East Midlands Gateway
Phase 2 (EMG2)

Document DCO 6.14F/MCO 6.14F (Part 6 of 6)

ENVIRONMENTAL STATEMENT

Technical Appendices

Appendix 14F

Preliminary Sources Study Affecting National Highways

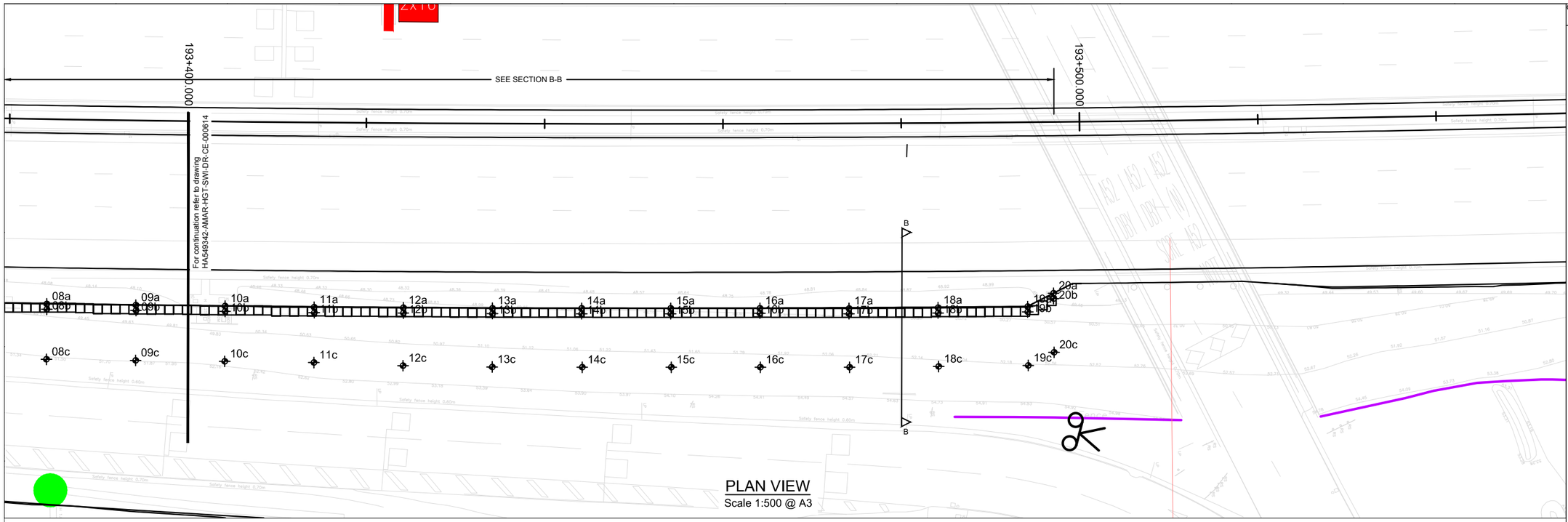
October 2025

14

The East Midlands Gateway Phase 2
and Highway Order 202X and The East Midlands Gateway
Rail Freight and Highway (Amendment) Order 202X

