Bicester Chord Conceptual Site Model

The Chiltern Railways (Bicester to Oxford Improvements) Order 2012

Version 1

July 2013

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ERM

Chiltern Railways

Bicester Chord Conceptual Site Mode: *The Chiltern Railways (Bicester to Oxford Improvements) Order 2012*

July 2013

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For and on behalf of
Environmental Resources Management

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Signed: 

Position: Partner

Date: 9 July 2013

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1 INTRODUCTION

1.1 TERMS OF REFERENCE

The Chiltern Railway Company Ltd ('Chiltern Railways') assisted by Network Rail, has retained Environmental Resources Management Ltd ('ERM') to manage the discharge of planning conditions associated with improving the railway between Oxford and Bicester.

1.2 BACKGROUND TO THE SCHEME

In October 2012, the Secretary of State made the Chiltern Railways (Bicester to Oxford Improvements) Order 2012 ('the Order'). This Transport and Works Act Order authorises the construction and operation of an improved railway between Bicester and Oxford. The Order is accompanied by a planning direction (or 'deemed planning permission') granted by the Secretary of State, which is subject to a number of conditions.

The Order is being implemented by Chiltern Railways assisted by Network Rail.

1.3 PLANNING CONDITIONS RELATING TO LAND QUALITY

In relation to land quality/contaminated land, Condition 11 set out in Annex 1 of the deemed planning permission requires that:

'No development shall commence…until a scheme to establish the presence or otherwise of, assess and, if necessary, remediate contamination at that location, which is likely to cause significant harm to persons, pollution of controlled waters or the environment within that section….

It requires that a scheme of investigation be *'…submitted to and approved in writing by the local planning authority, in consultation with the Environment Agency.'*

The planning condition also notes that the scope of the scheme should include '*all of the potentially contaminated sites identified in Figures 15.1A to 15.1Q in Volume 3 of the Environmental Statement*' and specifically identifies the following areas of interest:

- Bicester Town, Islip, Water Eaton Parkway and Oxford station works; and
- sites of the proposed bridges, culverts or other below ground structures.

If the remediation of land contamination is required at any location, Condition 11 states that *'all remedial measures shall be undertaken before*

development at that location is commenced, unless agreed in writing with the local planning authority. Further, that a verification report is provided to demonstrate that the '*agreed remediation has been completed and that the necessary degree of decontamination has been achieved*'.

In the event that previously unidentified contamination is encountered during development, '*no further construction shall be undertaken at that location ,unless otherwise agreed in writing with the local planning authority, until a scheme to assess and remediate that contamination… has been submitted to and approved in writing by the local planning authority, in consultation with the Environment Agency*'.

1.4 SCOPE AND OBJECTIVES OF THIS REPORT

The objectives of this report are to:

- develop a desk-based preliminary conceptual site model for the new chord line which is proposed from the Gavray Junction, to join the Chiltern Mainline at a new junction (Bicester South), identifying potential receptors that may be at risk, potential contaminant pathways which may be present, and the contaminant sources based upon the current and historical uses of the site its surroundings;

- determine the need, if any, for further intrusive investigation along the Bicester chord line, based on an evaluation of the likely exposure and its potential significance to identified receptors; and

- propose a scope of further works along the Bicester chord line, where required.

This report discusses the Bicester chord line only. Footbridges, the stations, embankments and cuttings, and other structures will be discussed in separate reports.

1.5 REPORT STRUCTURE

For ease of reference, the remainder of this report has been split into the following sub-sections:

- Site Location and Proposed Development
- Design of Structure
- Environmental Setting
- Preliminary Conceptual Site Model
- Conclusions and Recommendations

1.6 SOURCES OF INFORMATION AND ASSUMPTIONS

The sources of information that have been used in the production of this report are presented in *Table 1.6a*.

Table 1.6a Data Sources for the Assessment of Potential Contaminant Sources, Potential Contaminant Receptors and Exposure Pathways

Information	Data Source(s)
Site location and proposed development	Online aerial photography, OS mapping, Envirocheck* (landfill and pollution data), site visit (2 May 2013), engineering AIP documents.
Design of structure	Engineering AIP documents
Site history	Historical OS maps from Envirocheck**, Envirocheck* (historical landfill data).
Geology	BGS 1:50,000 geological map Sheet 219 *'Buckingham'* Solid & Drift ed., Atkins ground investigation data.
Hydrogeology	Abstraction information obtained from EA under licence, Envirocheck* (groundwater topics), Atkins ground investigation data.
Hydrology	OS mapping, online aerial photography, Envirocheck*, RBM plan, site visit (2 May 2013), abstraction information obtained from EA under licence.
Designated ecological sites	English Nature website, communication with ERM ecologists.

