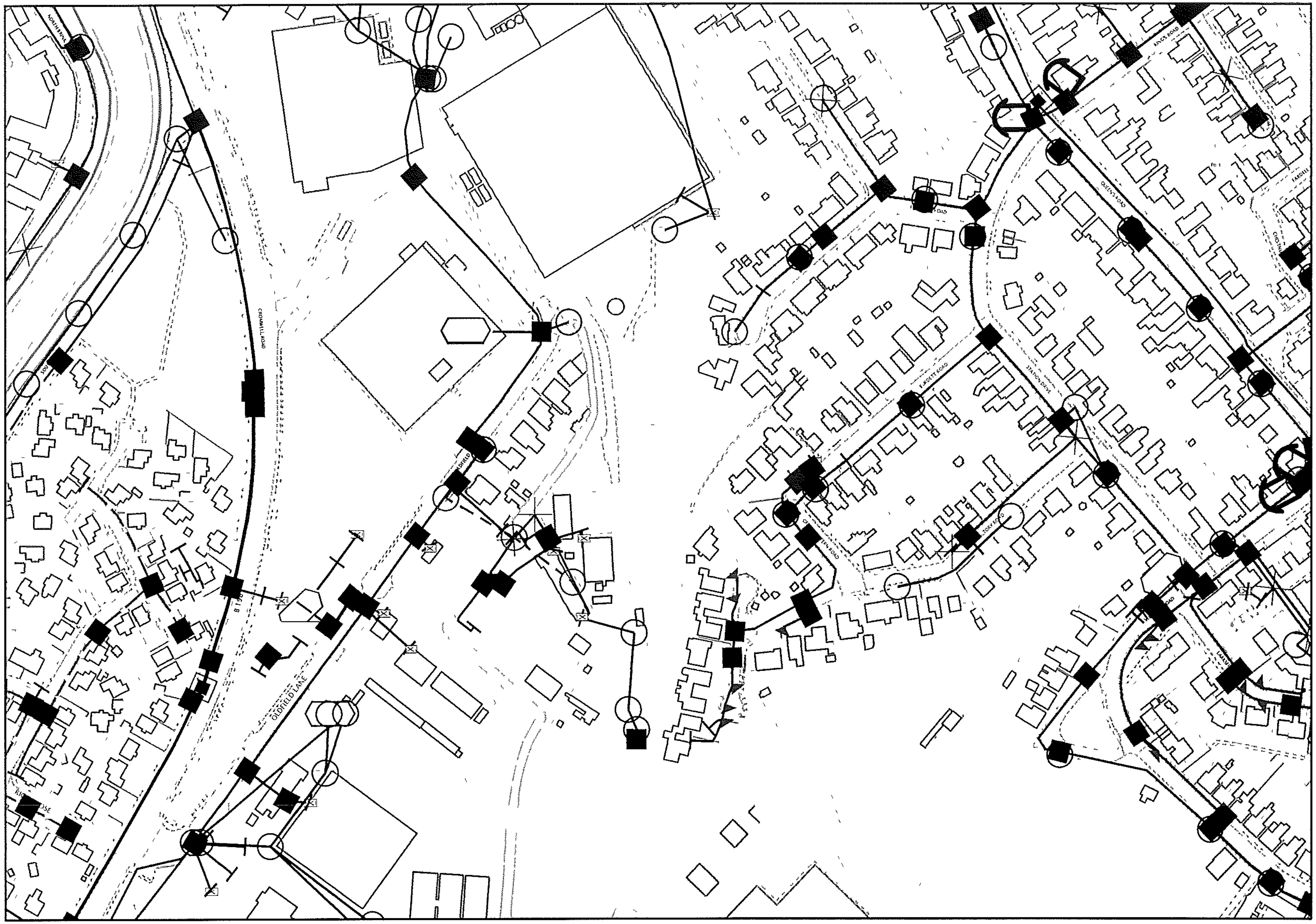
Other proposed plant is shown using dashed lines

BT symbols not listed above may be disregarded



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Existing BT plant may not be recorded
Information valid at time of preparation

CLICK BEFORE YOU DIG

email cbyd@openreach.co.uk

PLANT INFORMATION REPLY

March to Wisbech Railway

W3/830218/20

openreach

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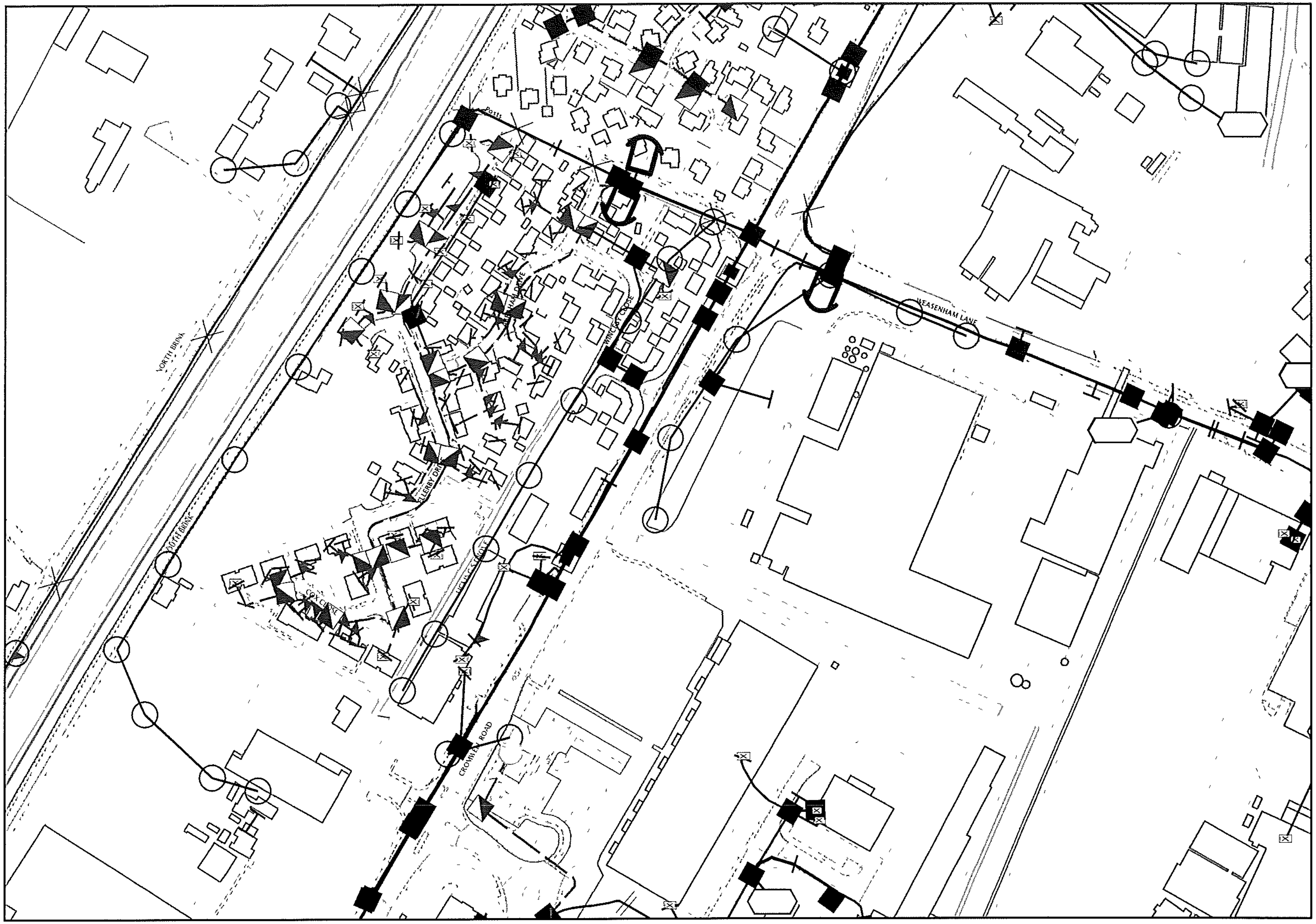

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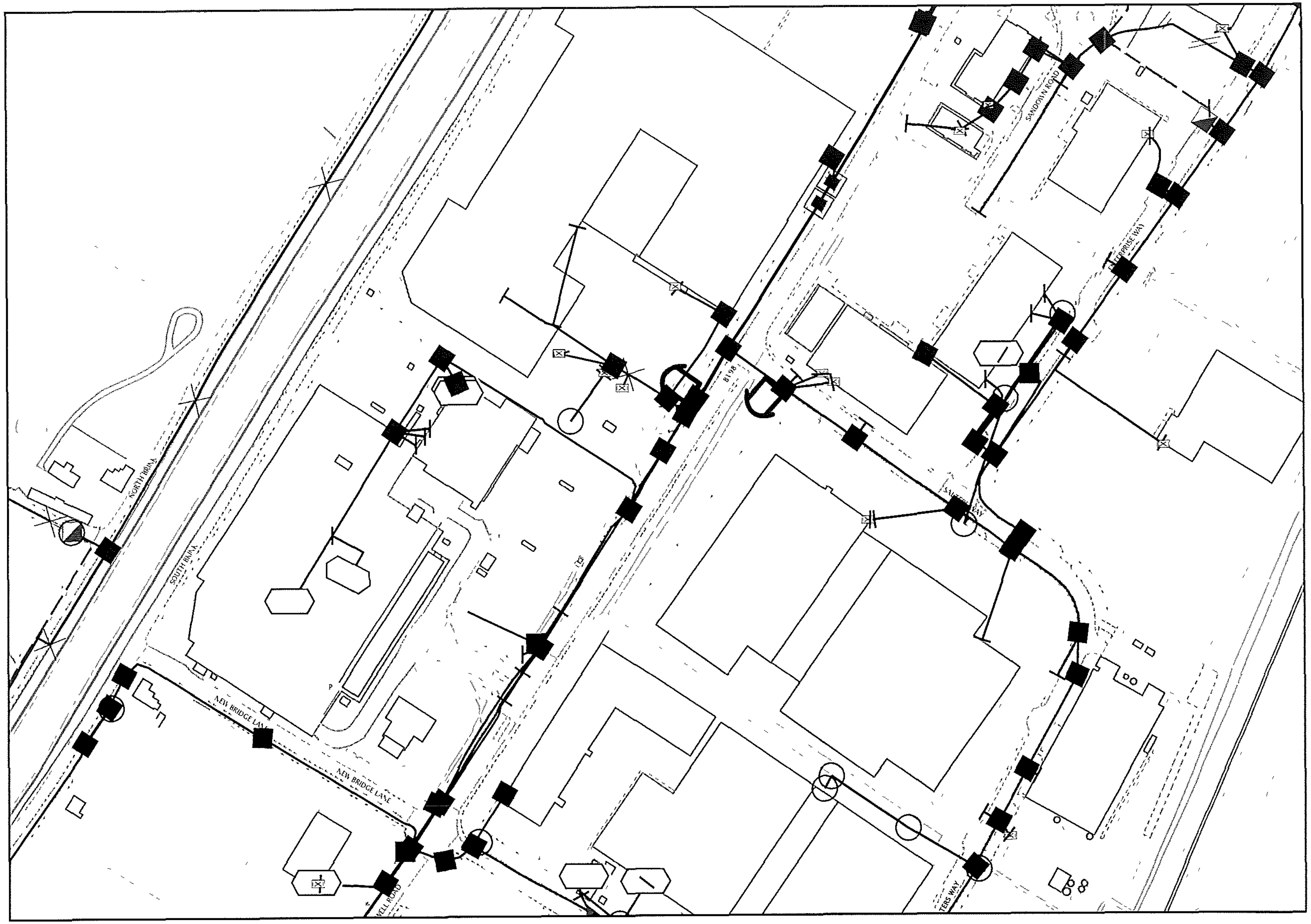

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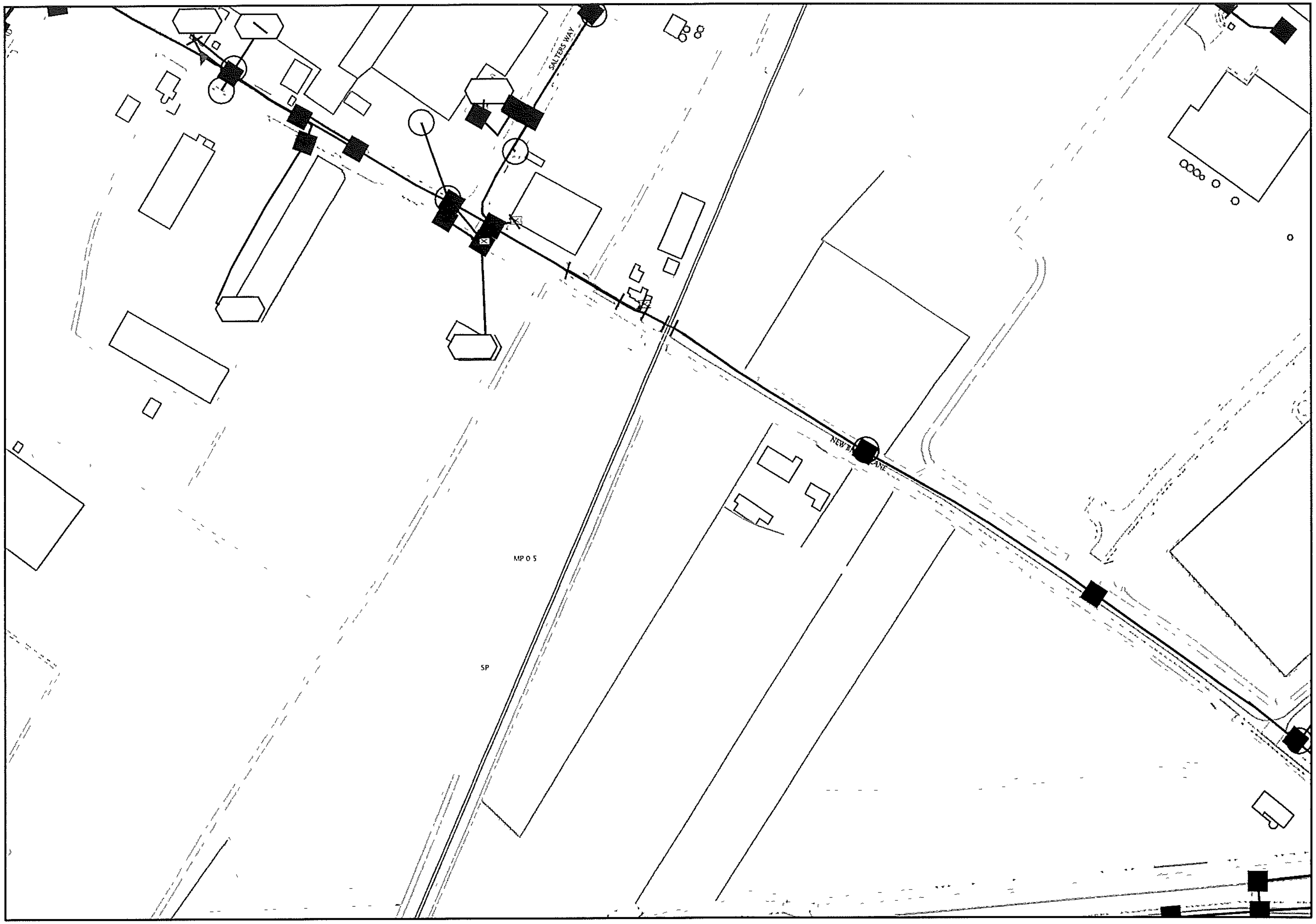