SEGRO.COM/SLPEMG2

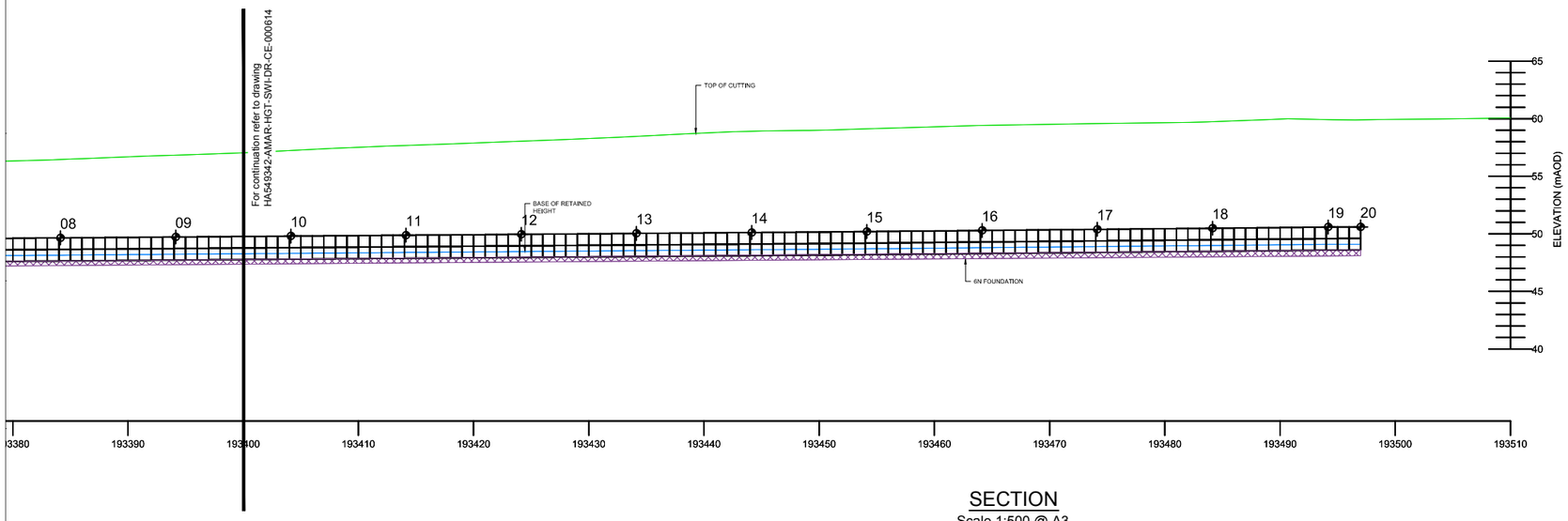
SEGRO



PLAN VIEW

Scale 1:500 @ A3

GABION WALL SETTING OUT POINTS										GABION WALL DETAILS	
	BASE OF RETAINED HEIGHT [a]			BACK OF GABION [b]			BACK OF BATTER [c]				
REFERENCE	EASTING	NORTHING	LEVEL (mAOD)	EASTING	NORTHING	LEVEL (mAOD)	EASTING	NORTHING	LEVEL (mAOD)	TOTAL RETAINED HEIGHT (m)	EMBEDMENT DEPTH (m)
014	447214.88	335477.82	48.60	447215.48	335477.82	49.70	447221.48	335477.82	52.10	1.10	0.40
015	447215	335487.81	48.70	447215.6	335487.81	49.80	447221.6	335487.8	52.10	1.10	0.40
016	447215.11	335497.81	48.80	447215.65	335497.81	49.90	447221.71	335497.8	52.10	1.10	0.40
017	447215.22	335507.81	48.90	447215.82	335507.81	50.00	447221.82	335507.8	52.10	1.10	0.40
018	447215.25	335517.81	49.00	447215.85	335517.81	50.10	447221.85	335517.8	52.20	1.10	0.40
019	447215.25	335527.86	49.10	447215.85	335527.85	50.20	447221.85	335527.85	52	1.10	0.40
020	447213.79	335530.77	49.10	447214.38	335530.76	50.20	447220.4	335530.75	52.30	1.10	0.40



SECTION

Scale 1:500 @ A3

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NOTES

1. ALL DIMENSIONS AND MEASUREMENTS ARE IN METRES (m) UNLESS OTHERWISE STATED.
2. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH DRAWING SERIES HA549342-AMAR-HGT-SWI-SH-CE-000001) AND SERIES 1600 SCHEDULE (REF. DOCUMENT NO.HA549342-AMAR-HGT-SWI-SH-CE-000002).
3. THE PROPOSED EARTHWORKS SOLUTIONS ASSUME THAT EXISTING EMBANKMENT AND CUTTING SLOPES ARE STABLE IN THEIR CURRENT CONDITION.
4. FOR DRAINAGE AND SERVICE DUCT DETAILS REFER TO SERIES 500 SPECIFICATION DRAWINGS.
5. FOR DETAILS OF CARRIAGEWAY CONSTRUCTION, WIDENING & TIE-IN, REFER TO SERIES 700 SPECIFICATION DRAWINGS.
6. ALL NEW SLOPE SURFACES TO BE TOPSOILED IN ACCORDANCE WITH THE PROJECT LANDSCAPING SPECIFICATION, BUT NO THICKER THAN 150MM FOR SLOPES OF 1(V) :2(H) OR STEEPER, OR 300MM FOR SHALLOWER GRADIENTS.
7. VERTICAL BENCHING NOT TO EXCEED 0.5 IN HEIGHT.
8. EXCAVATION PROFILES WILL VARY, WORST CASE SCENARIOS INDICATED IN SECTION A-A.