AIP – Atkins *Approval In Principle Form F001* Bicester South West Chord Earthworks, dated December 2012
* - Envirocheck report 46681148_1_1 *'Bicester Chord'* 6 June 2013
** - Envirocheck report 27207960_1_1 *'Chiltern Railways Project Evergreen 3'* 5 February 2009

The study areas used for the sites are the same as those used in the Environmental Statement(1) and are listed in *Table 1.6b*.

Table 1.6b Study Areas Assessed in Desk Study Review

Information	Study Area
Potential historic and current sources of contamination	500 m buffer from the centre line from Bicester South Junction and A41, and from Peartree Park & Ride to Oxford station. 100 m buffer from the centre line in the rural section between the urban ends (from A41 to Peartree Park & Ride)
Human neighbours	500 m radius from feature.

(1) Environmental Resources Management Ltd. '*The Chiltern Railways (Bicester to Oxford Improvements) Order Environmental Statement*' ref. 0094441. December 2009.

Information	Study Area
Geological strata	Within the Limit of Deviation* of the site.
Aquifer designation and groundwater vulnerability	Within the Limit of Deviation of the site.
Groundwater source protection zones	1 km distance either side of the centre line.
Surface water courses	500 m distance either side of the centre line.
Licensed surface water abstractions	500 m distance either side of the centre line.
Designated ecological sites	500 m buffer from the centre line from Bicester South Junction and A41, and from Peartree Park & Ride to Oxford station. 100 m buffer from the centre line in the rural section between the urban ends (from A41 to Peartree Park & Ride)

*Limit of Deviation - the horizontal limits of where construction may occur

2 SITE DESCRIPTION

2.1 SITE LOCATION AND PROPOSED DEVELOPMENT

The new chord line is proposed to be constructed approximately 600m east of Bicester town centre between the existing Chiltern Main Line at Gavray Junction (at project chainage 1110022m) and the Oxford Branch Line at the new Bicester South Junction (at project chainage 1109081m) (*Figure 2.1a*).

The route of the proposed chord line is currently agricultural land divided by a stream (Langford Brook) which flows under the Chiltern Main Line through Langford Brook culvert (structure NAJ3-25). A footpath is located towards the western side of the agricultural land and runs parallel to the Oxford Branch Line. A new footbridge is proposed to be constructed across the new chord line.

The proposed chord line is located in an urban setting with the following neighbouring land uses:

- *North and East* – Existing railway lines with industrial estates beyond; and
- *South and West* – agricultural land with residential housing beyond.

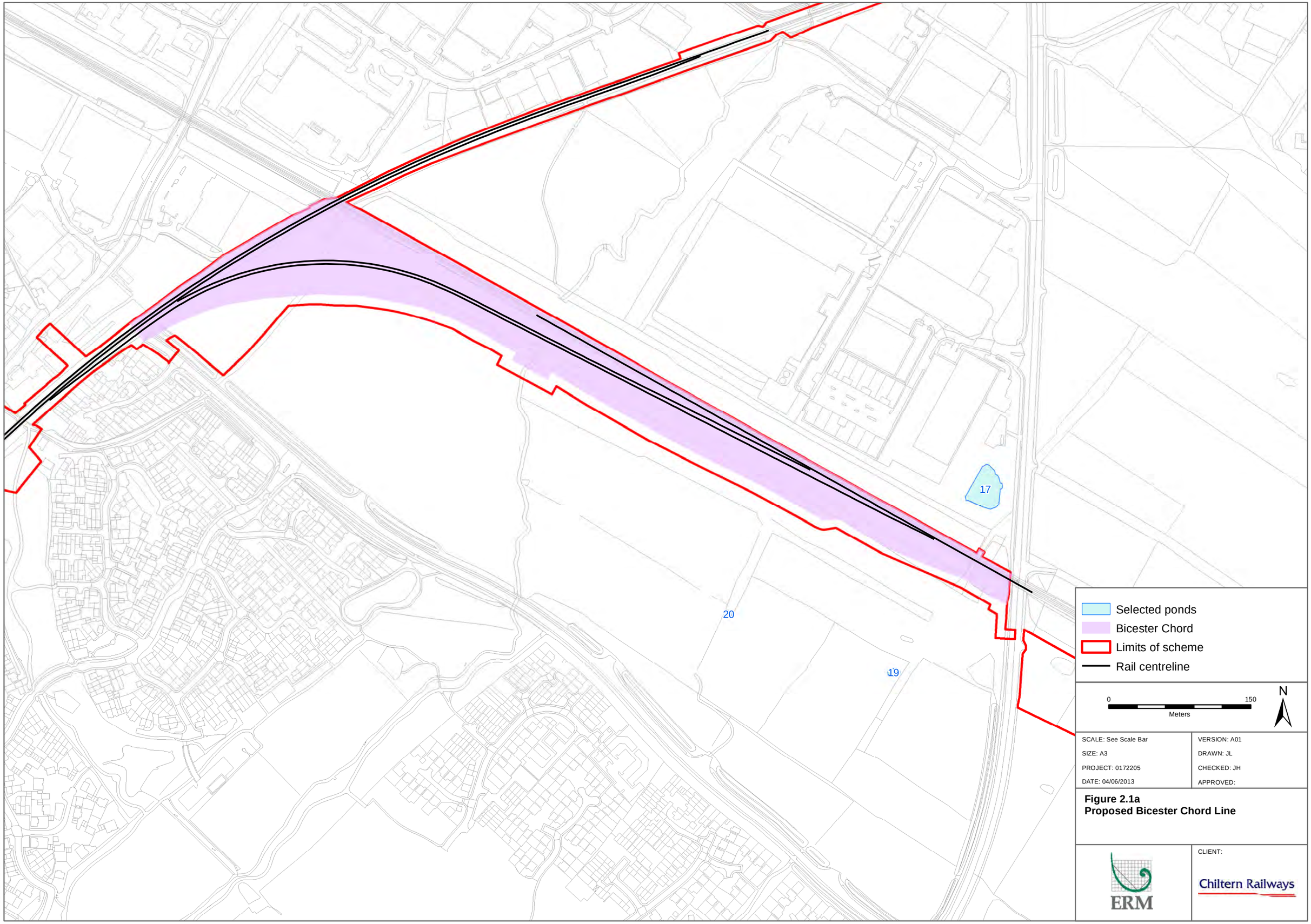
The industrial estate primarily consists of distribution depots with possible localised refuelling activities.