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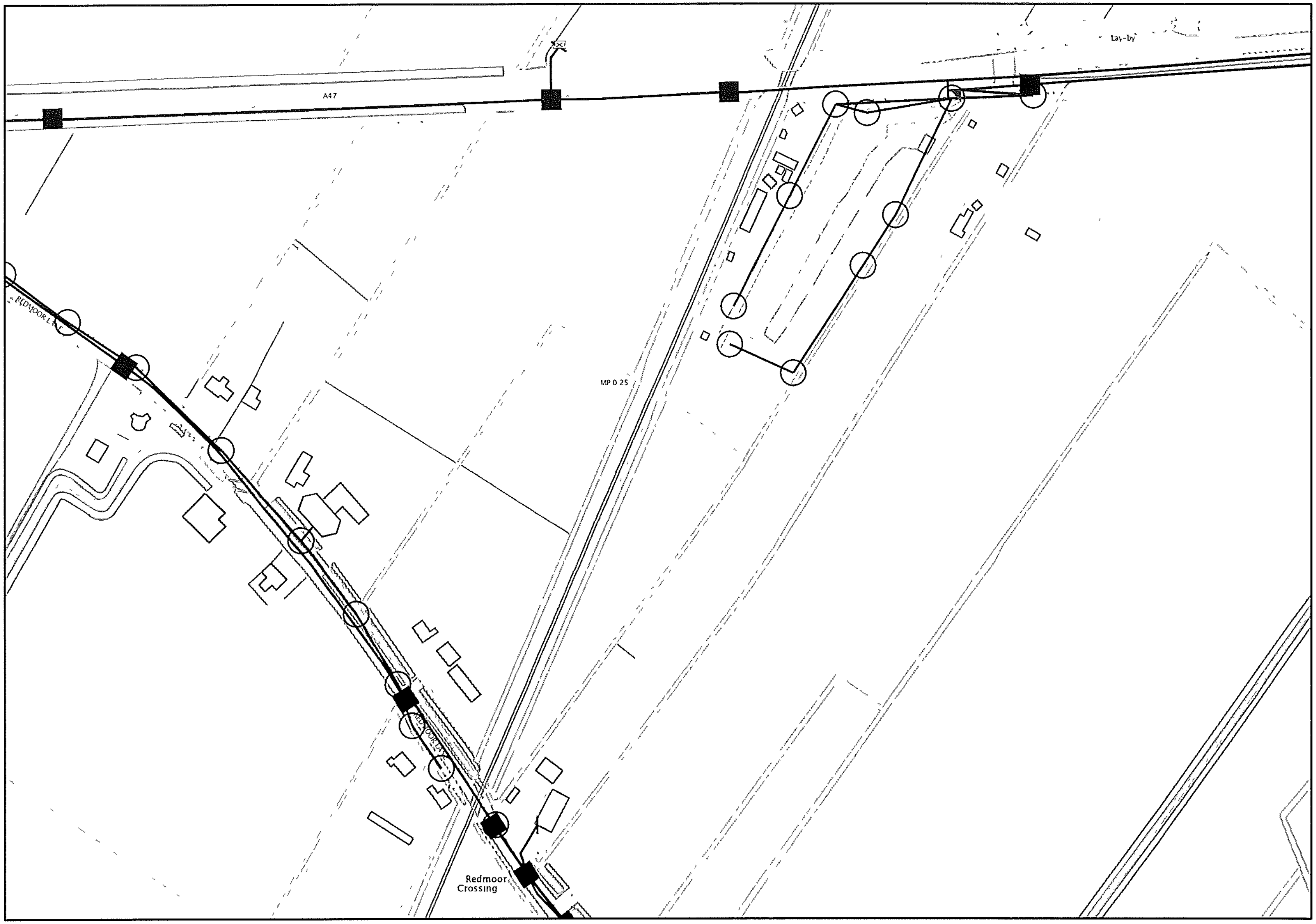

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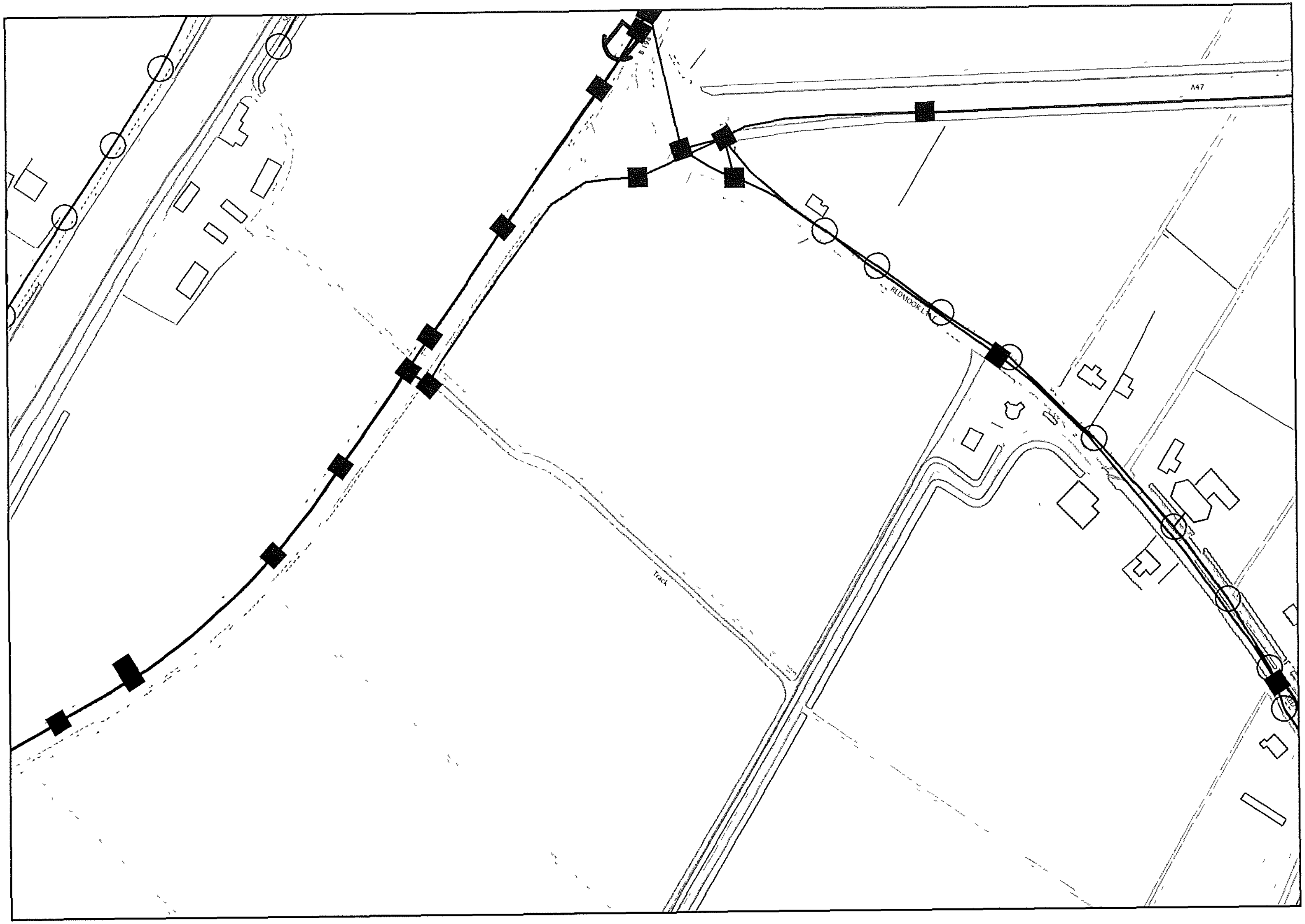

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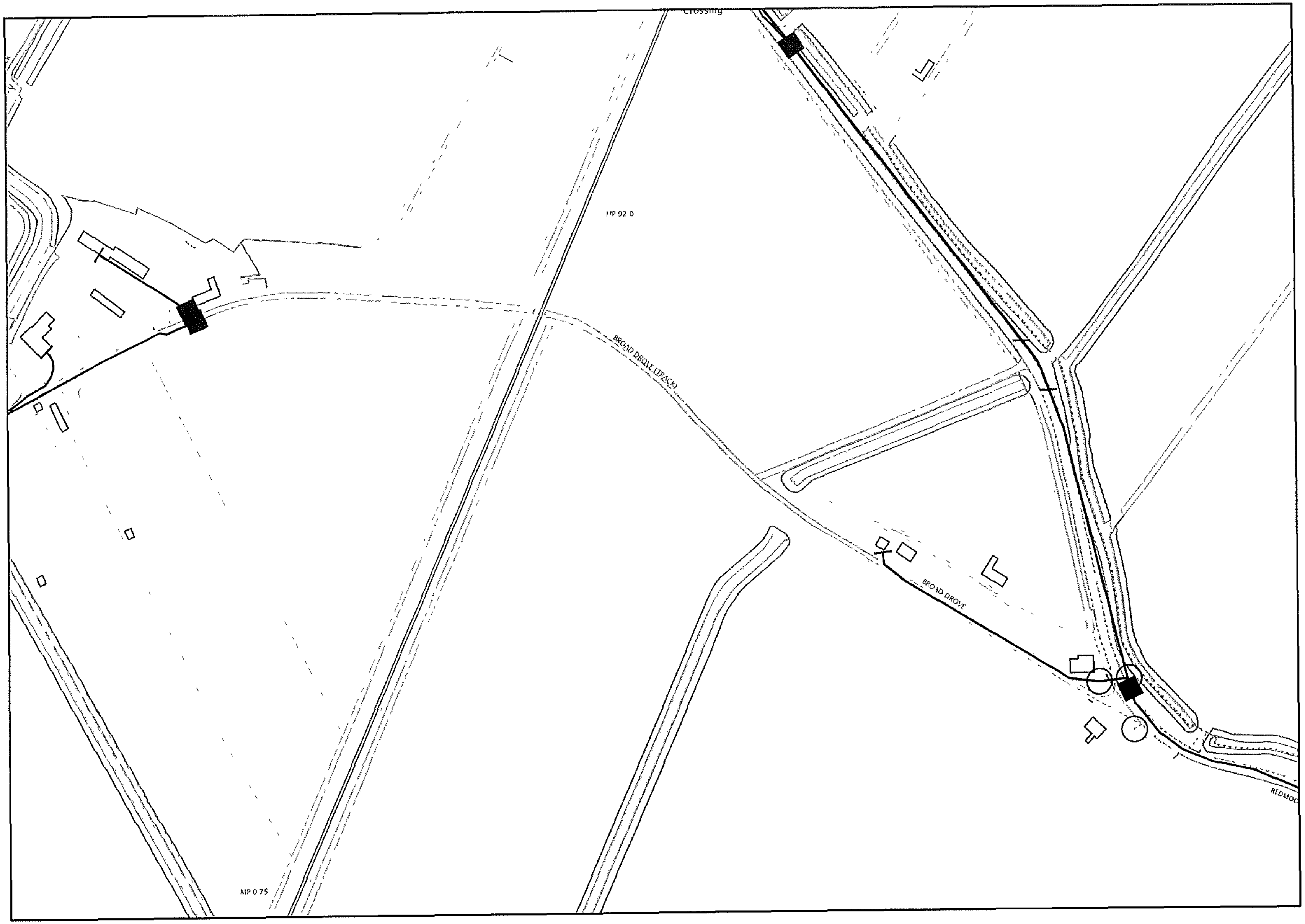

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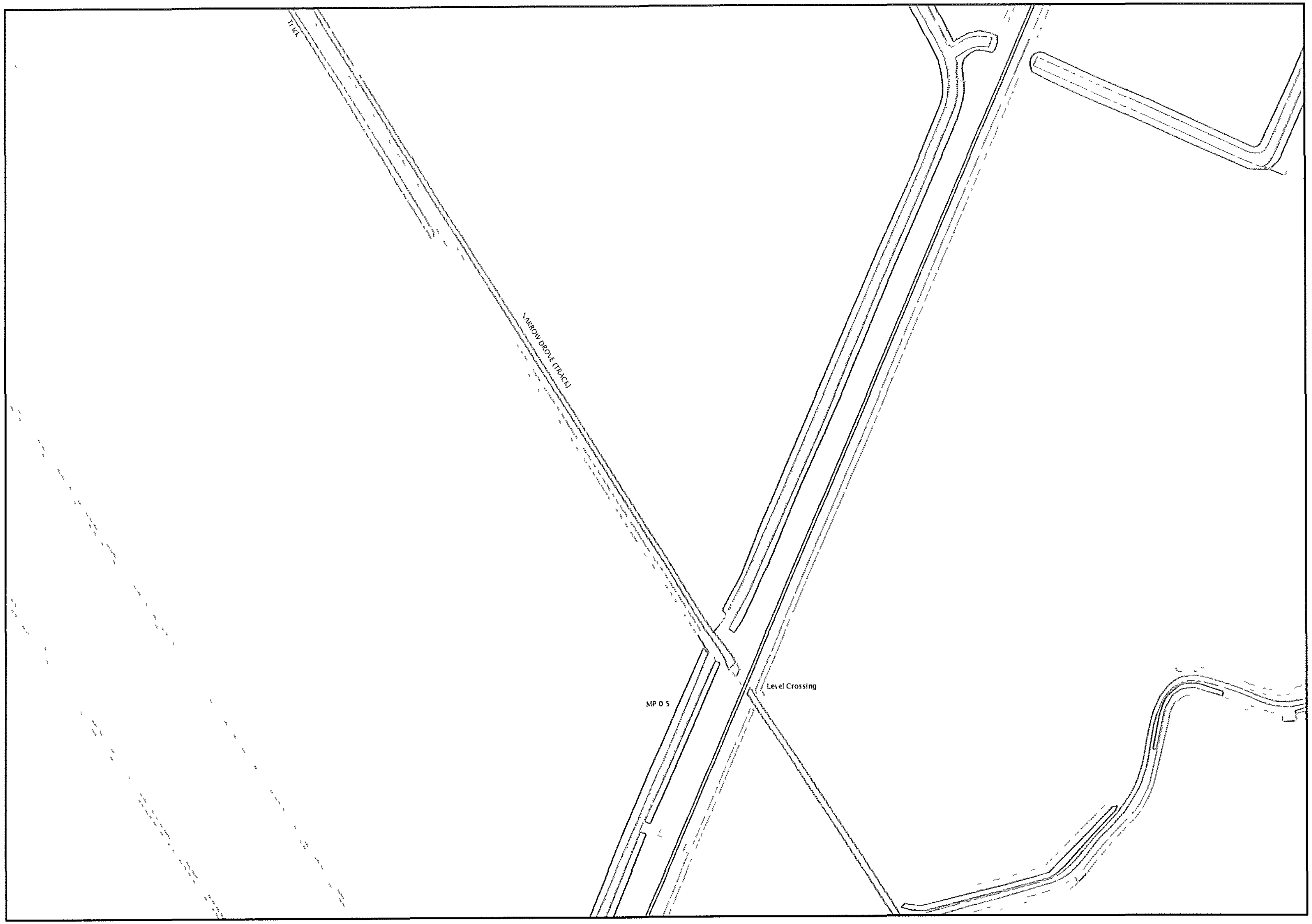

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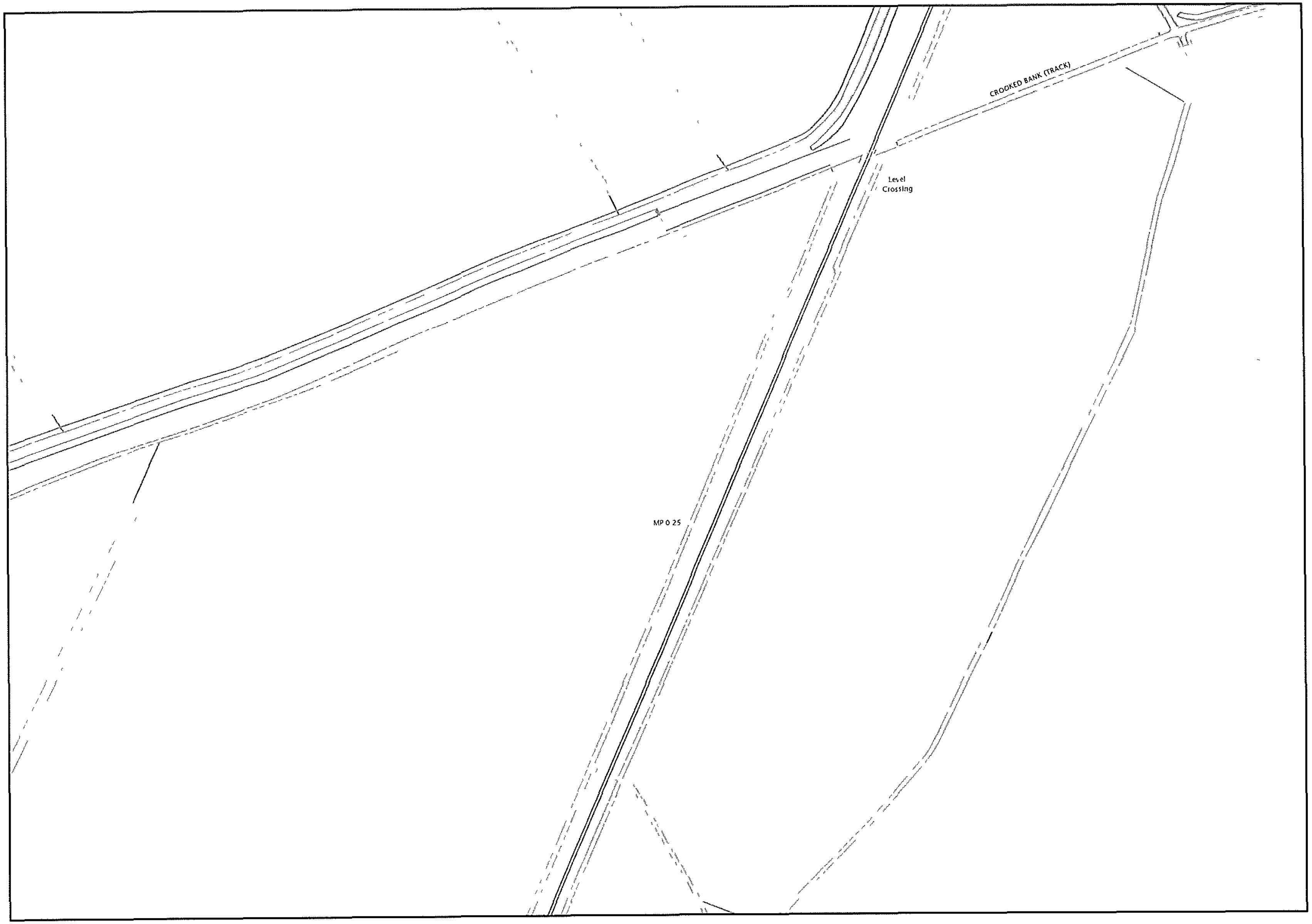