PLAN LEGEND

- HIGHWAYS ENGLAND BOUNDARY
- GABION LOCATION
- SETTING OUT POINTS
- SECTION LINE

ELEVATION LEGEND

- BASE OF RETAINED HEIGHT (FRONT OF WALL GROUND LEVEL)
- TOP OF CUTTING
- GABION BASKET
- GRANULAR FILL [REFER SERIES 600 SPECIFICATION]

Rev	Date	By	Chkd	Appd
P03	17/04/17	LP	---	SV

Issued for Client Sharing

amey ARUP

Colmore Plaza
20 Colmore Circus Queensway
Birmingham B4 6AT
Tel 0121 214 2000

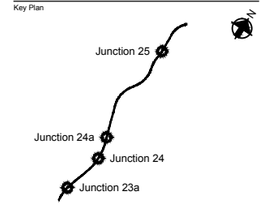
Client

highways england driving forward

Project Title

SMP M1 J23a - J25

Key Plan



Drawing Title

EARTHWORKS DESIGN SOLUTION PLAN
CH. 193320 TO 193497 (SB)
SHEET 02 OF 03

Scale at A1: 1:250

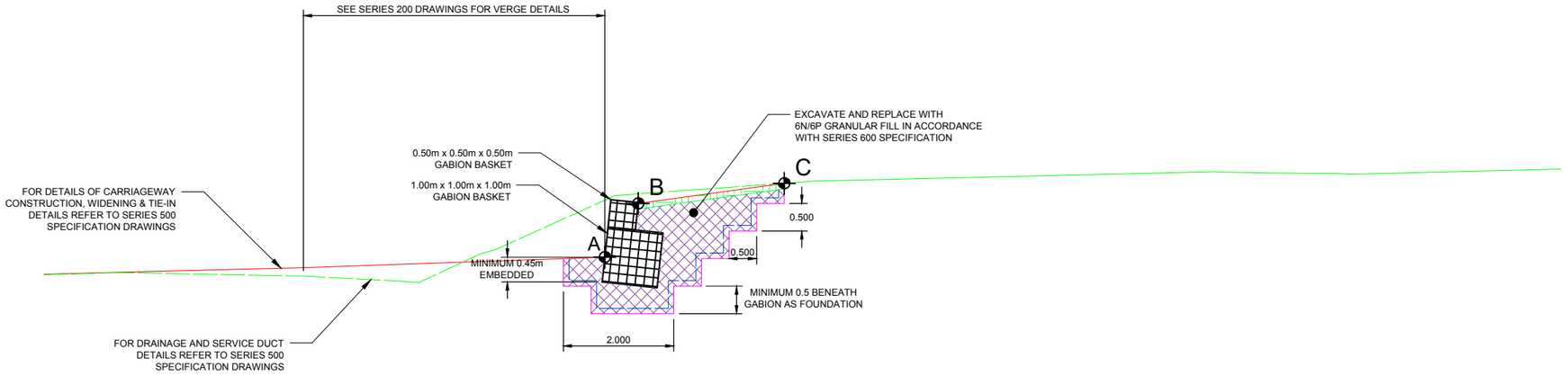
Role: Civil - Earthworks and Geotech

Suitability: S4 - Fit for construction approval

Job No: **244508-00**

Rev: **P03**

Name: **HA549342-AMAR-HGT-SWI-DR-CE-000615**

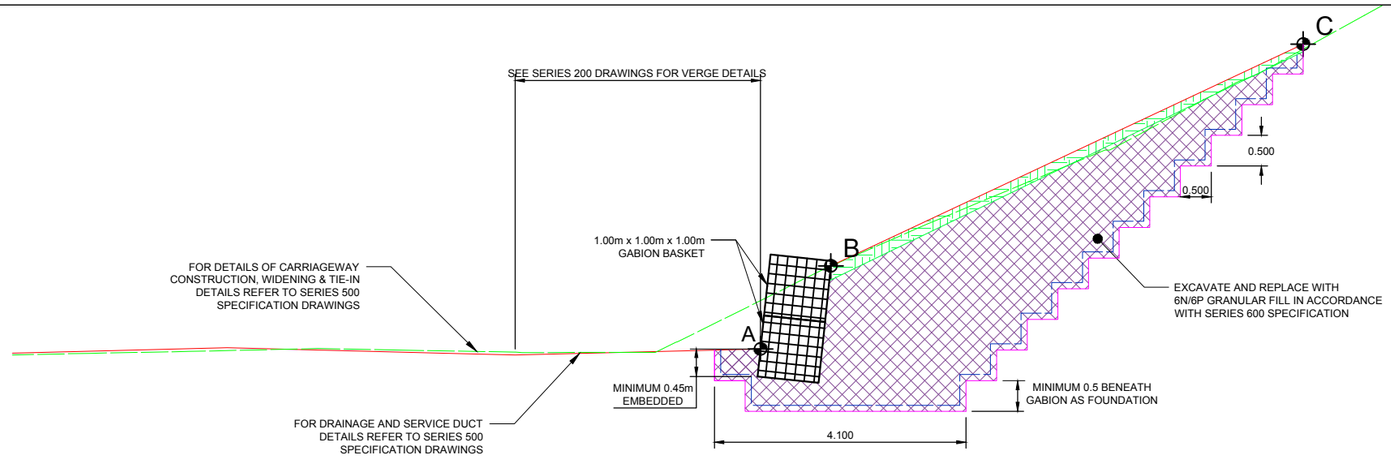


Level Datum =44.000

DESIGN LEVELS: 47.384, 47.475, 47.501, 47.692, 48.773, 49.078, 49.248, 49.302, 49.306

LIDAR LEVELS: 47.375, 47.413, 47.363, 47.346, 47.343, 47.258, 47.231, 47.763, 47.825, 48.809, 48.912, 48.913, 49.071, 49.094, 49.203, 49.241, 49.234, 49.221, 49.207, 49.192, 49.274, 49.280, 49.290

SECTION A-A
193320
Scale 1:100 @ A3