2.2 DESIGN OF EARTHWORKS

The Approval In Principle reports (AIP) for Bicester Chord (1) and the proposed new footbridge (2) provides details of the proposed design for the earthworks. *Figure 2.2a* reproduces the general arrangement provided in the Bicester Chord report.

In terms of earthworks during construction, the AIP states that the proposed line will commence at grade at the Oxford Branch Line end and gradually climb on a new embankment until it merges into the Chiltern Main Line embankment. The top of the proposed new embankment will be approximately 10.4m wide. The embankment supporting the new chord line (acting as a berm) will be benched (minimum benched thickness of 500mm) into the existing main line embankment.

(1) Atkins 'East-West Rail: *Phase 1 Bicester South West Chord Earthworks Form F001: Approval in Principle*' 5114534-ATK-EWRP1-GEO-004 Revision A01, 17th December 2012.
(2) Atkins 'East-West Rail: Phase 1 Bicester Chord Footbridge Form F001: Approval in Principle' 5114534-ATK-CST-FRM-008101 Revision A01, 21st December 2012.



SCALE: See Scale Bar | VERSION: A01
SIZE: A3 | DRAWN: JL
PROJECT: 0172205 | CHECKED: JH
DATE: 04/06/2013 | APPROVED:

Figure 2.1a
Proposed Bicester Chord Line

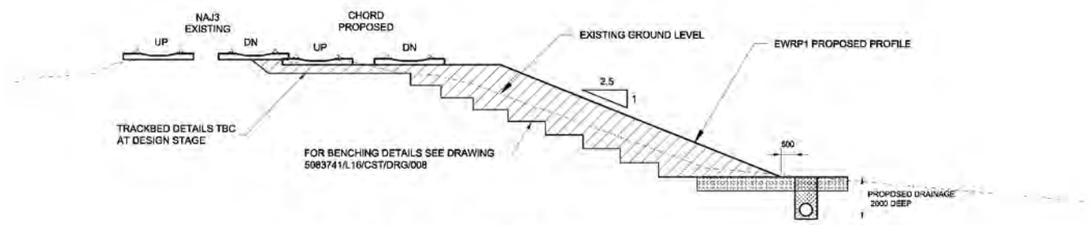
CLIENT: Chiltern Railways

ERM

PROJECTION: British National Grid

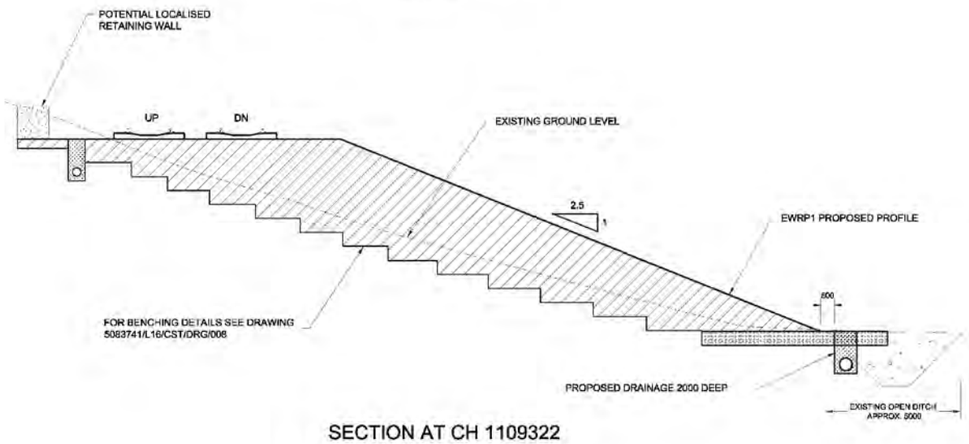
Path: C:\Users\john.lee\Documents\GIS_Data\0172205ChilternGIS_AZ_SG\MAPS\PROJECT_DETAILS\0172205_ProposedBicesterChordLine_A02.mxd