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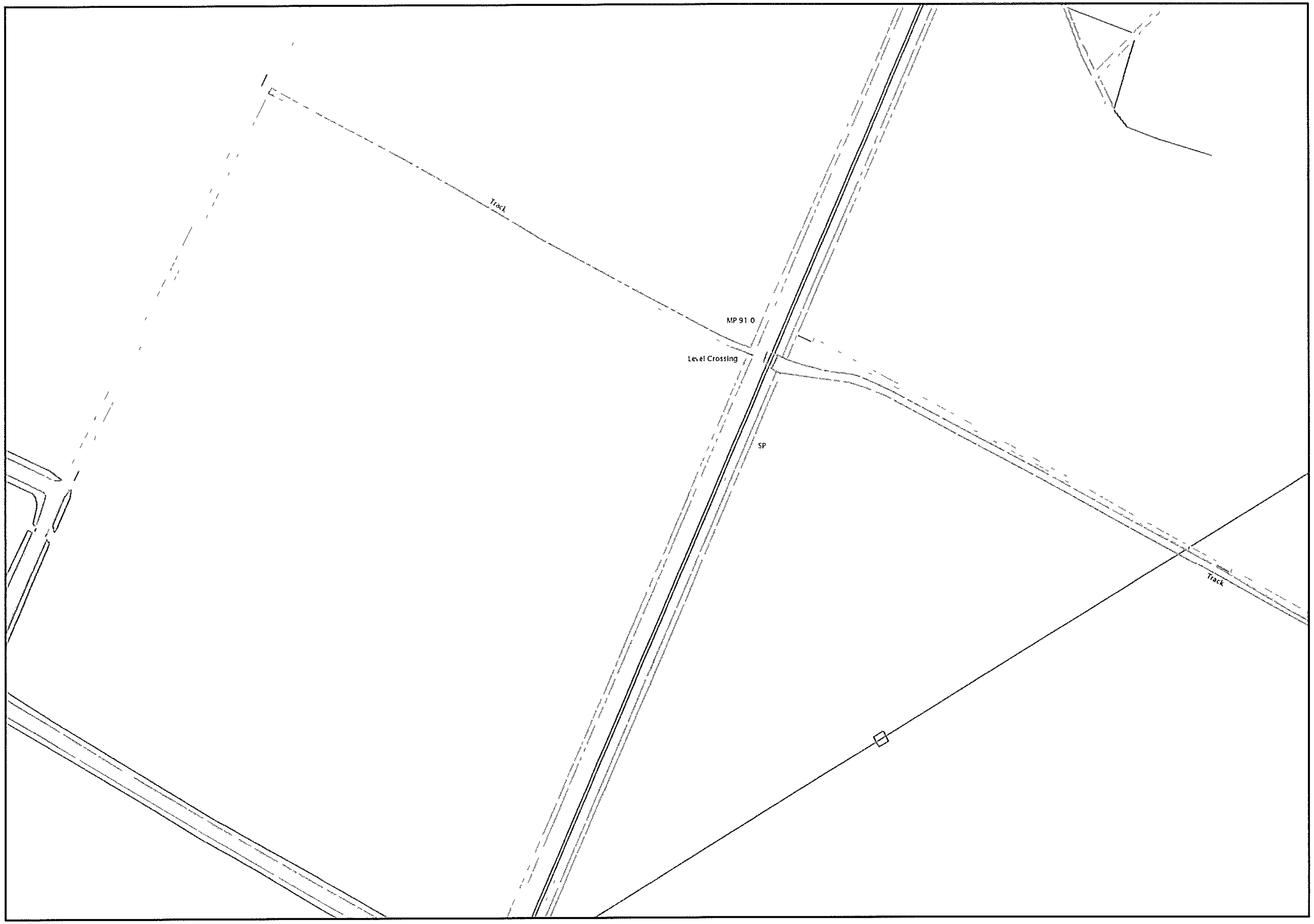

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CHANGE OF STATE

DUCT TEE

PROPOSED

MANHOLE

JOINTBOX

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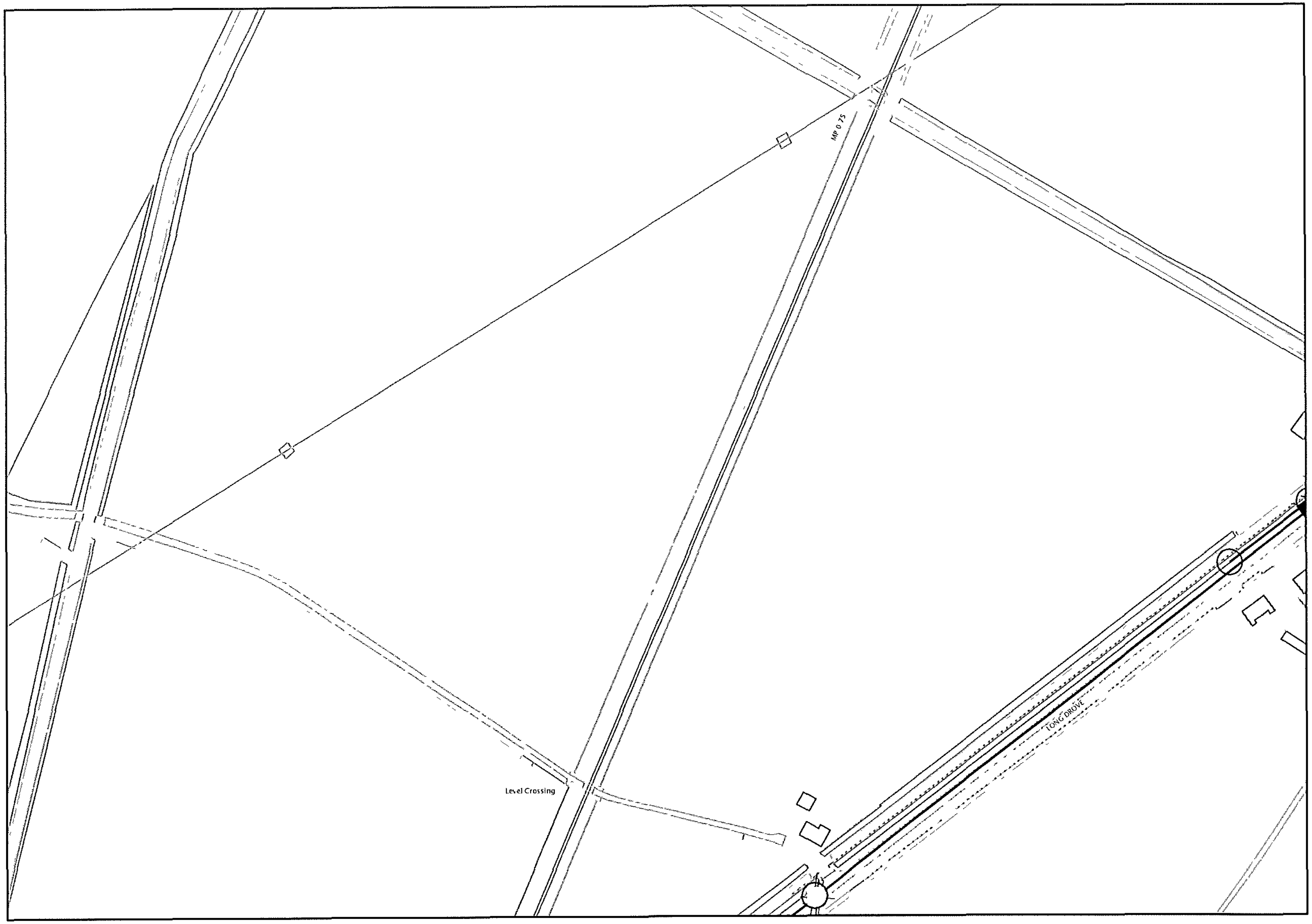

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CLICK BEFORE YOU DIG

email cbyd@openreach.co.uk

PLANT INFORMATION REPLY

March to Wisbech Railway

W3/830218/20

openreach

Legend

CAUTION AREA

BT CAUTION_AREA

EQUIPMENT

TABCD FIBRE, TCODE

COPPER, CABINET

476R COPPER, DP

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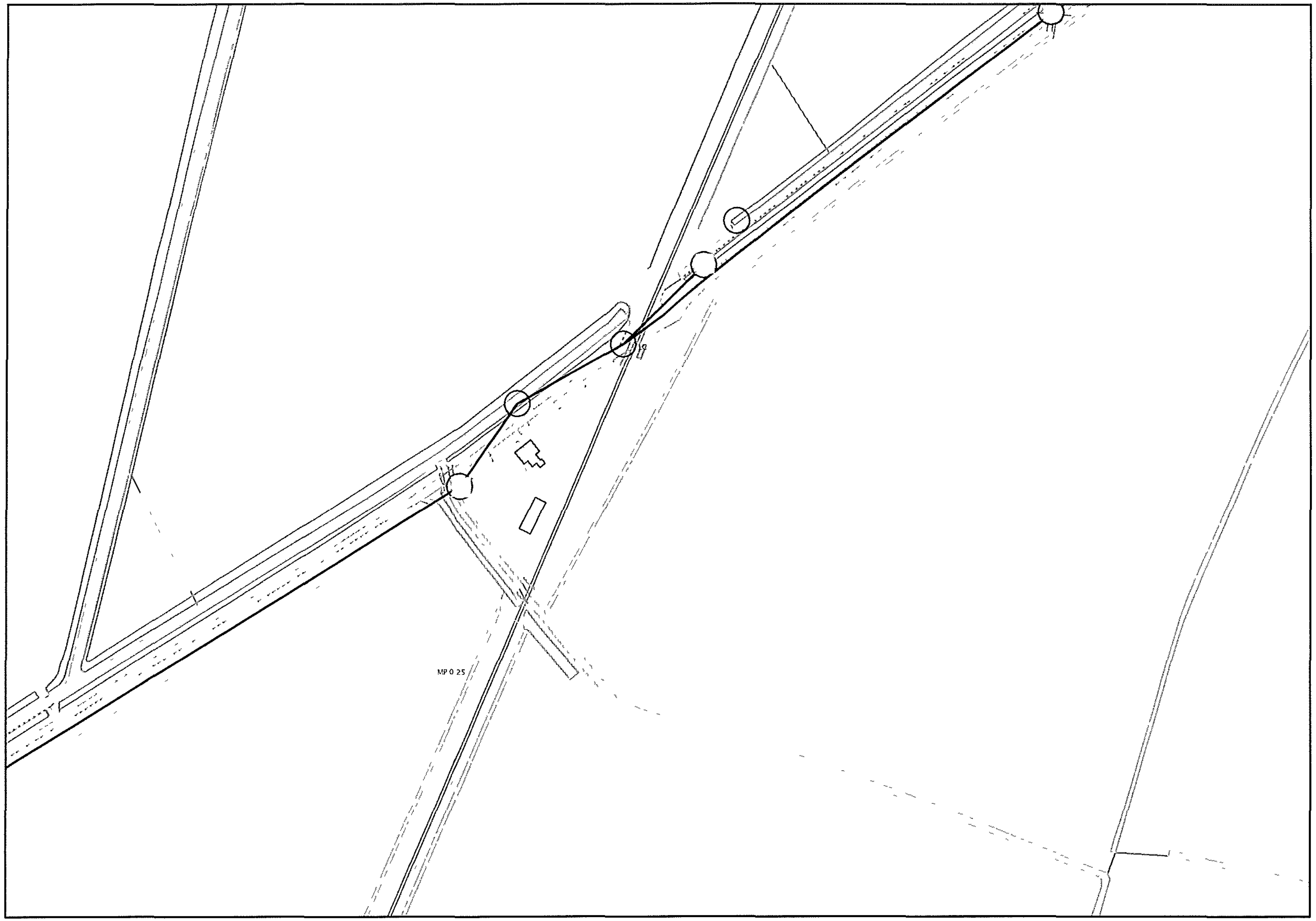

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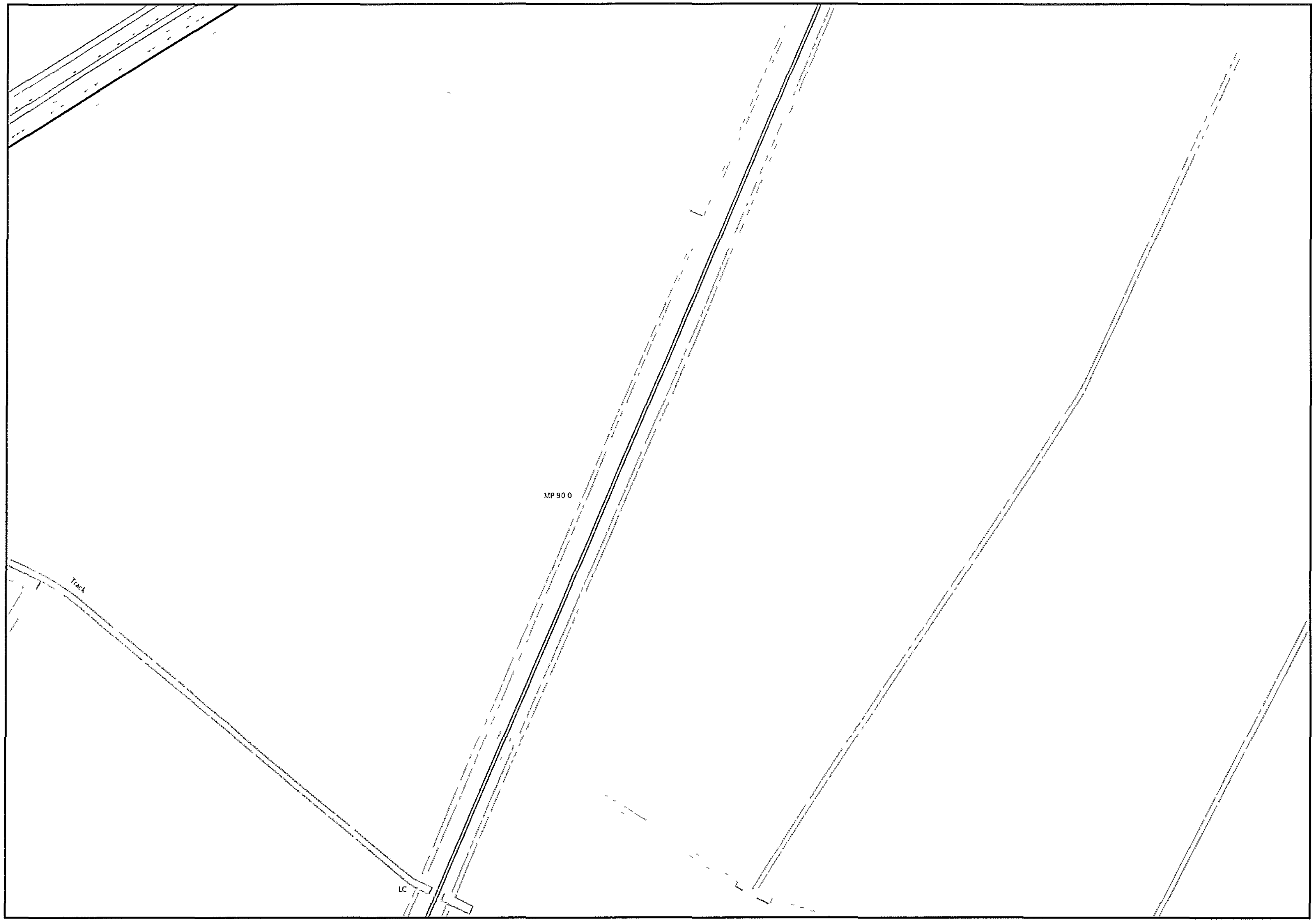