Level Datum =46.000

DESIGN LEVELS: 48.858, 48.946, 48.855, 48.828, 48.928, 49.757

LIDAR LEVELS: 48.856, 48.887, 48.934, 48.910, 48.875, 48.867, 48.873, 48.872, 49.035, 49.044, 50.228, 50.955, 52.171, 52.169, 53.279, 53.408, 54.645, 54.646, 54.703, 54.840

SECTION B-B
193480
Scale 1:100 @ A3

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NOTES
1. ALL DIMENSIONS AND MEASUREMENTS IN METRES (m) UNLESS OTHERWISE STATED.
2. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE EARTHWORKS SCHEDULE (REF. DOCUMENT NO. HA549342-AMAR-HGT-SWI-SH-CE-000001) AND SERIES 1600 SCHEDULE (REF. DOCUMENT NO.HA549342-AMAR-HGT-SWI-SH-CE-000002).
3. THE PROPOSED EARTHWORKS SOLUTIONS ASSUME THAT EXISTING EMBANKMENT AND CUTTING SLOPES ARE STABLE IN THEIR CURRENT CONDITION.
4. FOR DRAINAGE AND SERVICE DUCT DETAILS REFER TO SERIES 500 SPECIFICATION DRAWINGS.
5. FOR DETAILS OF CARRIAGEWAY CONSTRUCTION, WIDENING & TIE-IN, REFER TO SERIES 700 SPECIFICATION DRAWINGS.
6. ALL NEW SLOPE SURFACES TO BE TOPSOILED IN ACCORDANCE WITH THE PROJECT LANDSCAPING SPECIFICATION, BUT NO THICKER THAN 150MM FOR SLOPES OF 1(V) :2(H) OR STEEPER, OR 300MM FOR SHALLOWER GRADIENTS.
7. VERGE SURFACE TO BE IN ACCORDANCE WITH PROJECT VERGE DETAILS.
8. VERTICAL BENCHING NOT TO EXCEED 0.5 IN HEIGHT.