Drawing Number 5114534-ATK-DRG-GE-000221 | A01



SECTION AT CH 1109187

SCALE 1:100



SECTION AT CH 1109322

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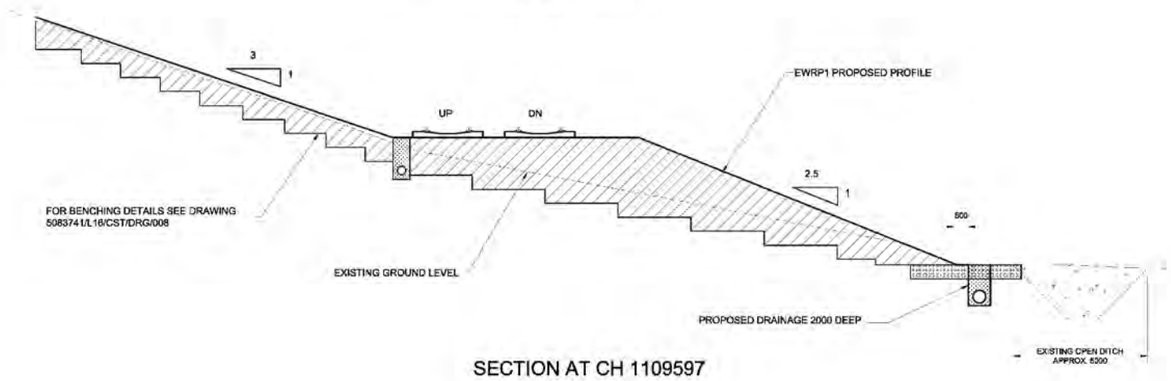
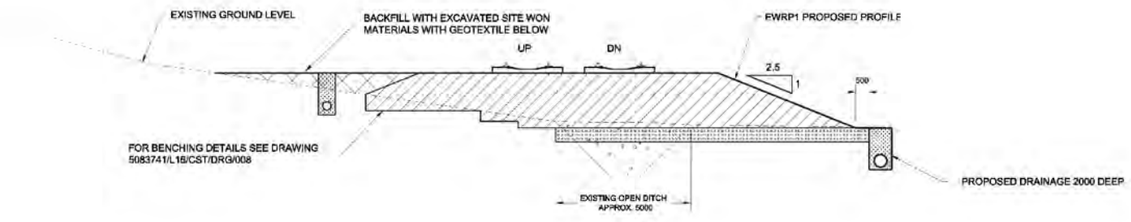


SECTION AT CH 1109597

SCALE 1:100



SECTION AT CH 1109732

SCALE 1:100

Note: Drawing 5114534-ATK-DRG-GE-000221 from 'East-West Rail: Phase 1 Bicester South West Chord Earthworks Form F001: Approval in Principle' 5114534-ATK-EWRP1-GEO-004 Revision A01. Atkins, 17th December 2012.

SCALE: Unknown	VERSION: A01
SIZE: A3	DRAWN: JL
PROJECT: 0172205	CHECKED: ST
DATE: 05/06/2013	APPROVED:

Figure 2.2a
Proposed Chord Line Earthworks

ERM

CLIENT: Chiltern Railways

PROJECTION: British National Grid

Path: C:\Users\john.lee\Documents\GIS_Data\0172205ChilternGIS_AZ_SG\MAPS\PROJECT_DETAILS\0172205_ProposedChordLineEarthworks_A01.mxd

An existing toe ditch along the main line embankment is to be infilled and a new open ditch toe drain is to be installed along the new toe and discharge into Langford Brook at project chainage 1109542 m. The existing arch culvert is to be extended by approximately 7.5 m in order to accommodate the widened embankment. The extension will take the form of a reinforced concrete box culvert to maintain the watercourse beneath the proposed widened embankment.

The AIP report states that benching of the existing mainline embankment will generate only minor quantities of surplus material, which may be used for landscaping on the new chord earthworks.

It is also reported that the existing footpath crossing the route of the chord will be accommodated by a footbridge.