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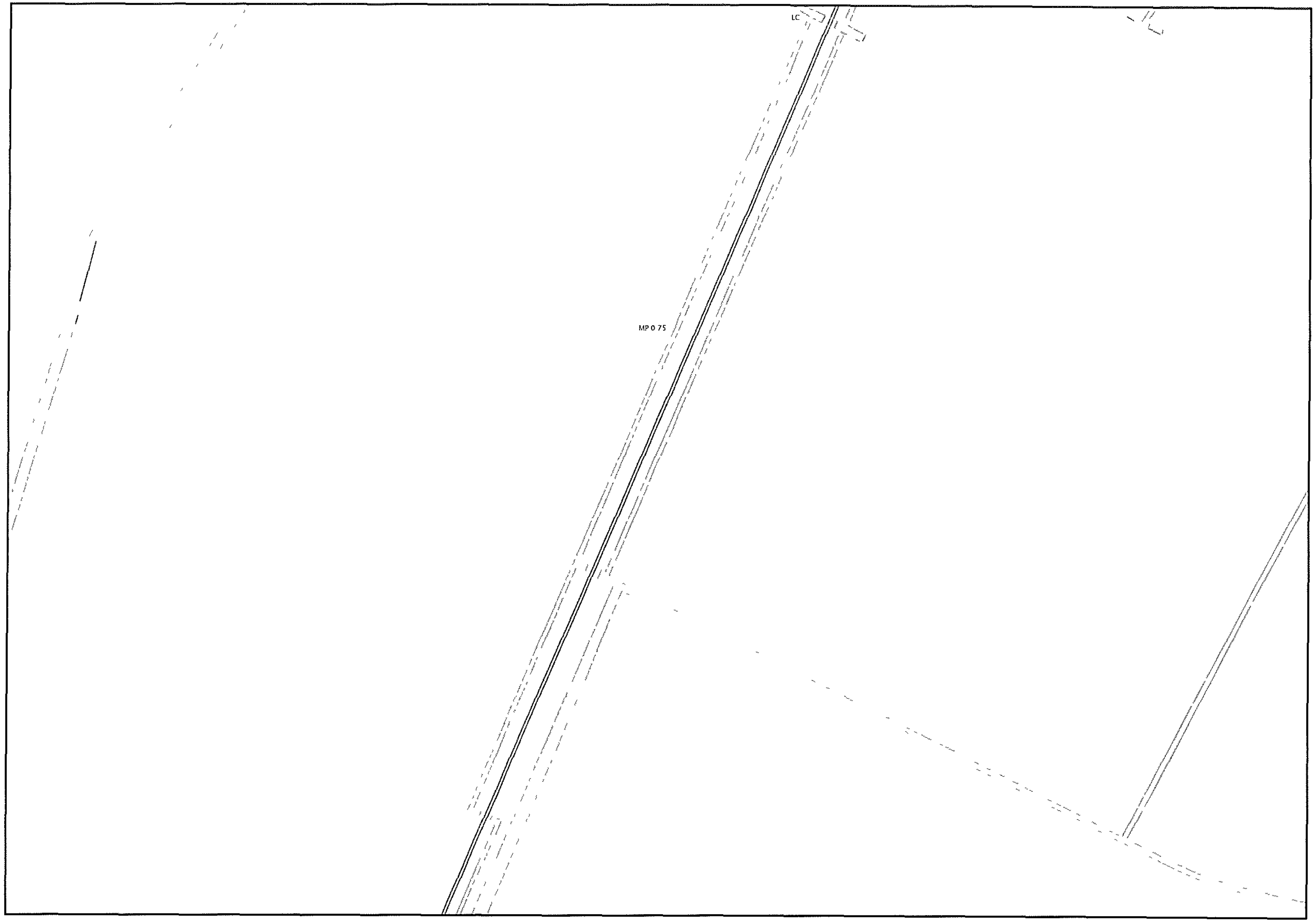

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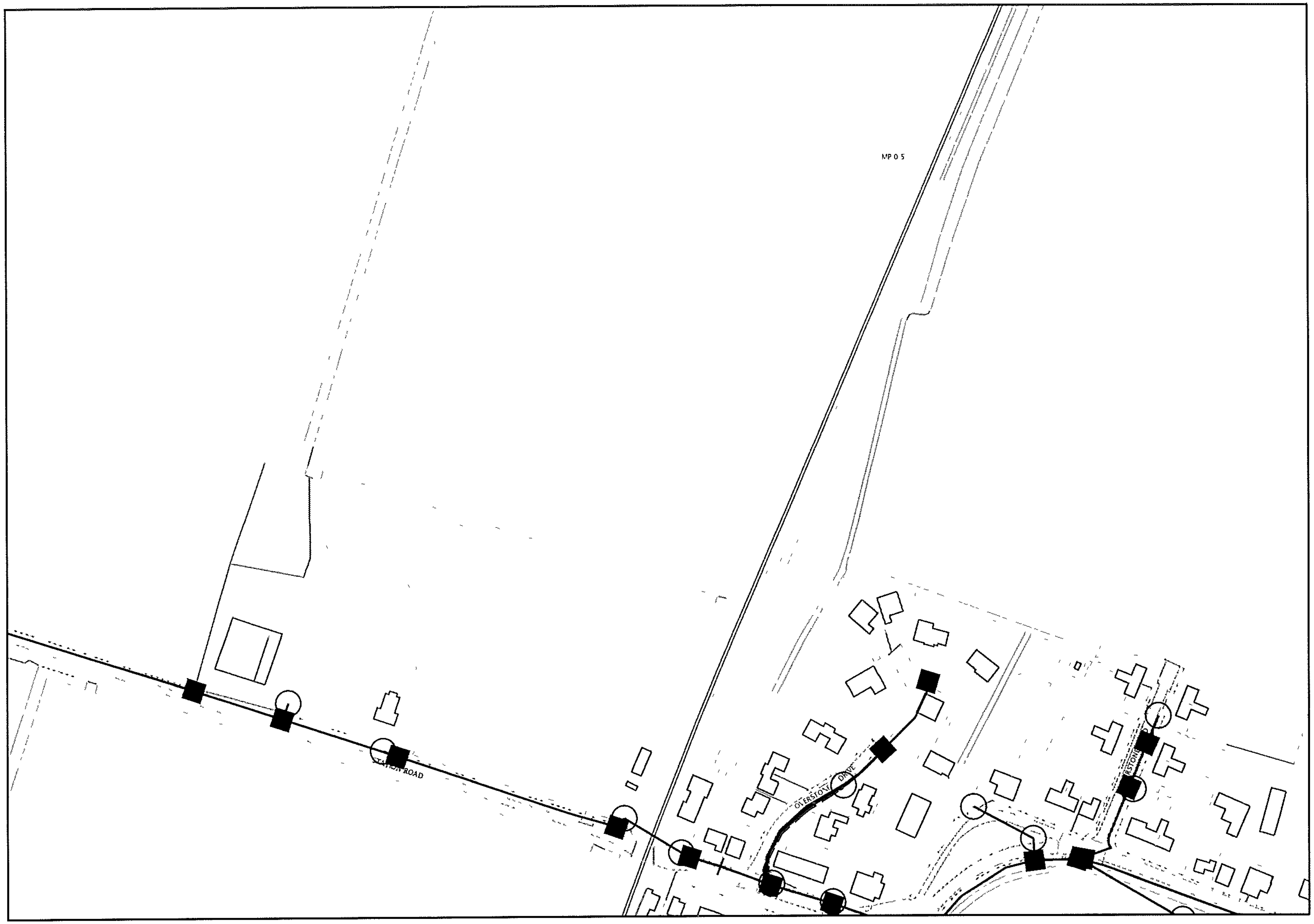

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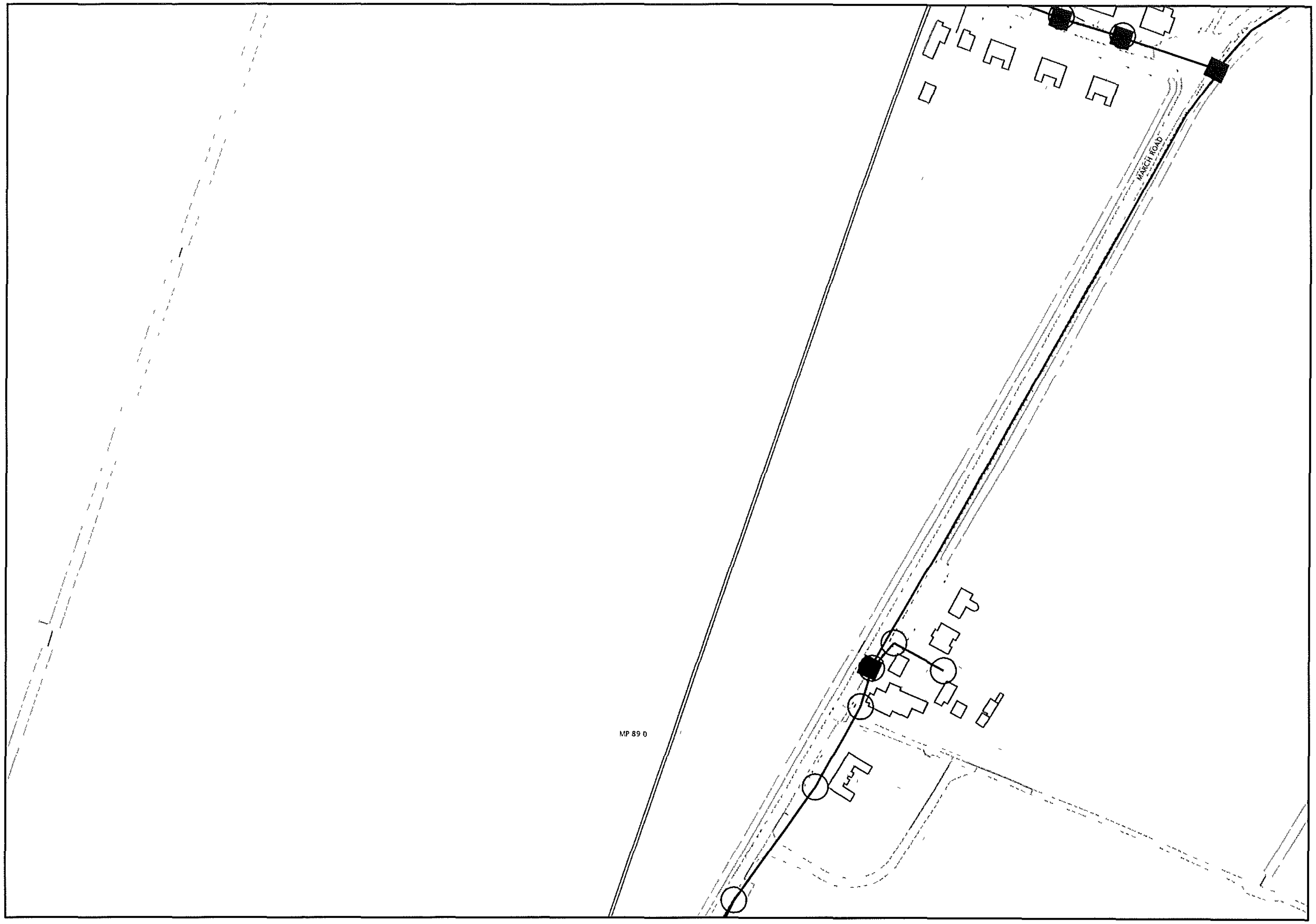

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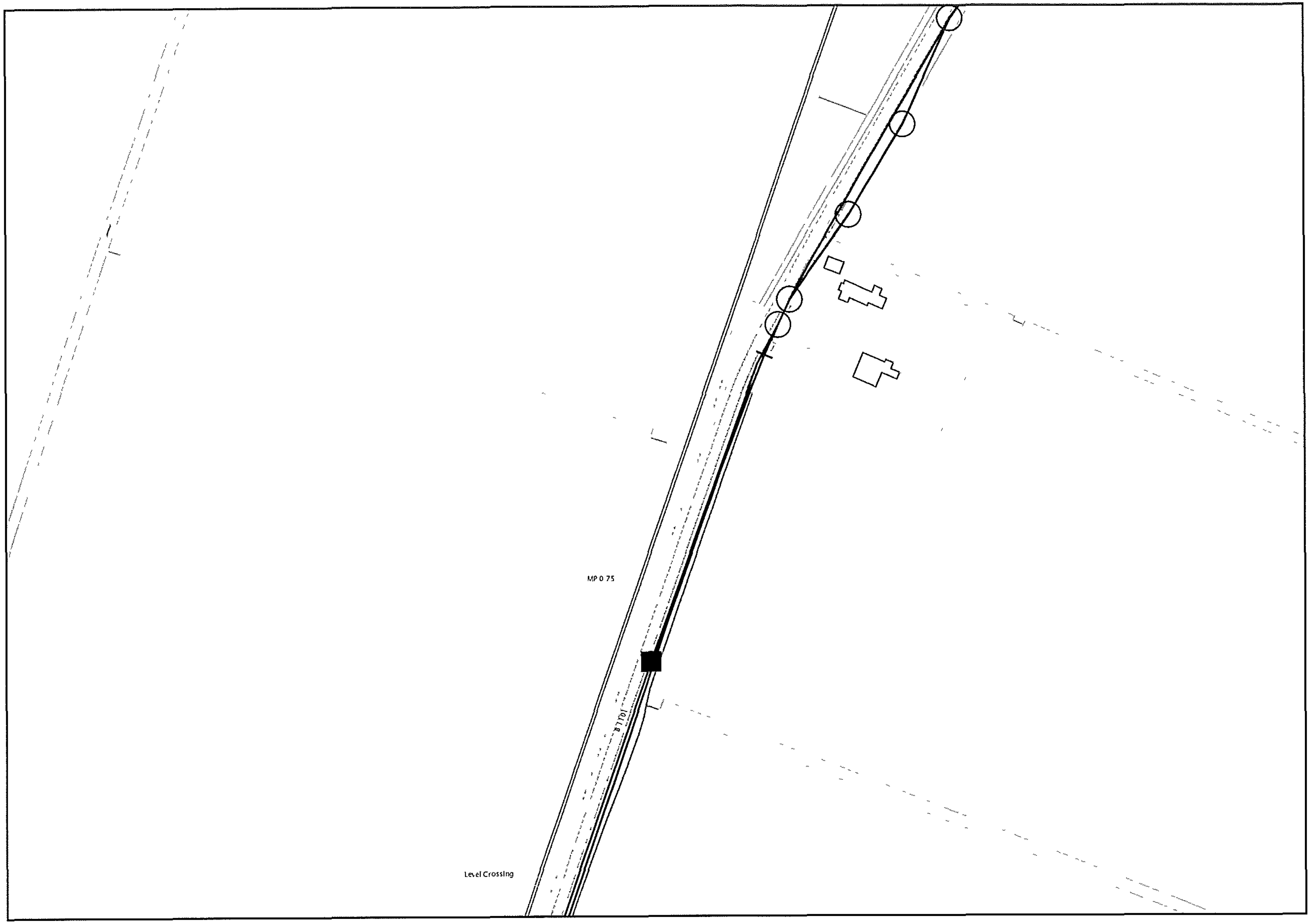

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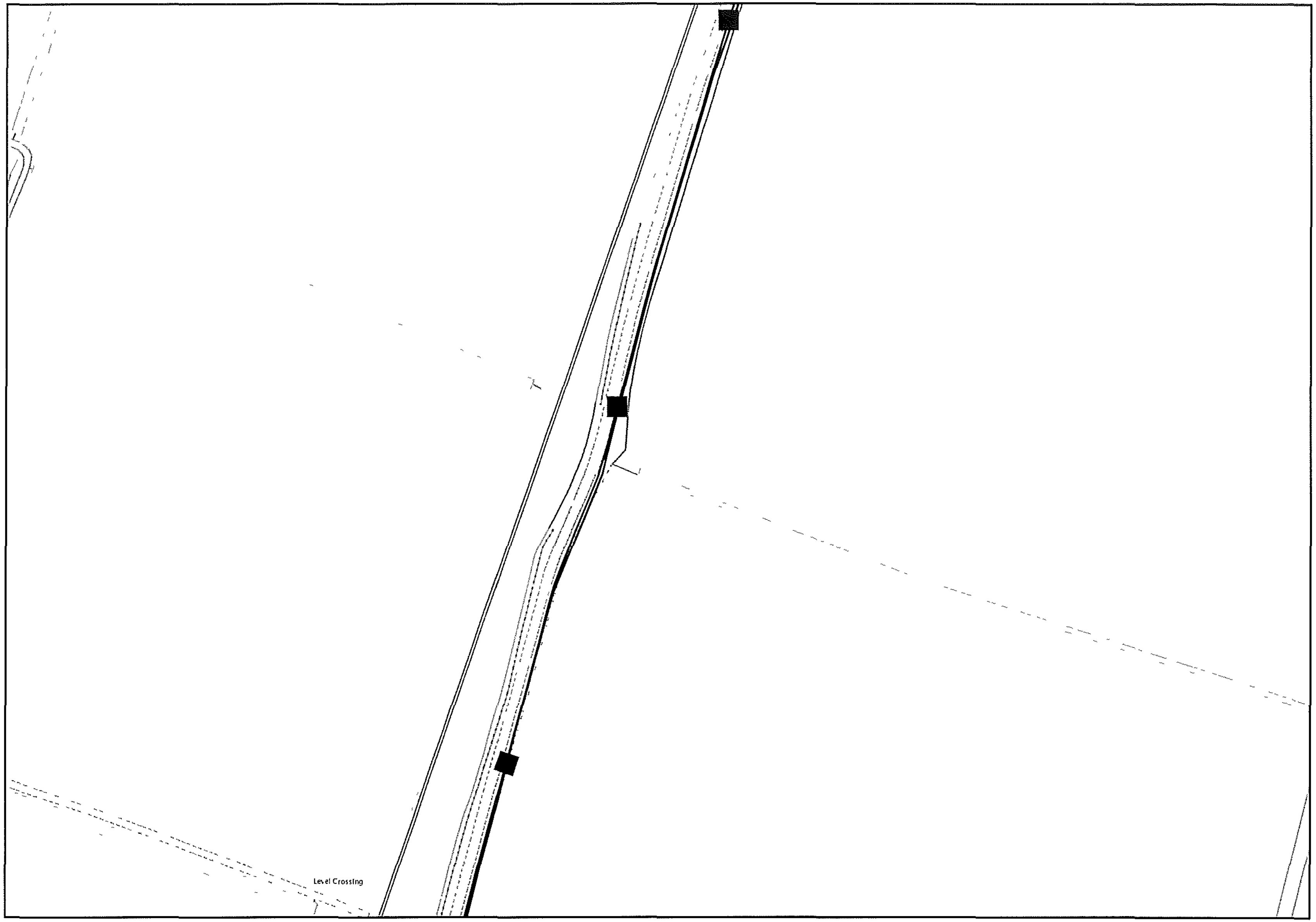