SECTION LEGEND
- PROPOSED GROUND PROFILE
- EXISTING GROUND PROFILE
- EXISTING GROUND PROFILE TO BE REMOVED
- INDICATIVE EXCAVATION PROFILE
- GEOTEXTILE SEPARATOR LAYER
- TOPSOIL [MINIMUM 0.1m]
- GRANULAR FILL [REFER TO SERIES 600 SPECIFICATION]
- GABION BASKET
- SETTING OUT POINT

Rev	Date	By	Chkd	Appd
P03	17/04/17	LP	---	SV

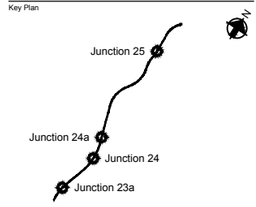
Issued for Client Sharing

amey ARUP
Colmore Plaza
20 Colmore Circus Queensway
Birmingham B4 6AT
Tel 0121 214 2000

Client: highways england driving forward

Project Title: SMP M1 J23a - J25

Key Plan



Drawing Title: EARTHWORKS DESIGN SOLUTION CROSS SECTION CH. 193320 TO 193291 (SB) SHEET 03 TO 03

Scale at A1: 1:50

Role: Civil - Earthworks and Geotech

Suitability: S4 - Fit for construction approval

Job No: 244508-00

Rev: P03

Name: HA549342-AMAR-HGT-SWI-DR-CE-000616

Contact name
Amey Arup Joint Venture

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International Design Hub
5th Floor
The Colmore Building
20 Colmore Circus
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Appendix G. Ramboll Gantry Loadings

Project:	Gantry System		
Element:	Gantry leg loads for Gantry type: F18-S6-A1		
Job no.:	GGS	Date:	18/04/2016
Author:	NK	Sheet:	1 of 1

RAMBOLL

References

Gantry leg loads for Gantry type: **F18-S6-A1**

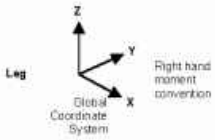
Notes

- All loads in kN, all moments in kNm; relative to the global coordinate system
- Loads are given at the base of the gantry leg
- Residual accidental actions included only, no main actions
- Loads to be combined as per EN1990:2002+A1:2005
- All loads are nominal ie. unfactored
- All loads, except for those shaded below, are independently reversible (i.e. opposite sign).
- Impact position calculation based on max leg height of 6.5m - 2.7m from underneath the boom = 3.8m

Revision history

Revision	Date	Purpose
-	18/04/16	Leg Loads

Gantry shown schematically only



Refer to superstructure drawings for details.

	ID	Load	Location	Loading type
	DL	Dead Load	Structural members	Permanent
	SDL	Superimposed Dead Load	Equipment positions	Permanent
	PT	Transverse Wind Load	Wind load in +PT direction	Variable
	PL	Longitudinal Wind Load	Wind load in +PL direction	Variable
	PV	Vertical Wind Load	Wind load in +PV direction	Variable
	Snow	Snow Load	Snow load on members	Variable
BD51/14, F.17	Live	Imposed Loading	Imposed load on flooring	Variable
BD51/14, §5.27 - §5.31 (Table 5.3 & 5.4)	VI (UR) - X	Vehicle Impact	Collision on leg 1 - X direction	Accidental
	VI (UR) - Y	Vehicle Impact	Collision on leg 1 - Y direction	Accidental
	VI (MR) - X	Vehicle Impact - Min. Robustness	Collision on leg 1 - X direction	Accidental
	VI (MR) - Y	Vehicle Impact - Min. Robustness	Collision on leg 1 - Y direction	Accidental