In terms of ground disturbance during construction of the footbridge, the AIP states that the foundations will comprise around eight footings supporting reinforced concrete pad foundations. The exact depth of these foundations is to be confirmed by additional site investigations. It is anticipated that any soft strata present at an approximate depth of 1 meter below ground level (m bgl) to 1.5 m bgl will be removed and replaced with suitable engineering fill material. Ground improvement e.g. soil/cement mixing, dynamic compaction may be considered as an alternative to excavating and replacing the fill if this is considered to be a more cost effective solution.

Where Made Ground is encountered, it will be assessed for its suitability for re-use, and used as backfill around foundations either at this location or where there is a requirement for suitable fill. Any unsuitable material will be removed from site.

3 ENVIRONMENTAL SETTING

3.1 SITE HISTORY

The earliest available historical map, dated 1881, indicates that the area of the proposed chord line comprised agricultural land with a stream bisecting the centre of the site and the Oxford Branch Line along the northern boundary of the site (in its existing location). Other than field boundary changes, and the construction of the Chiltern Main Line (first identified on the 1922 map) along the eastern boundary of the site (in its existing location), the land use has remained unchanged.

In addition to the current railway lines, themselves a possible source of historical contamination, sites with potential for historical contamination to be present nearby comprise:

- Gasworks constructed early 1970's, labelled as works disused by 1973 and as an industrial estate from the mid 1980s (including a builders yard between mid 1980s and early 1990s). *Immediately north east of the crossing between the existing branch and main lines.*

- Industrial estate first identified in the mid 1990s to the present day. *Adjacent to the eastern boundary of the Chiltern Main Line*.

- Engineering works constructed late 1960s then builder's yard 1970s and 1980s. Currently being redeveloped for housing. 10*0 m to the west.*

3.2 GEOLOGY

Superficial/drift deposits consisting of alluvium comprising clay, silt, sand and gravel is identified within areas close to Langford Brook. No drift geology is identified within areas away from the Brook. The bedrock geology consists of Jurassic Kellaways Clay Member mudstone (<2m thick) underlain by the Calcareous Greater Oolite Group, the top of which comprises 1-4m of Cornbrash Member (medium to fine grained limestone) underlain by 2-7m of Forest Marble Member (interbedded limestone and mudstone).

Atkins has undertaken ground investigation works in the locality of the proposed Bicester Chord. The position of the investigation locations and the logs are attached in *Annex A*.

BH39, BH40 and BH41 were advanced in March 2013 and located along the route of the proposed chord line either side of Langford Brook. Made Ground was encountered within a single location (BH41) to a depth of 1.1 m bgl and comprised sandy gravelly, ashy clays with occasional slag gravel. Natural strata consisting of a soft orange sandy Clay (considered likely to be alluvium)

was identified to depths of between 1.4m bgl and 1.5m bgl within BH39 and BH40. The Made Ground within BH41 and soft clay in BH39 and BH40 was underlain by a firm grey Clay, becoming stiff, and terminating at depths of between 2.9m bgl and 3.35m bgl on limestone, believed to be the top of the Cornbrash Member.

3.3 HYDROGEOLOGY

The alluvium deposits are identified as a Secondary A drift aquifer. The Kellaways Clay Member is designated as unproductive strata. The underlying Greater Oolite Members are designated as Secondary A bedrock aquifers.

The site is not located in a groundwater source protection zone and there are no currently licensed groundwater abstractions within 1 km of the site.

Groundwater seepages were encountered at depths of between 0.2m bgl (BH41) and 1.0m bgl (BH40) with Made Ground and Alluvium deposits, during the excavation of hand dug starter pits. No groundwater was identified during actual drilling works.

3.4 HYDROLOGY

The nearest named surface water course is Langford Brook which bisects the site flowing north to south. The Environment Agency has assessed its current ecological status in the vicinity of the site to be Moderate and predicts that it will have improved to Good by 2015, although the Agency evaluates that there is a risk that this may not be achieved. It does not consider that chemical quality requires assessment.

A drainage ditch runs along the toe of the existing Chiltern mainline embankment which discharges into Langford Brook. It is understood the existing drainage ditch will be infilled as part of the works and a new toe drain installed.

3.5 DESIGNATED ECOLOGICAL SITES

Three water bodies, pond 17 (50m north) and ponds 19 & 20 (70m south) (see *Figure 2.1a*) have been identified as containing a medium meta-population of greater crested newts.

4 PRELIMINARY CONCEPTUAL SITE MODEL

4.1 INTRODUCTION

The preliminary conceptual site model (CSM) has been developed in accordance with industry good practice. It uses the information and data presented in *Sections 2 & 3* to identify plausible contaminant-pathway-receptor contaminant linkages in the context of the proposed development of Bicester Chord. The findings of the CSM are used to determine the potential risks associated with land quality in the context of likelihood of unacceptable exposure of sensitive receptors.