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email cbyd@openreach co uk

[illegible]

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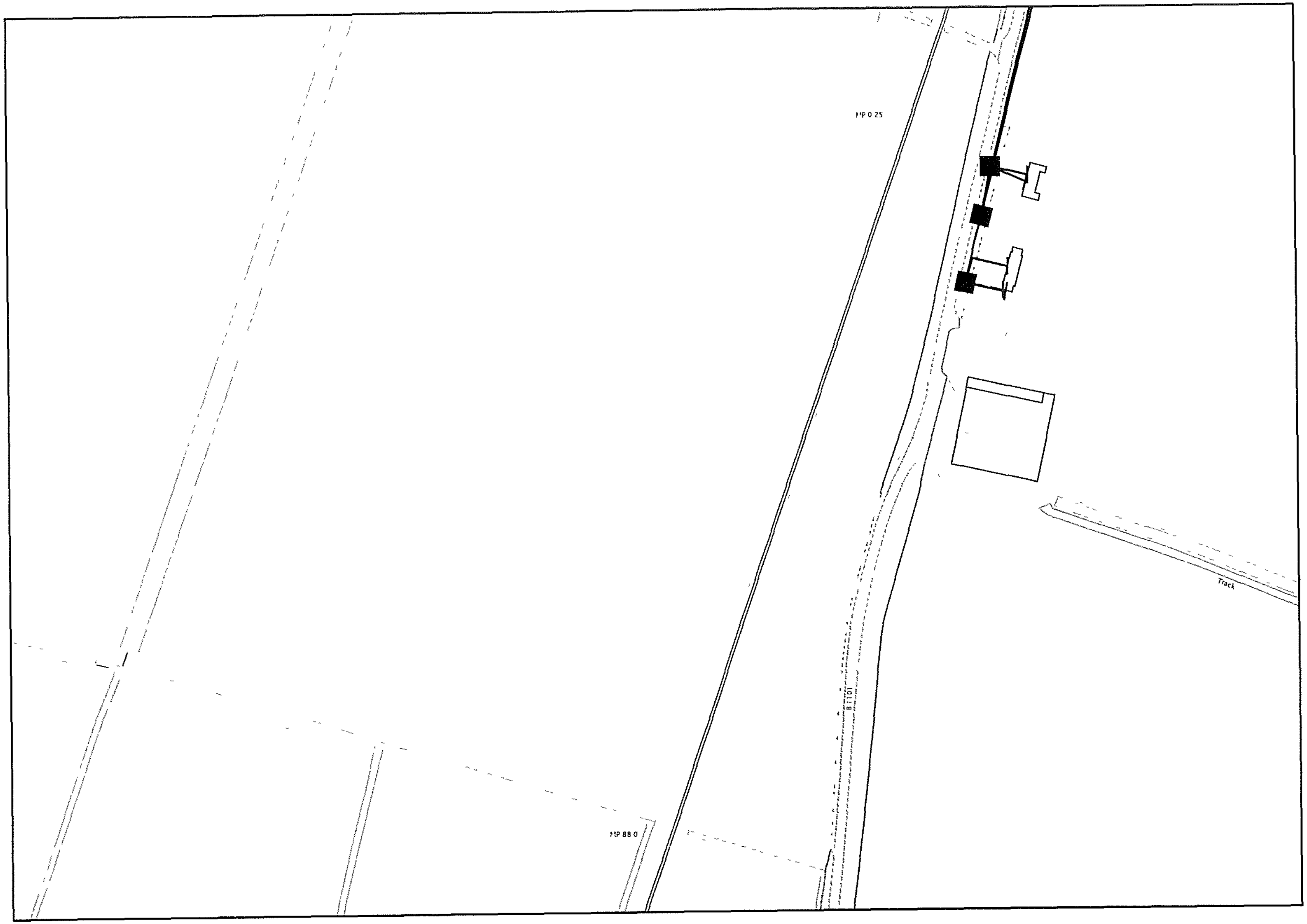

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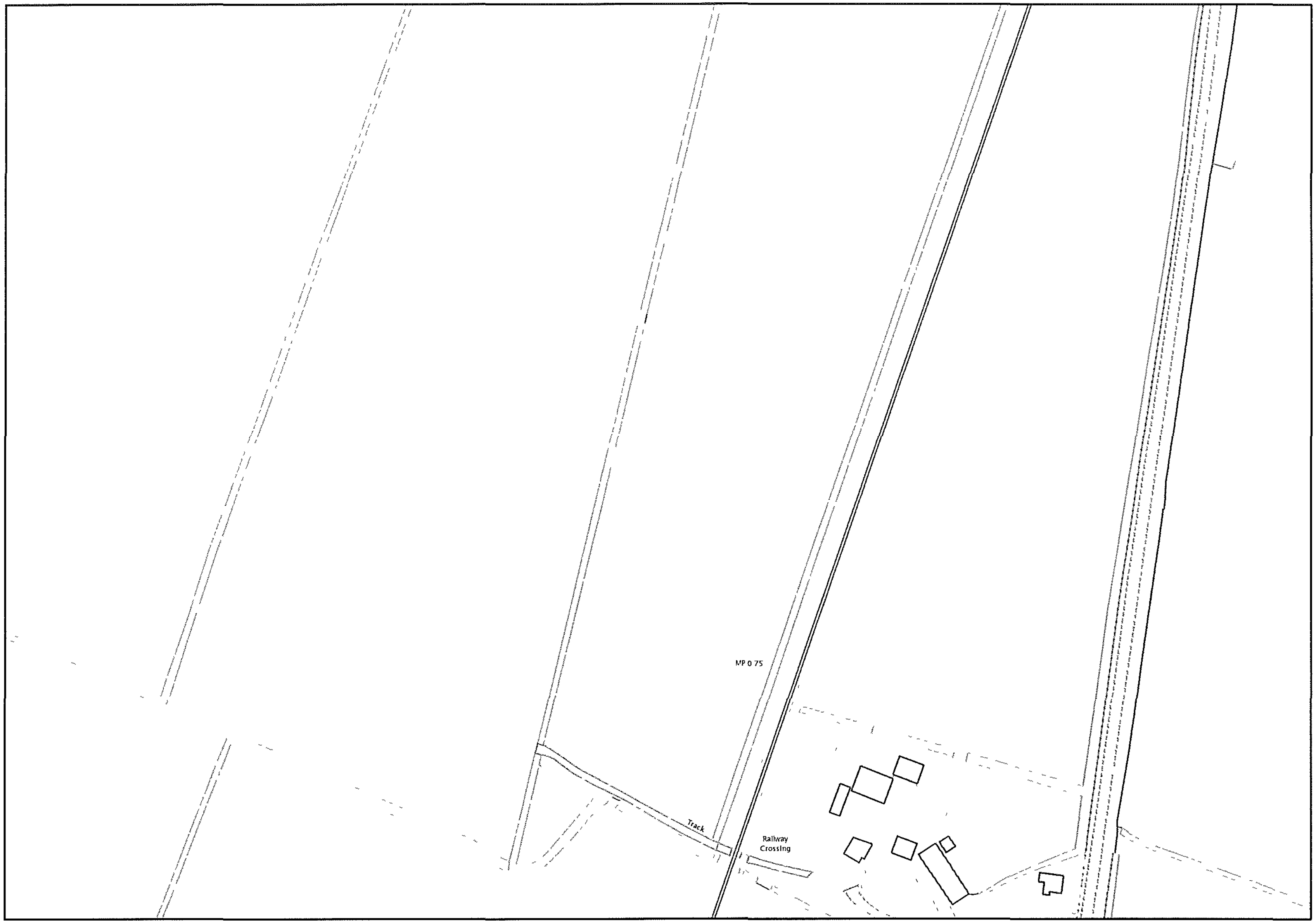

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PLANT INFORMATION REPLY

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W3/830218/20

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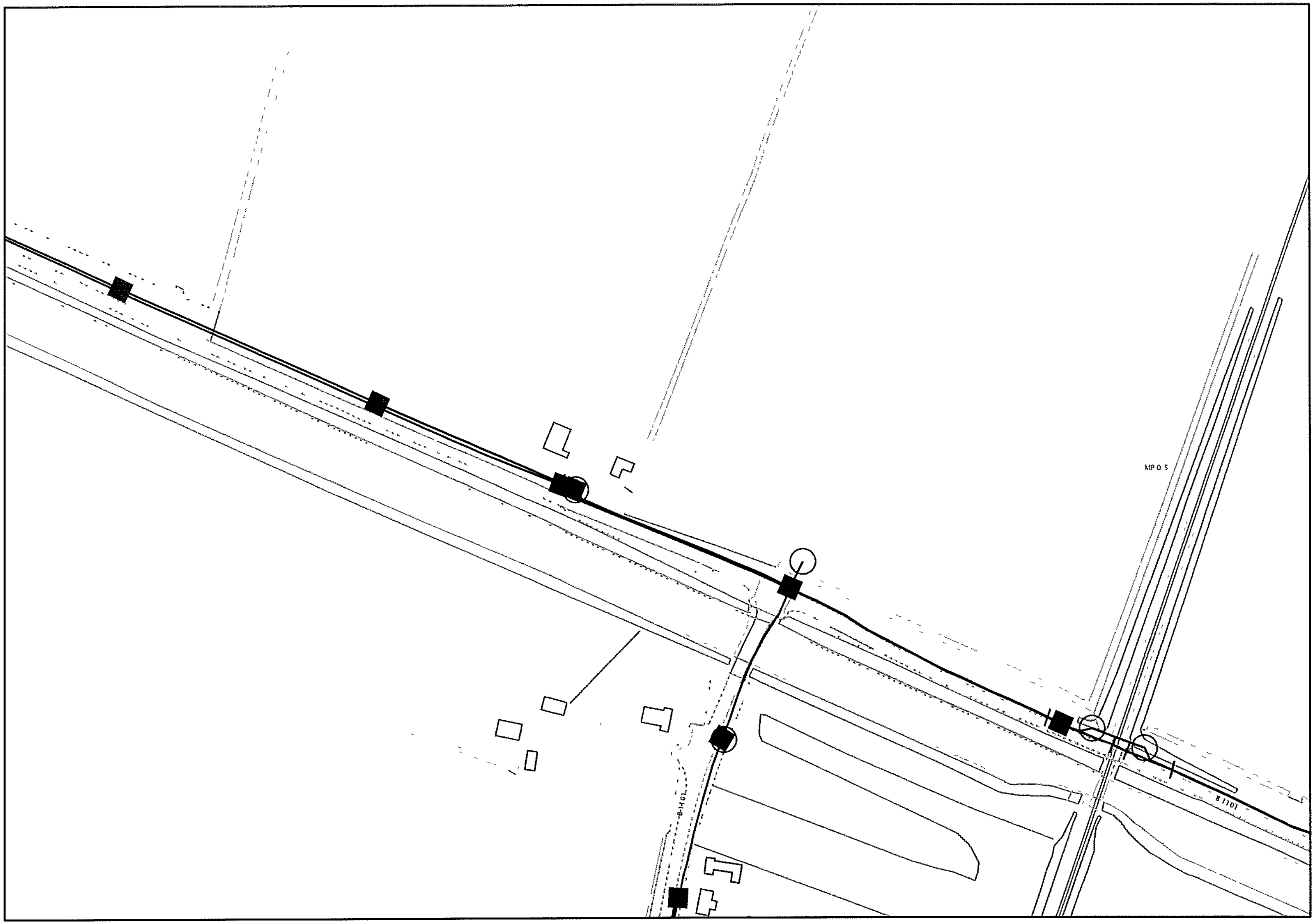

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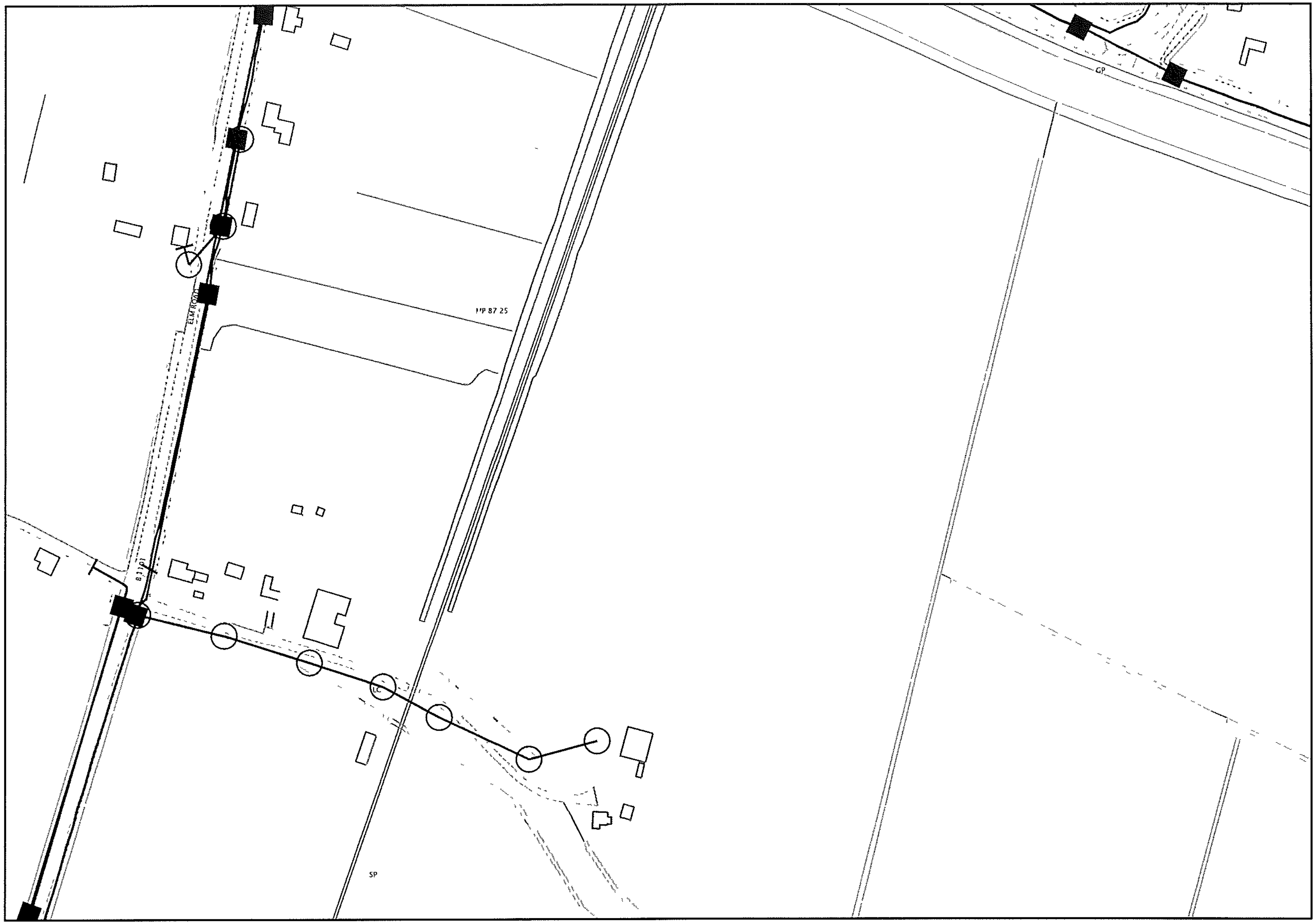

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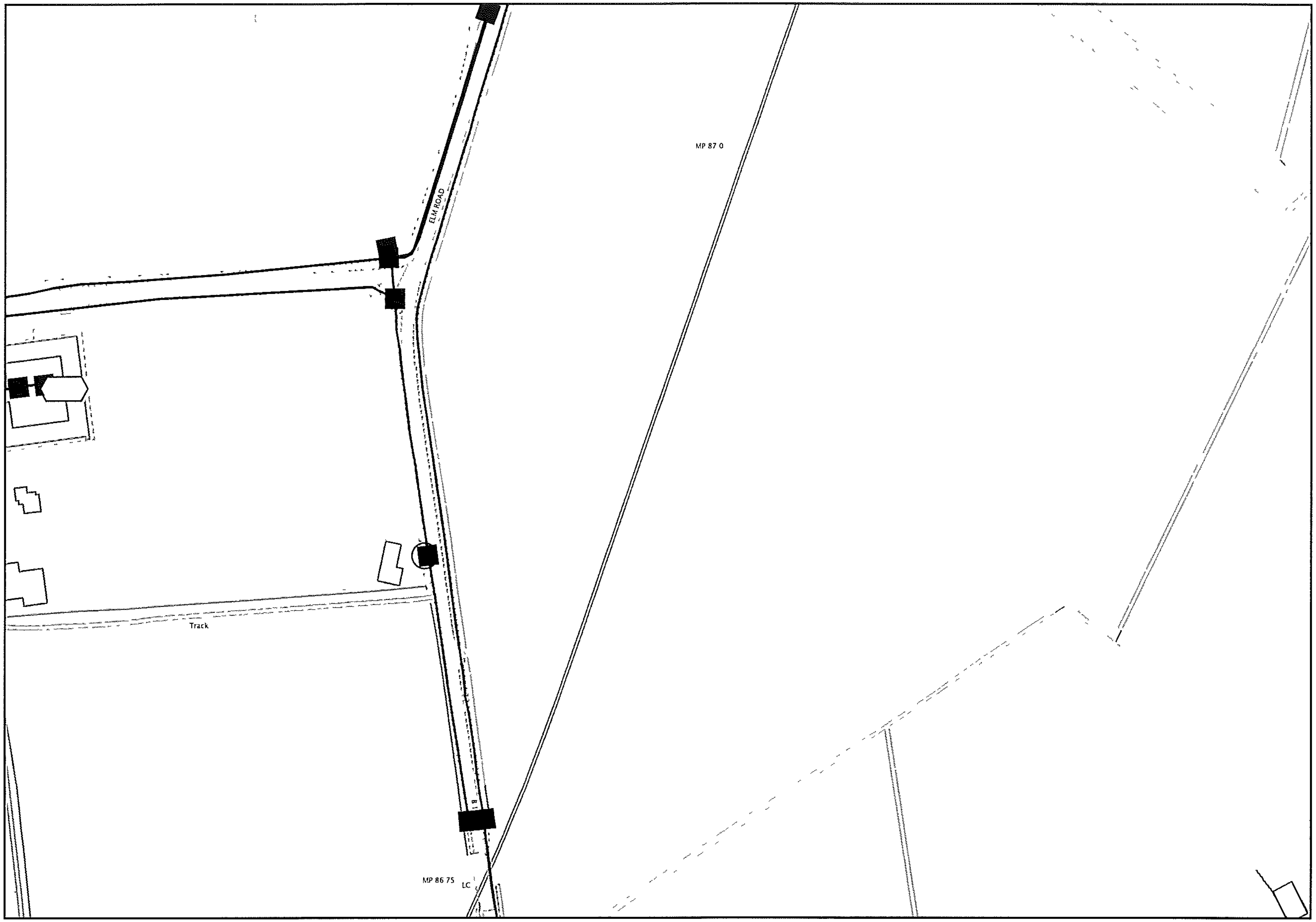

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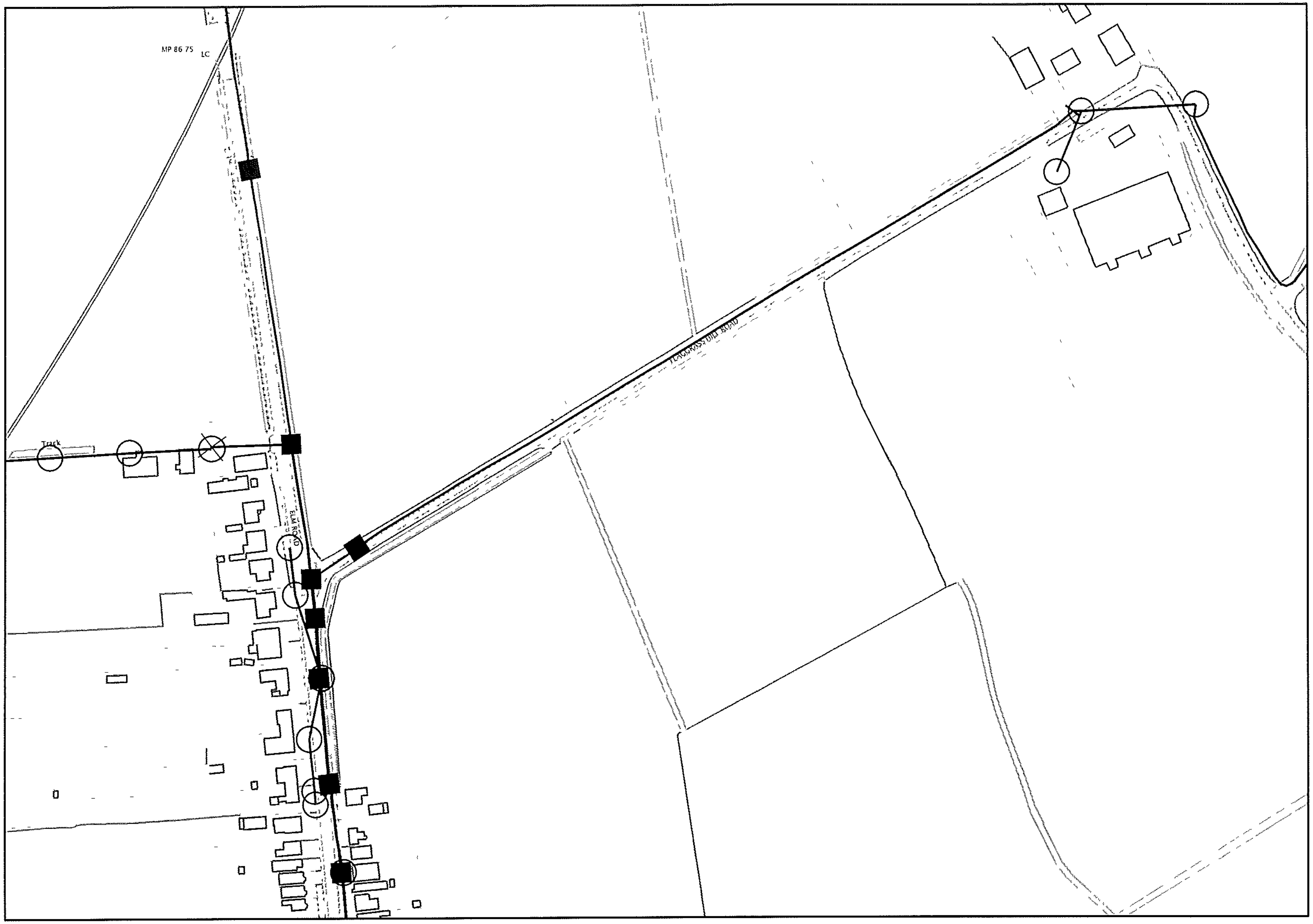

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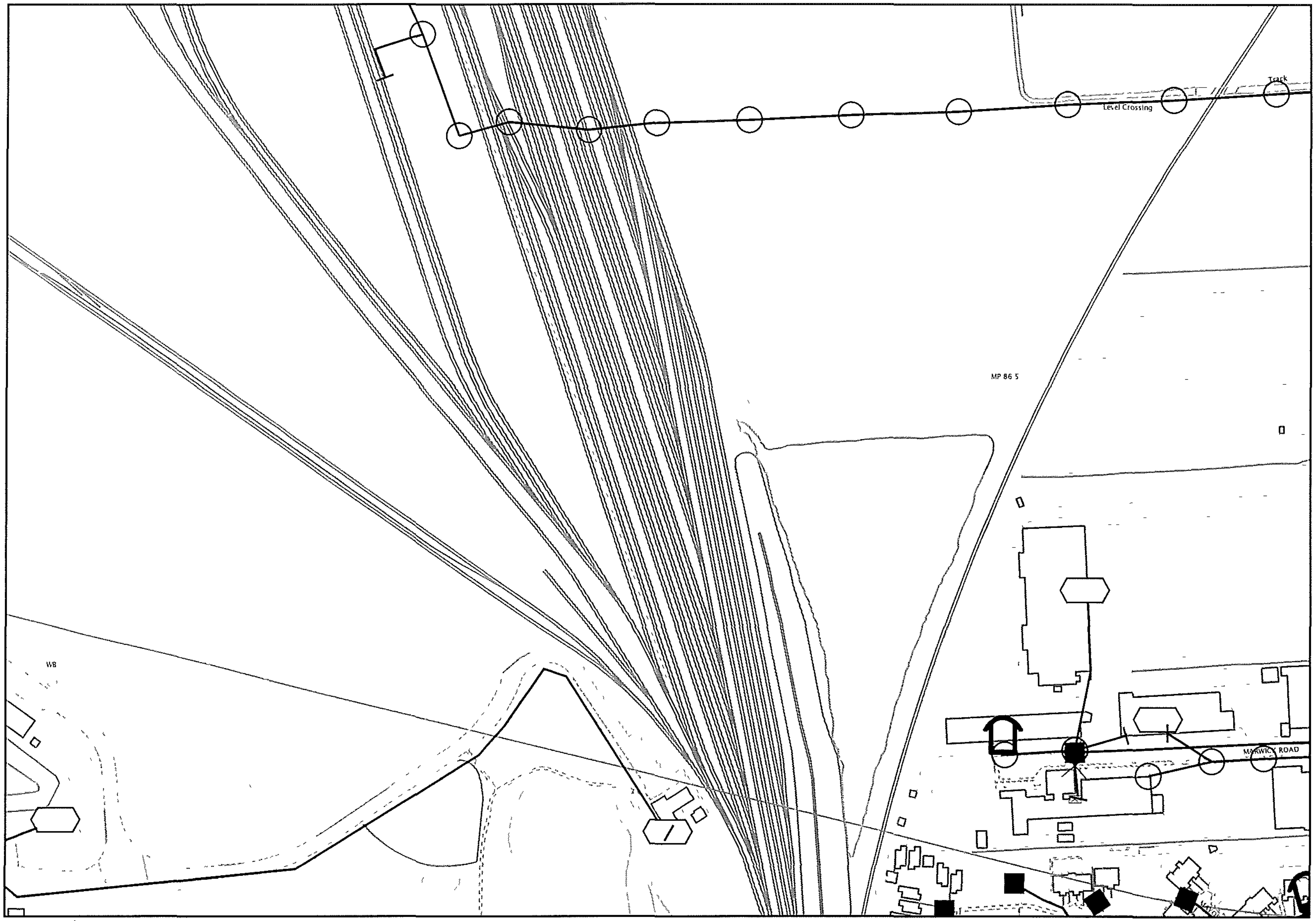

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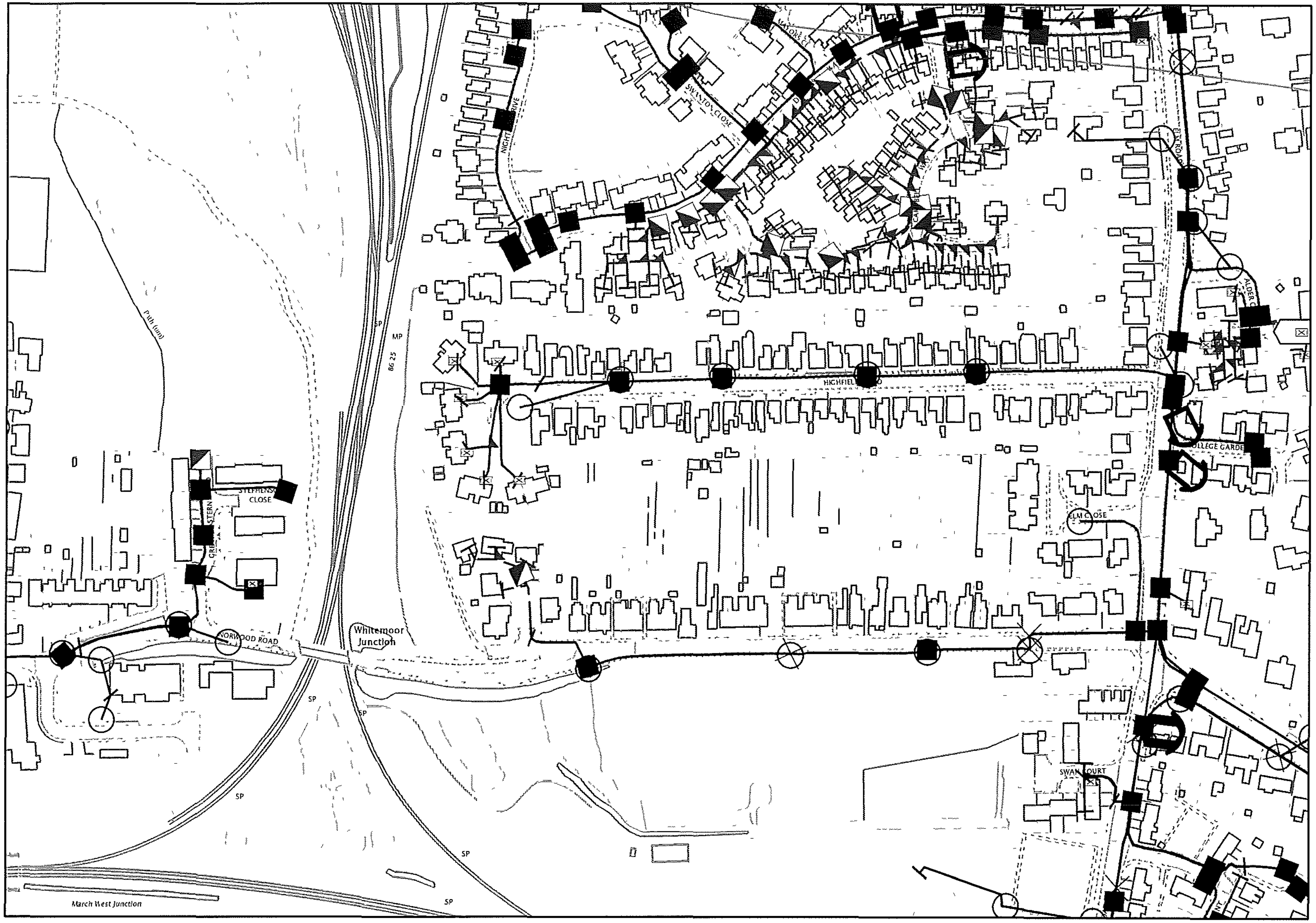

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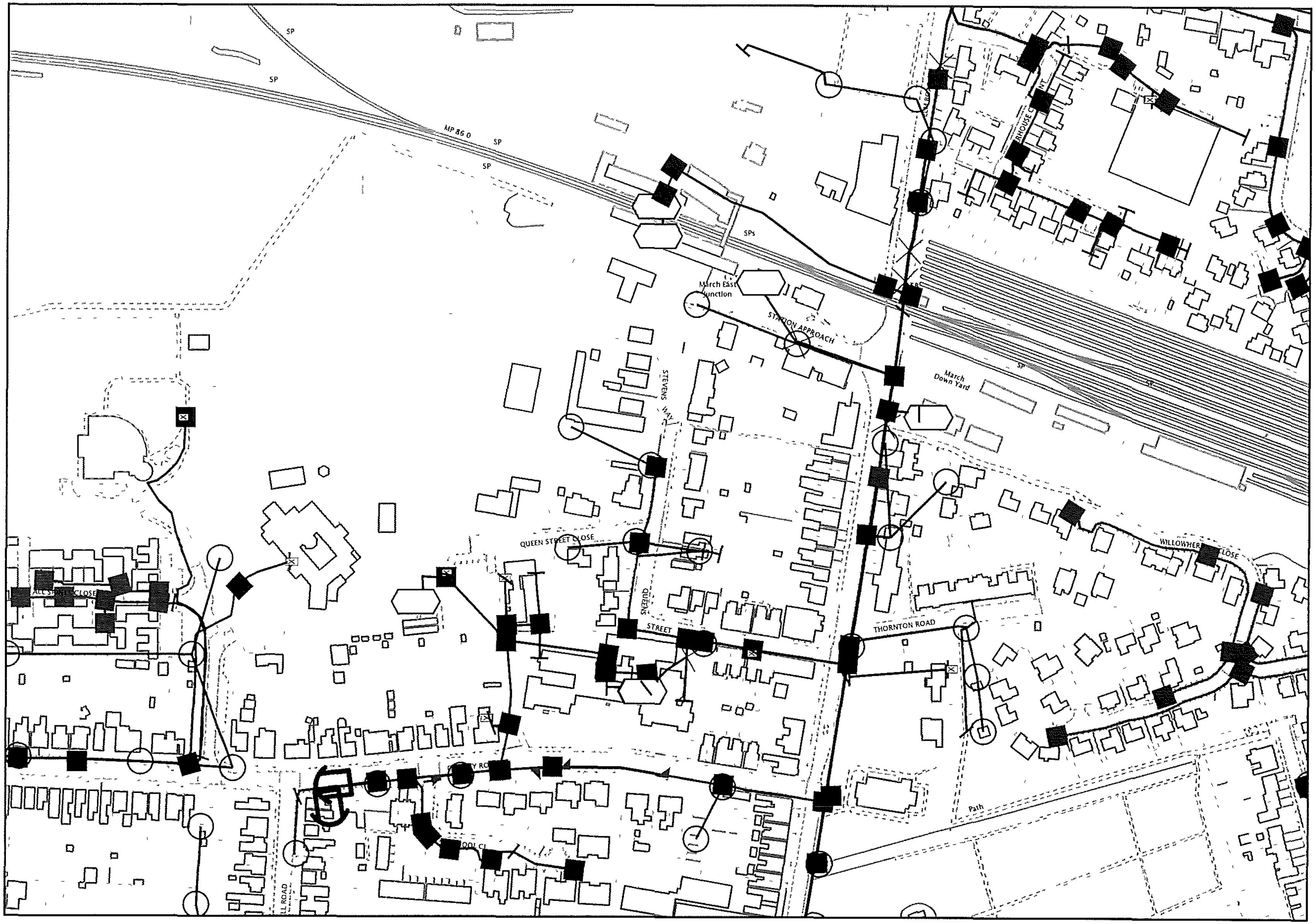

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W.4 UK Power Networks

Registered Office:
Newington House
237 Southwark Bridge Road
London SE1 6NP

Company:
UK Power Networks
(Operations) Limited

Registered in England and Wales No: 3870728

Naomi Ward
Mott MacDonald
Mott MacDonald House
8-10 Sydenham Road
Croydon CR0 2EE
United Kingdom

Julie-Anne Casey
Tel: 01279 824 984
Date 30/03/2020

Networks / EPN / 8500137124 / 3000005
Your Ref:

Dear Naomi,

Re: NTR Cambridgeshire PE13 4EL.
Project Reference Number: 8500137124

Thank you for your recent enquiry regarding the diversionary work at the above site.