4.2 POTENTIAL PRIMARY SOURCES OF CONTAMINATION

On-Site

The proposed chord line will be benched into the existing railway embankments and the existing toe drainage ditch infilled to allow the construction of the chord line. It is understood that the railway ballast has been replaced on an 'as needed' basis, typically on 20 year cycles. There is potential for the track bed to be impacted historically by creosote seeping from wooden sleepers and from oils, greases and diesel fuel which could leak/drip from passing trains. Such substances may also be found within the existing toe drainage ditch. Other contaminants that may have impacted the ballast include: weedkillers such as atrazine, simazine, diuron and glyphosate which may have been used in track maintenance; antifreezes such as ethylene glycol ; and pathogens associated with disposal of sanitary waste from passing trains. However, sanitary waste contaminants are considered unlikely to be present at significant concentrations because they are not persistent in the environment.

Off-Site

A gas works was historically present adjacent to the northern boundary of the site (but beyond the existing railway lines) which may give rise to localised impacts on soils and groundwater from ammoniacal liquors, coal tar, spent oxide, metals and coal dust.

The historical and existing industrial estates directly adjacent to the northern and eastern boundaries of the site primarily consist of distribution depots. Activities may include localised refuelling, which may result in localised hydrocarbon impact to soils and groundwater.

Sources Discounted from Further Assessment

The engineering works and subsequent builder's yard 70 m to the north is currently being redeveloped for housing and so it is presumed that the site

will be suitable for use under the current planning regime and that no sources of contaminants remain at the site.

4.3 *OBSERVED IMPACT AND ANALYTICAL RESULTS*

A sulphurous odour was noted within Made Ground encountered within BH41 between 0.8m bgl and 1.1m bgl, described as ashy clayey sand with gravel of slag. No chemical analytical data is currently available for the land associated with the proposed chord line.

4.4 *POTENTIAL RECEPTORS*

The following potential receptors of soil and/or groundwater impact were identified:

- Local residents to the west of Gavray Drive approximately 180m west of the proposed chord line;
- Users of the public footpath in the north of the site;
- Local employees in industrial estates to the north and east;
- Current and future embankment toe drainage ditch;
- Langford Brook which crosses the site;
- Secondary A aquifers including recent alluvial drift deposits and Cornbrash and Forest Marble Members (near surface).

Groundworkers are discounted from this assessment because they will be protected through health and safety systems and controls during the works. It is anticipated that procedures for worker protection will be covered by method statements which will be produced by the contractor.

Any below ground structures are discounted from this assessment because the engineers (Atkins) are independently evaluating soil and groundwater chemical data in order to finalise detailed design requirements and to ensure that suitably chemically-resistant construction materials are used.

4.5 *HYDROGEOLOGICAL MODEL*

Groundwater seepages were encountered within the Made Ground and Alluvium at depths of between 0.2m bgl and 1.0m bgl during the excavation of hand dug starter pits. No groundwater was identified during the actual drilling works. There is insufficient data to infer a groundwater flow direction, but based on the topography and location of Langford Brook, it is

inferred that regional groundwater flow direction will be towards the south-east. i.e. that contaminants could be leaching into groundwater from off-site contaminant sources (former gas works and industrial estate) and migrating towards the route of the proposed chord line. Therefore, there is potential for saturated and capillary zone soils within the chord line route to be impacted by off-site contaminant sources.

The alluvium Secondary A aquifer is separated from the underlying Cornbrash and Forest Marble Members by Kellaways Clay Member which is unproductive strata. However, as the Kellaways clay is likely to be <2 m thick in the area, hydraulic continuity between the alluvium and Great Oolite Group is assumed.

It is assumed that shallow groundwater within the alluvium could migrate towards Langford Brook to the east and be in hydraulic continuity.

The AIP report describes the existing main line railway embankment, in which the proposed chord line is to be benched, to be approximately 8m high and 9m wide, therefore the potential for the migration of groundwater into the actual embankment material which is to be excavated is considered unlikely.

The existing and proposed new toe drainage ditch along the main line embankment discharges into Langford Brook. Langford Brook is culverted beneath the existing embankment which is proposed to be extended in order to accommodate the widened embankment.

4.6 EVALUATION OF POTENTIAL CONTAMINANT LINKAGES

Table 4.6a provides an evaluation of the potential contaminant linkages to determine which are considered to be plausible.