BUDGET ESTIMATE FOR DIVERSIONARY WORK

Based upon the information provided with your enquiry, a preliminary assessment of the work required to meet your requirements has been made. Based on this assessment, it is possible that the following assets may be affected:

- Overhead line(s) crossing the site or on/near the boundary of the site.
- Underground cable(s) crossing the site or on or near the boundary of the site.

The budget estimate for altering the above apparatus is £400,000.00 exclusive of VAT.

Work Included in This Budget Estimate

Diverting HV, LV cables and undergrounding HV overhead cables with a relocation of one PMT. Budget cost is based on you carrying out all trench work as agreed with us at Formal estimate stage. We do not provide plans at budget stage.

Please note that this budget does not include any costs for carrying out work on Third Party Land.

Work NOT Included in This Budget Estimate

The Budget Estimate shown above does not include the price of providing any electricity connections. If requested, the cost of these works will be provided separately.

Please note that the Budget Estimate provided has been created from a quick desk top assessment, and is intended as a guide only. If the price of the diversionary work is critical to your decisions or financial commitment to this project, you are strongly advised to consider the option of asking UK Power Networks to provide an estimate for the work.

Should the work proceed, UK Power Networks reserves the right to charge an amount based on the actual cost of the work carried out, and this may vary from any estimate provided.

Application for an Estimate

If you decide to proceed with this project, UK Power Networks will be pleased to provide an estimate for the diversionary work on receipt of your detailed plans indicating your exact requirements.

Important Information

The position of UK Power Networks' existing apparatus shown on any drawings is believed to be correct. UK Power Networks accepts no responsibility in the event of any inaccuracy and should any other cables be discovered on site they must be considered LIVE and DANGEROUS at all times and must not be cut, re-sited, suspended or generally interfered with unless specifically authorised on site by UK Power Networks' Project Manager.

All the cables are UK Power Networks property and remain so even when made dead and abandoned and any such cable exposed should be reported to my Engineering Department for collection and authorised disposal.

In the interest of safety to personnel, equipment, and UK Power Networks apparatus, it is imperative that the approximate position of the underground cables is established before any excavation is commenced. The positions are to be obtained by the use of electronic cable locators and to then be confirmed by careful trial holing, using hand held tools. UK Power Networks CANNOT UNDERTAKE THIS WORK FOR CONTRACTORS. UK Power Networks CableWatch team will be able to advise you in this respect and they can be contacted on free phone 0800 056 5866.

As you are aware the responsibility for site safety of your employees, your contractors and other site visitors rests with the manager on site. All works must be carried out in accordance with the Health & Safety at Works Regulations 1974 and its relevant Regulations, including the Electricity at Work Regulations 1989. It is recommended that you obtain H.S.E. booklet HS(GS)47 which deals with safe digging practises.

Where overhead equipment is either evident on site or shown on UK Power Networks' plans it must be considered live and dangerous at all times. All work in the locality should be carried out in accordance with Document GS6, issued by the Health and Safety Executive, and the Electricity at Work Regulations 1989 must be observed. Work must not be commenced on site until UK Power Networks have attended and agreed the necessary precautions.

Where 132,000 volt cables are present a site meeting will be required to agree the safe method of working in the vicinity of these cables.

UK Power Networks does not have details of equipment owned by National Grid, British Rail, other utilities or Companies or local authorities, and you should contact them to obtain about other cables and lines which may be in the vicinity.

CDM

The Construction (Design and Management) Regulations 2015 apply to most construction work. Before UK Power Networks provide a detailed price, please advise who will be the CDM Coordinator for this development. This information, with details of any particular site hazards, must be provided before UK Power Networks can start design work on this project. Further information about the role of the Client under this legislation is contained in Approved Code of Practice "Managing Health and Safety in Construction" – ISBN 978-0—7176-6223-4.

Should you require any further information or advice, please contact me on the number shown above.

Yours Sincerely

[redacted]

Julie-Anne Casey
Project Designer
PrelimsEPN@ukpowernetworks.co.uk

W.5 Virgin Media

Our Reference : VM/CIP/376965

Mott MacDonald

8-10 Sydenham Road,
Croydon,
CR0 2EE

Virgin Media
1 Dove Wynd
Strathclyde Business Park
Bellshill
ML4 3AL
Tel: 0800 408 0088
Fax: 01698 565 551

21/02/2020

Dear Sir/Madam,

NRSWA 1991 Section 83, 84 & 85 (S142, 143 & 144 Scotland) - C3 Budget Estimate.

Thank you for your enquiry requesting a C3 budget estimate for diversionary works associated with the above site.

We are pleased to provide this budget Estimate below and on the attached documents.

How Much Will this cost?

The estimated cost of altering Virgin Media apparatus (including VAT) is £ 293,449.48.

The estimate is valid for 3 months from the date of this letter and a breakdown of costs can be found in the detailed specification of works attached.

We would like to stress that this is a budgetary estimate and only intended as a guide. The final amount may differ from that shown and you will be charged the full amount for the required alterations. Any outstanding balance whether more or less will be debited or credited to you on completion of works.

Prior to any works involving Virgin Media apparatus being undertaken we must agree a Specification of Works and provide a more Detailed Estimate of costs. The costs incurred in producing the specification and detailed estimate (including VAT) are chargeable and for this scheme they are £ 1,614.88.

Payment is required in advance for the estimated cost of detailed design work and the charge applies whether or not your works proceed.

What's included in this Pack?

1. **A copy of the budget estimate**
2. **A plan of our existing infrastructure annotated to show proposed diversionary works**
3. **Our special requirements and precautions documents**
4. **Payment information**

What Happens Next?

Virgin Media require payment to be made before works commence. You can pay by Cheque, BACS or Purchase Order. Please note that if paying by Purchase Order that no works will start until the invoice is paid. We also require the specification to be signed and returned to indicate agreement with the proposals in the specification.

If making payment by BACS or Cheque please use **VM/CIP/376965** number as your payment reference.

Upon receipt of payment, our planning team will order materials and begin preparation of work instructions for our contractors provisional timescales will be detailed on the attached estimate and specification.

When works are programmed, our Build Engineer will be available to liaise on site and be your point of contact for these works

Legal Stuff

Any works adjacent to our plant must be undertaken in accordance with Health & Safety guidance HS(G)47.

Some of the materials needed for this diversion may have a long lead delivery time and may require advanced ordering. Consideration must be given to this when programming your works. For operational reasons, six months may be necessary to programme some works.

Yours faithfully,

Karl Gough
Network Planner

Our Reference : VM/CIP/376965

C3 Budget Estimate

Client:	Mott MacDonald	
Clients Project:		
Clients Representative:		
Date Estimate Prepared:	21/02/2020	*Valid for 12 weeks*

Direct Labour:	£ 0.00	
Contractor Charges:	£ 175,992.25	
Materials:	£ 0.00	
Overheads:	£ 68,548.98	
Total Cost:	£ 244,541.23	
Total (Inc. VAT):	£ 293,449.48	**PAYMENT IN ADVANCE** (SEE BELOW)

Note:
This C3 budget estimate has been prepared with due care and regard to the NRSWA Act 1991 Diversionary Works Code of Practice by Virgin Media, who accept no liability for errors or omissions.
With works of this nature there can be unforeseen eventualities which may affect the actual charges on completion of the works, you should therefore allow for such contingencies within your project budget.
We will not allow C9,2 discounts without providing a C4 detailed estimate and advanced payments prior to the ordering of materials or the start of works on site.
Timescales quoted are approximate and will be reviewed when we have an opportunity to view and understand the actual construction project plan.
Please provide details of formal Construction (Design & Management) Regulations 2007 appointments for this project together with full details and risk assessments of any known hazards on or adjacent to the site unless you have previously provided these details.
Your request for a C4 detailed estimate should be marked for the attention of the project planner.

Timescales:
Approximately 12 weeks for completion of works, following receipt of the C5 payment and AGREED PROGRAMME OF WORKS & START DATE with appointed Site Agent.
NOTE: ANY alteration to original scheme and/or programme of works may result in a revaluation of timescale and will require agreement between the Virgin Media Project Planner and clients appointed Site Agent.

Estimate Prepared by: Karl Gough

Signature: ______________________________
Contact No:
Virgin Media Limited. Registered Office: 500 Brook Drive, Reading, RG2 6UU.

Sheet Base Details

Enter details to populate required elements to ALL sheets (except Utility reference details)

Reference Number:	VM.CIP.376965
Type of Works:	Diversionary Works - Rechargeable
Customer Name:	Mott Macdonald
Works Address:	Bramley Line PE14 0SR
Originator:	Karl Gough
Contact Number:	03333 434503
Issue Date:	
Office:	Ipswich
Line Manager:	Steve Payton
Planning Region:	East Anglia
VM Partner:	Kelly (Networks - Beds & Anglia)
VM Partner Representative:	

DO NOT DELETE THIS PAGE

Our Reference:	VM.CIP.376965
Customer:	**Mott Macdonald**
Works Address:	Bramley Line PE14 0SR

Work Point Reference Details

No.	Description of exactly what activities should be carried out
WP1	Lower cabled duct to below proposed construction depth for a distance of 25 meters . Demolish and rebuild chamber.
	X545685,Y309023

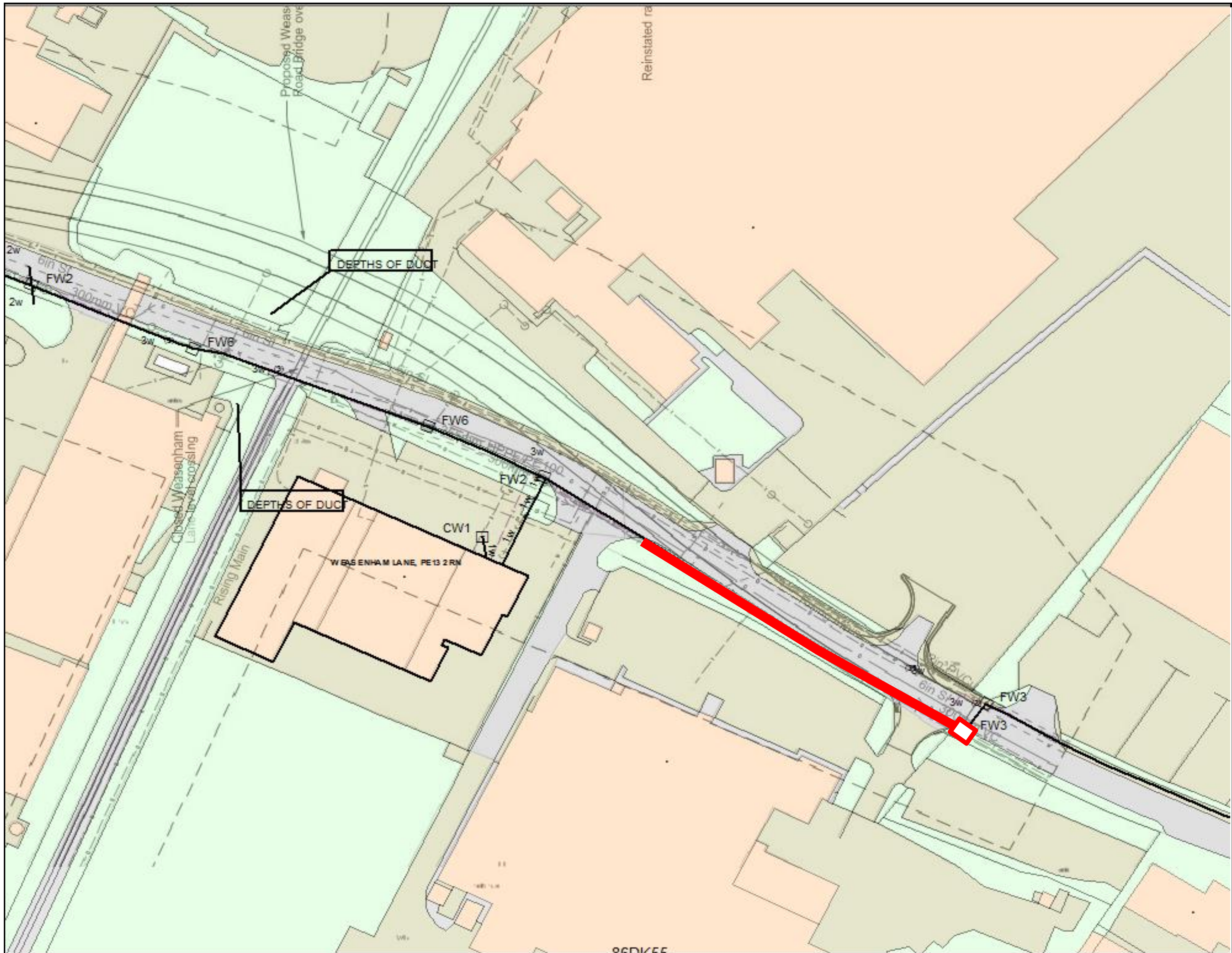
Any modifications to the drawing or use of alternative items to those specified must be agreed with Virgin Media's local planning department

Planned	CIVILS	As-Built	Planned	FIBRE	As-Built
1w	Duct Path with number of ways	1w	XXX	Fibre Cable	XXX
	Chamber with and without Equipment		XXX	National Network Fibre Cable	XXX
	Overground and Underground Cabinet		XXX	Fibre Splice	XXX
2 2	Swept Tee and SID with number of feeds	2 2	XXX	National Network Fibre Splice	XXX
NN OO	National Network / Other Operator	NN OO			

Originator	Karl Gough
Contact Number	03333 434503
Issue Date	00 January 1900
Office	Ipswich
Line Manager	Steve Payton

Virgin Media
280 Bartley Way
Bartley Wood Business Park
Hook
Hampshire
RG27 9UP

Internal Use Only



Our Reference:	VM.CIP.376965
Customer:	**Mott Macdonald**
Works Address:	Bramley Line PE14 0SR

Work Point Reference Details

No.	Description of exactly what activities should be carried out
WP2	Slew and lower cabled duct for a distance of 100 meters . Demolish and rebuild chamber.
	X545938,Y308538

Any modifications to the drawing or use of alternative items to those specified must be agreed with Virgin Media's local planning department

Planned	CIVILS	As-Built	Planned	FIBRE	As-Built
1w	Duct Path with number of ways	1w	XXX	Fibre Cable	XXX
	Chamber with and without Equipment		XXX	National Network Fibre Cable	XXX
	Overground and Underground Cabinet		XXX	Fibre Splice	XXX
2 2	Swept Tee and SID with number of feeds	2 2	XXX	National Network Fibre Splice	XXX
NN OO	National Network / Other Operator	NN OO			

Originator	Karl Gough
Contact Number	03333 434503
Issue Date	00 January 1900
Office	Ipswich
Line Manager	Steve Payton

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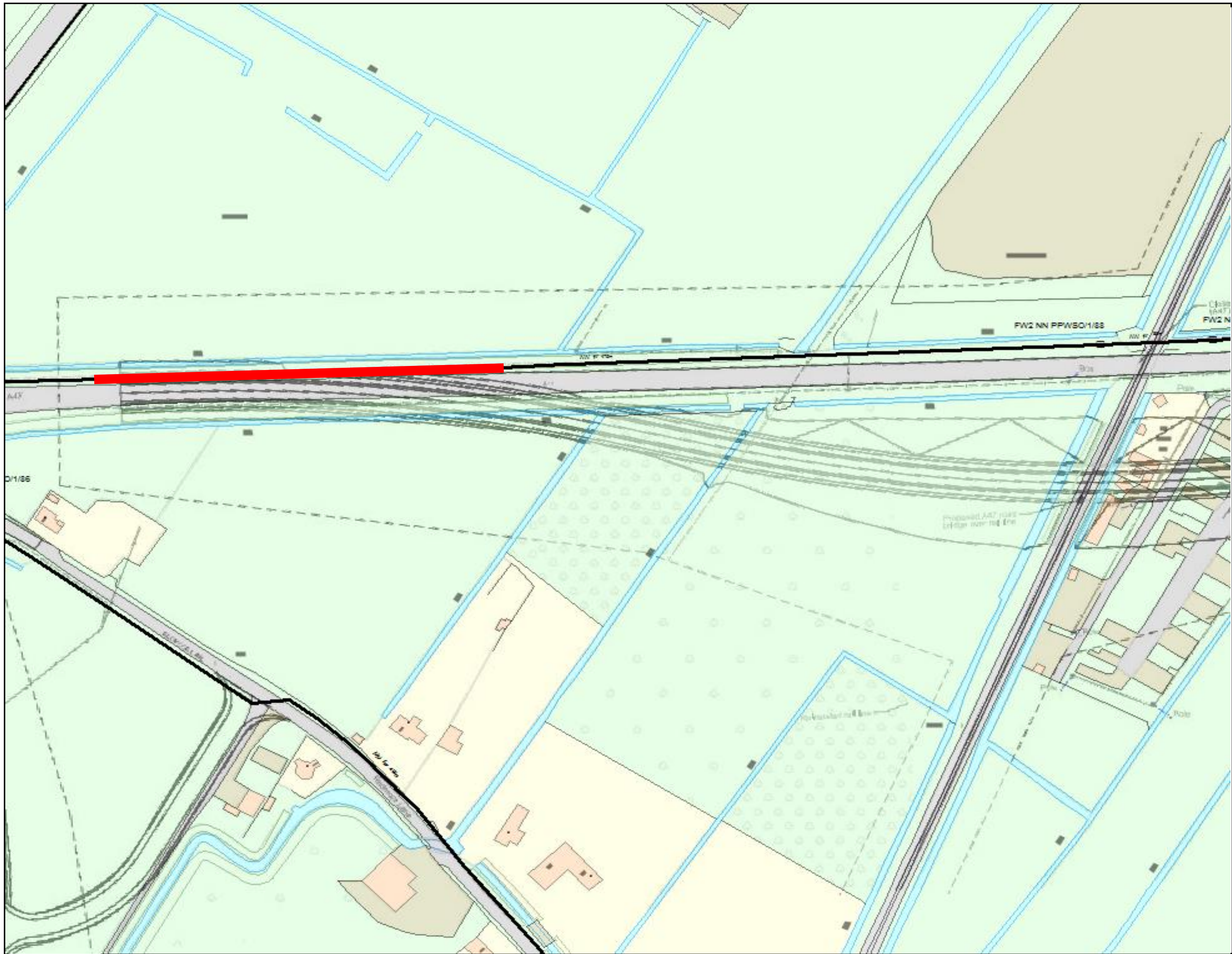

Our Reference:	VM.CIP.376965
Customer:	**Mott Macdonald**
Works Address:	Bramley Line PE14 0SR

Work Point Reference Details

No.	Description of exactly what activities should be carried out
WP3	Slew and lower cabled duct for a distance of 165 meters.
	X545687,Y307482

Any modifications to the drawing or use of alternative items to those specified must be agreed with Virgin Media's local planning department

Planned	CIVILS	As-Built	Planned	FIBRE	As-Built
1w	Duct Path with number of ways	1w	XXX	Fibre Cable	XXX
	Chamber with and without Equipment		XXX	National Network Fibre Cable	XXX
	Overground and Underground Cabinet		XXX	Fibre Splice	XXX
2 2	Swept Tee and SID with number of feeds	2 2	XXX	National Network Fibre Splice	XXX
NN OO	National Network / Other Operator	NN OO			

Originator	Karl Gough
Contact Number	03333 434503
Issue Date	00 January 1900
Office	Ipswich
Line Manager	Steve Payton

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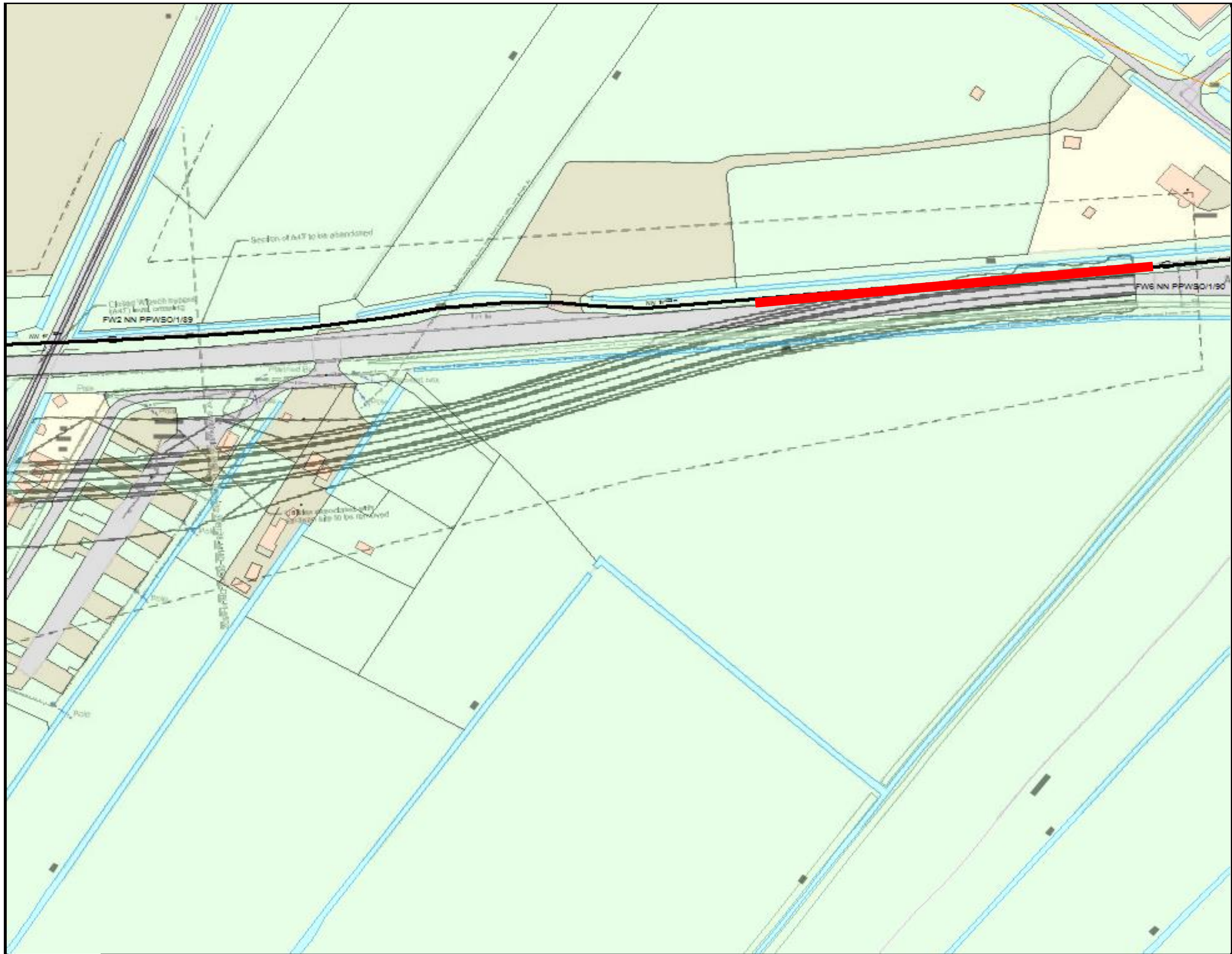
Our Reference:	VM.CIP.376965
Customer:	**Mott Macdonald**
Works Address:	Bramley Line PE14 0SR

Work Point Reference Details

No.	Description of exactly what activities should be carried out
WP4	Slew and lower cabled duct for a distance of 165 meters.
	X545938,Y308538



Any modifications to the drawing or use of alternative items to those specified must be agreed with Virgin Media's local planning department

Planned	CIVILS	As-Built	Planned	FIBRE	As-Built
1w	Duct Path with number of ways	1w	XXX	Fibre Cable	XXX
	Chamber with and without Equipment		XXX	National Network Fibre Cable	XXX
	Overground and Underground Cabinet		XXX	Fibre Splice	XXX
2 2	Swept Tee and SID with number of feeds	2 2	XXX	National Network Fibre Splice	XXX
NN OO	National Network / Other Operator	NN OO			

Originator	Karl Gough
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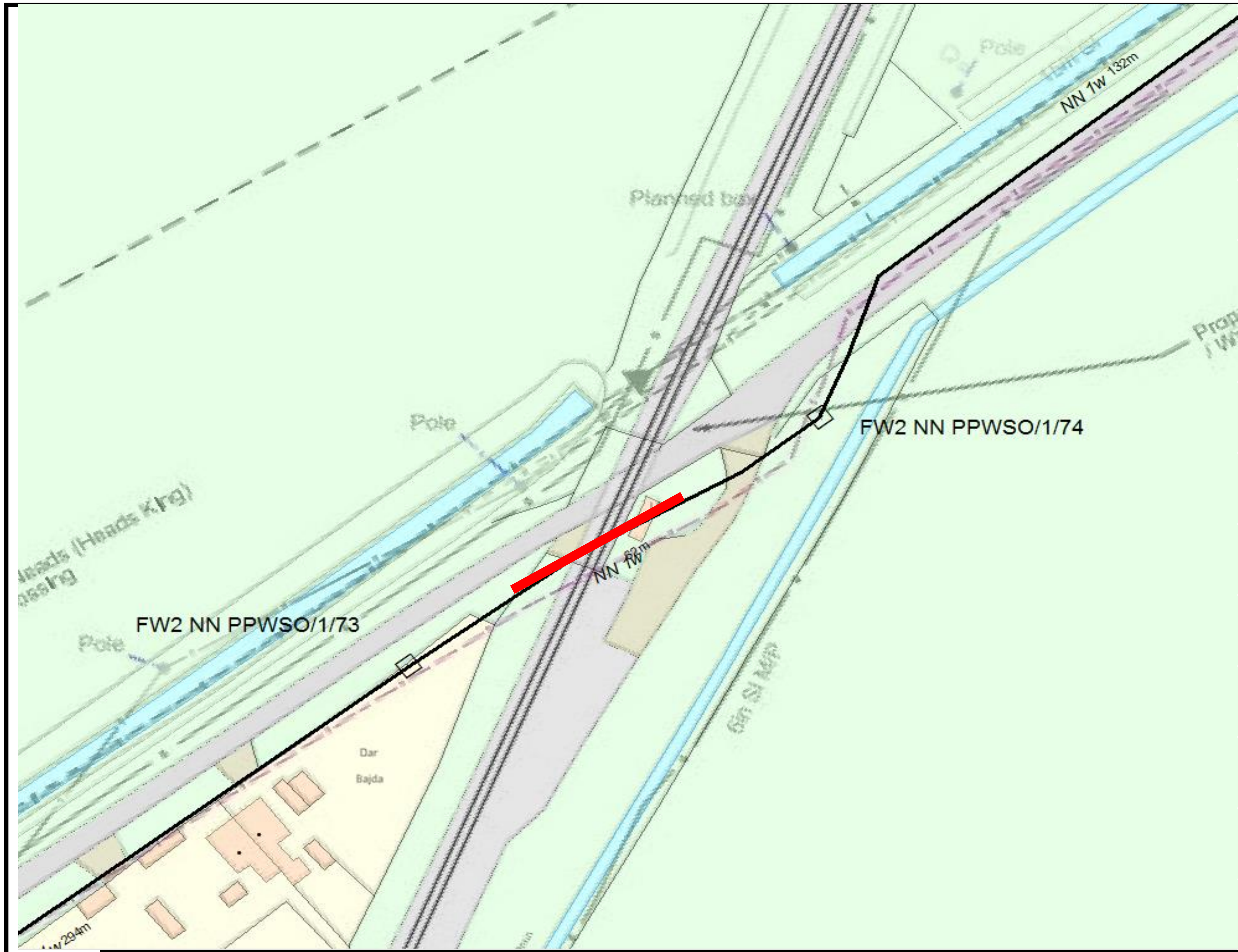

ur Reference:	VM.CIP.376965
ustomer:	**Mott Macdonald**
Vorks Address:	Bramley Line PE14 0SR

Work Point Reference Details

No.	Description of exactly what activities should be carried out
WP5	lower cabled duct for a distance of 30meters.
	X543979,Y304495

Any modifications to the drawing or use of alternative items to those specified must be agreed with Virgin Media's local planning department

Planned	CIVILS	As-Built	Planned	FIBRE	As-Built
1w	Duct Path with number of ways	1w	XXX	Fibre Cable	XXX
	Chamber with and without Equipment		XXX	National Network Fibre Cable	XXX
	Overground and Underground Cabinet		XXX	Fibre Splice	XXX
2 2	Swept Tee and SID with number of feeds	2 2	XXX	National Network Fibre Splice	XXX
NN OO	National Network / Other Operator	NN OO			

Originator	Karl Gough
Contact Number	03333 434503
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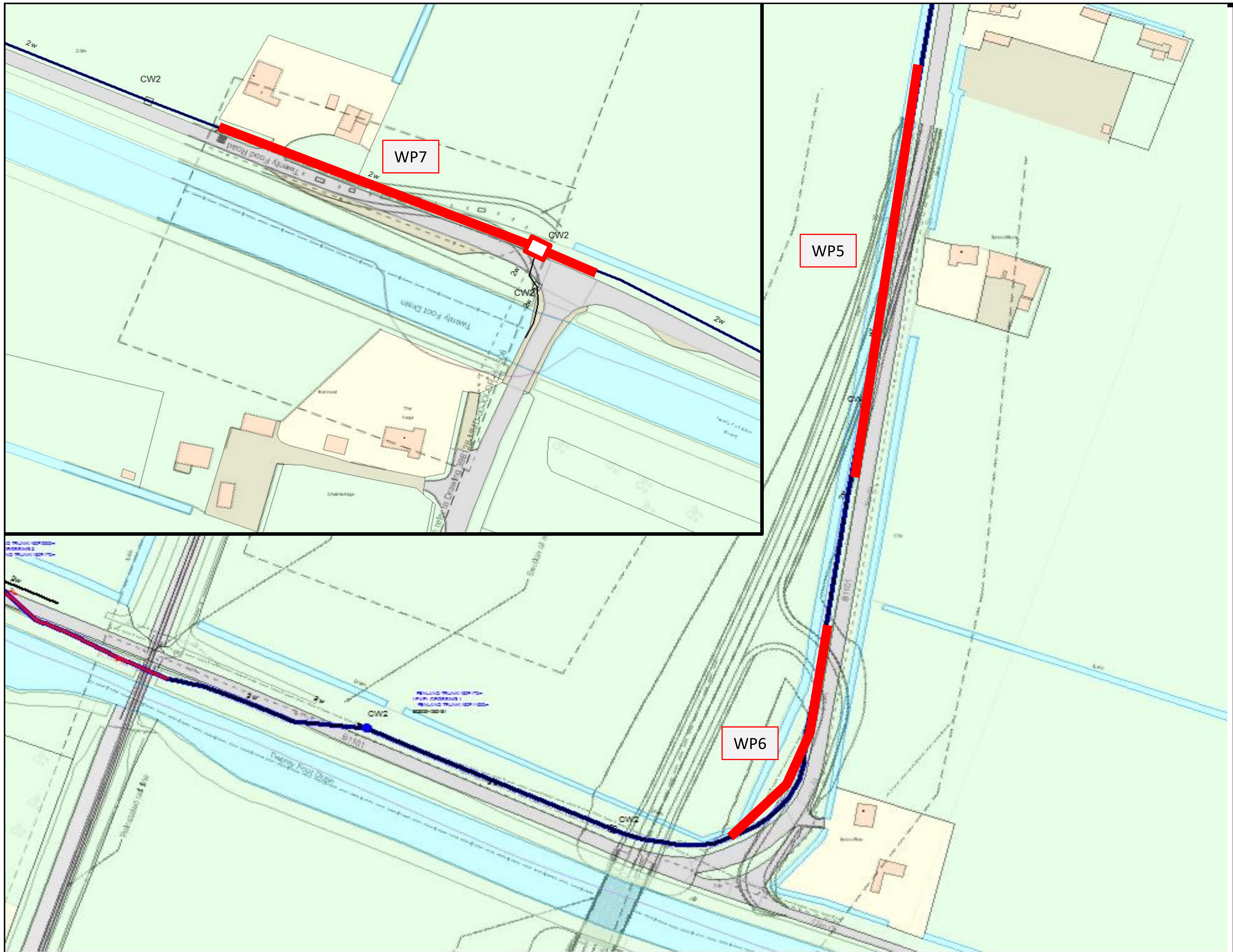

Our Reference:	VM.CIP.376965
Customer:	**Mott Macdonald**
Works Address:	Bramley Line PE14 0SR

Work Point Reference Details

No.	Description of exactly what activities should be carried out
WP5	lower cabled duct for a distance of 180 meters.
WP6	Slew and lower cabled duct for a distance of 125 meters.
WP7	Lower cabled duct for a distance of 150 meters. Demolish and rebuild Carriageway chamber.
	X543979,Y304495

Any modifications to the drawing or use of alternative items to those specified must be agreed with Virgin Media's local planning department

Planned	CIVILS	As-Built
1w	Duct Path with number of ways	1w
	Chamber with and without Equipment	
	Overground and Underground Cabinet	
② ②	Swept Tee and SID with number of feeds	② ②
NN OO	National Network / Other Operator	NN OO

Planned	FIBRE	As-Built
XXX	Fibre Cable	XXX
XXX	National Network Fibre Cable	XXX
XXX	Fibre Splice	XXX
XXX	National Network Fibre Splice	XXX

Originator	Karl Gough
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Issue Date	00 January 1900
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