Table 4.6a: Evaluation of Potential Contaminant Linkages

Potential Contaminant	Receptors	Pathways	Evaluation	Plausible Contaminant Linkage?
All contaminants	• Langford Brook & embankment drainage ditch (adjacent)	Deposition of air-borne soil particles.	CoCP states that precautions will be taken to prevent air-borne dusts from entering any bodies of water (Section 7)	No
		Deposition of water-borne soil particles.	CoCP states that precautions will be taken to prevent water-borne dusts from entering any bodies of water (Section 7)	No
		Lateral migration in groundwater	Contaminants derived from site not considered to be significant based on evidence from logs. Mobilisation of contaminants in groundwater derived from off-site sources possible.	Yes
	• Secondary A aquifers (near surface)	Leaching from sorbed phase	Contaminants derived from site not considered to be significant based on evidence from logs. Mobilisation of contaminants in groundwater derived from off-site sources possible. Vertical migration considered unlikely given shallow depth of excavation for the earthworks.	Yes
	• Local residents • Users of public footpath • Local employees	Dermal contact and ingestion of soil particles (on-site)	CoCP states that work sites will be secured to prevent unauthorised access (Section 4)	No

Potential Contaminant	Receptors	Pathways	Evaluation	Plausible Contaminant Linkage?
		Dermal contact, ingestion and inhalation of soil particles (off-site)	Dust suppression and prevention measures during construction are included in the CoCP (Sections 4 and 7)	No
	• Ecological systems (Great Crested Newts within Ponds 17, 19 & 20)	Deposition of air-borne soil particles.	CoCP states that precautions will be taken to prevent air-borne dusts from entering any bodies of water (Section 7)	No
		Deposition of water-borne soil particles.	CoCP states that precautions will be taken to prevent water-borne dusts from entering any bodies of water (Section 7)	No
		Lateral migration in groundwater	Contaminants derived from site not considered to be significant based on evidence from logs. Mobilisation of contaminants in groundwater derived from off-site sources possible.	Yes
Volatile compounds	• Local residents • Users of public footpath • Local employees	Vapour inhalation	No VOC odours recorded. Sulphurous odour from slag likely to be localised and associated with sulphur in slag. CoCP states requirement for suitable monitoring and mitigation where the potential for VOC emissions exists.	No

CoCP – Code Of Construction Practice

The Code of Construction Practice (CoCP)(1) provides mitigation measures that remove the pathways from most of the identified potential contaminant linkages. The plausible linkages that remain are restricted to the potential to mobilise contaminants that are derived from off-site sources during excavation of the embankment drainage ditch and footings of the proposed footbridge. The ultimate receptors for this mobilisation could be Langford Brook and the near-surface Secondary A aquifers (Alluvium, Cornbrash Member and Forest Marble Member).

No chemical data is available for the land associated with the proposed chord line, however, an evaluation of the available window sampling logs does not indicate that gross contamination is present. Given that the existing main line railway embankment is approximately 8m high and 9m wide, the potential for groundwater migration within the embankment is considered to be low, with the toe drainage ditch predominantly collecting surface water run off from the embankment. The proposed works involve the construction of a new embankment for the chord line to allow it to merge into the existing Chiltern Main Line. Construction of the new embankment will include a Materials Management Plan which will control the quality of materials used within the construction of the embankments to help ensure that it is suitable for use and not pose a risk to human health or the environment.

It is recommended that this information is provided to the construction contractor to ensure that an awareness for potential contamination to be present is communicated to all employees and sub-contractors working at the site.

In the event that contaminated groundwater enters an excavation on site, then it will require removal before the excavated area can be back backfilled. Dewatering should be applied which minimises additional ingress of contaminated water, as this is likely to be migrating from an off-site source.

(1) Environmental Resources Management Ltd. '*Chiltern Railways (Bicester to Oxford Improvements) Order Code of Construction Practice*' v.5. ref. TWA/10/APP/01/Oxford/ALL/C18/CoCP. April 2013.

Annex A

Atkins Borehole Logs and Exploratory Location Plan

NICHOLLS COLTON GEOTECHNICAL

BOREHOLE RECORD - BH39

(Window Sampler)

Site
EWRP1 - Bicester Offline Chord.

Client
Atkins Limited

Boring diameter:	Casing diameter:	Project No.:
100 mm to 3.00m	100 mm to 2.00m	G13066

Logged by: NB	Ground Level:	Date: 28/03/2013	Location: -	Scale: 1:30

Samples & In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill
Ref:	Depth (m)	SPT N						
E1	0.30-0.40					Vegetation over very soft red brown sandy CLAY with rare coarse angular limestone gravel and many roots.		
B2	0.50-0.60				0.50			
E3	0.60-0.70		▼			Soft orange brown and pale grey mottled sandy CLAY with occasional roots.		
E4	1.00-1.10							
D5	1.10-1.20							
S	1.20	N=3						
SD6	1.20-1.65					... with small pockets of silty fine to medium sand from 1.20m.		
D7	1.50-2.00				1.50			
						Firm orange brown and grey CLAY.		
S	2.00	N=2						
SD8	2.00-2.45					. . . Note: SPT value not indicitive of clay strength recovered in liners.		
D9	2.60-2.90				2.60			
						Stiff fissured grey CLAY.		
D10	2.90-3.00				2.90			
S	3.00	50/10mm			3.00	Stiff dark grey CLAY with many shells. ... SPT at 3.00m refused (bouncing) probably on Limestone rockhead (no recovery); borehole terminated.		
						End of Borehole at 3.00 m		

Remarks and Water Observations

1. Hand dug starter pit to 1.20m to check for services.
2. Groundwater seepages were encountered at 0.70m during excavation of the hand dug starter pit.
3. The borehole was backfilled with the spoil arisings.

NICHOLLS COLTON GEOTECHNICAL

BOREHOLE RECORD - BH40

(Window Sampler)

Site
EWRP1 - Bicester Offline Chord.

Client
Atkins Limited

Boring diameter:	Casing diameter:	Project No.:
100 mm to 3.10m	100 mm to 2.00m	G13066

Logged by: NB	Ground Level:	Date: 28/03/2013	Location: -	Scale: 1:30

Samples & In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill
Ref:	Depth (m)	SPT N						
						Turf over very soft red brown sandy CLAY.		
E1	0.30							
D2	0.30-0.45				0.45			
						Soft orange sandy slightly gravelly CLAY (gravel is coarse angular flint).		
E3	0.60							
B4	0.60-0.80				0.80			
						Soft orange and grey brown locally sandy CLAY.		
E5	1.00		▼					
D6	1.10-1.20							
S	1.20	N=6						
SD7	1.20-1.65							
D8	1.40-1.60				1.40	... becoming firm from 1.30m.		
D9	1.60-2.00				1.60	Firm orange brown and white mottled locally sandy CLAY.		
						Firm orange grey and yellow mottled CLAY with occasional selenite crystals.		
S	2.00	N=7						
SD10	2.00-2.45							
D11	2.00-2.60							
D12	2.60-3.00				2.60			
						Stiff fissured grey CLAY.		
S	3.00	50/5mm			3.05			
SD13	3.00-3.10				3.10	Weak grey LIMESTONE.		
						End of Borehole at 3.10 m		

Remarks and Water Observations

1. Hand dug starter pit to 1.20m to check for services.
2. Slight groundwater seepages were encountered at 1.00m during excavation of the hand dug starter pit.
3. The borehole was backfilled with the spoil arisings.

NICHOLLS COLTON GEOTECHNICAL

BOREHOLE RECORD - BH41

(Window Sampler)

Site
EWRP1 - Bicester Offline Chord.

Client
Atkins Limited

Boring diameter:	Casing diameter:	Project No.:
100 mm to 3.40m	100 mm to 2.00m	G13066

Logged by: NB	Ground Level:	Date: 28/03/2013	Location: -	Scale: 1:30

Samples & In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill
Ref:	Depth (m)	SPT N						
			▼			MADE GROUND - turf over brown sandy topsoil.		
E1	0.30				0.30	MADE GROUND - very soft orange brown and pale grey sandy clay.		
					0.50			
E2	0.60					MADE GROUND - firm orange sandy clay.		
E3	0.80-1.00				0.80	MADE GROUND - orange and black ashy clayey fine to coarse sand and fine to coarse angular rock and occasional slag gravel with a sulphurous odour.		
					1.10			
S	1.20	N=5				Firm orange brown and grey mottled CLAY.		
SD4	1.20-1.65							
D5	1.20-1.50							
D6	1.70-2.00				1.70	Firm orange grey and yellow mottled CLAY.		
S	2.00	N=10						
SD7	2.00-2.45							
D8	2.00-2.50							
					2.40			
D9	2.50-3.00					Stiff fisssured grey CLAY.		
S	3.00	50/245mm						
SD10	3.00-3.40							
					3.35			
					3.40	Weak grey LIMESTONE.		
						End of Borehole at 3.40 m		

Remarks and Water Observations

1. Hand dug starter pit to 1.20m to check for services.
2. Groundwater seepages were encountered at 0.20m during excavation of the hand dug starter pit.
3. The soils excavated within the starter pit were softened by the inflow of groundwater and turned to slurry.
4. Gas/groundwater monitoring pipe (slotted from 1.00m installed to 3.00m).

41

40

39

Limits of scheme

Bicester Chord

Rail centreline

Atkins investigation locations

0 150

Meters

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A3	DRAWN: JL
PROJECT: 0172205	CHECKED: ST
DATE: 05/06/2013	APPROVED:

Figure A1
Atkins Bicester Chord
Investigation Locations

ERM

CLIENT:

Chiltern Railways

PROJECTION: British National Grid

Path: C:\Users\john.lee\Documents\GIS_Data\0172205ChilternGIS_AZ_SG\MAPS\PROJECT_DETAILS\0172205_AtkinsInvestigationLocations_A02.mxd