Load	Load Effects					
	F_x	F_y	F_z	M_x	M_y	M_z
DL	0	0	-78	-117	0	0
SDL	0	0	-23	-91	20	0
PT	-41	0	0	0	-324	130
PL	0	14	0	-91	0	0
PV	0	0	-20	-65	0	0
Snow	0	0	-11	-35	0	0
VI (UR) X	-165	0	0	0	-630	0
VI (UR) Y	0	-85	0	325	0	0
VI (MR) X	-85	0	0	0	-325	0
VI (MR) Y	0	-85	0	325	0	0
Live	0	0	-4	-12	0	0

Page 1 of 1

Working on behalf of highways england

Project:	M1 J26 to J31 Managed Motorways		
Element:	F11-S13-A1 Cantilever Gantry		
Job no.:	20203	Date:	19/04/2012
Author:	LAW	Sheet:	1

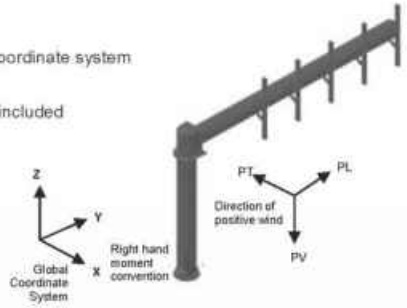
RAMBOLL

References

Cantilever Gantry Type : **F11-S13-A1**

Notes

- All loads in kN, all moments in kNm; relative to the global coordinate system
- Loads are given at the base of the Cantilever leg
- Residual accidental actions included only, no main actions included
- Loads to be combined as per EN1990:2002+A1:2005
- All loads are nominal ie. unfactored
- Transverse and longitudinal wind loads are reversible



ADS Cantilever shown schematically only.
Refer to superstructure drawings for details.

Revision history

Revision	Date	Purpose
Rev 0	02/03/12	Preliminary & unchecked
1	13/03/12	Preliminary & unchecked
2	19/04/12	Preliminary & checked
3	25/03/14	Added VI(UR) at 4.3m

	ID	Load	Location	Loading type
	DL	Dead Load	Structural members	Permanent
	SDL	Superimposed Dead Load	Equipment positions	Permanent
	PT	Transverse Wind Load	Wind load in +PT direction	Variable
	PL	Longitudinal Wind Load	Wind load in +PL direction	Variable
	PV	Vertical Wind Load	Wind load in +PV direction	Variable
	Snow	Snow Load	Snow load on members	Variable
EC7-1, §2.4.7.1(3)	VI (UR) - X	Vehicle Impact	Collision on leg 1 - X direction	Accidental
	VI (UR) - Y	Vehicle Impact	Collision on leg 1 - Y direction	Accidental

Action	Effects of Action					
	F_x	F_y	F_z	M_x	M_y	M_z
DL	0	0	-110	-380	5	0
SDL	0	0	-20	-165	15	0
PT	-105	0	0	0	-730	700
PL	0	30	0	-150	0	10
PV	0	0	-25	-135	0	0
Snow	0	0	-15	-85	0	0
VI (UR) X	-165	0	0	0	-700	0
VI (UR) Y	0	-85	0	360	0	0
VI (MR) X	-85	0	0	0	-360	0
VI (MR) Y	0	-85	0	360	0	0

Page 1 of 1

Project:	GGS		
Element:	Gantry leg loads for Gantry type:F9-S19-A3		
Job no.:	GGS	Date:	08/07/2014
Author:	JN/AL	Sheet:	See footer

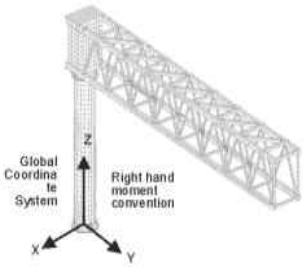
RAMBOLL

References

Gantry leg loads for Gantry type: **F9-S19-A3**

Notes

- All loads in kN, all moments in kNm; relative to the global coordinate system
- Loads are given at the base of the gantry leg
- Residual accidental actions included only, no main actions included
- Loads to be combined as per EN1990:2002+A1:2005
- All loads are nominal ie. unfactored
- All loads, except for those shaded below, are independently reversible (i.e. opposite sign).
- If appropriate, the foundation designer should liaise with the superstructure designer to ensure that any deflections due to local ground conditions are with the limits defined in BD 51/14.
- Impact position calculation based on max leg height of 6.5m - 2.7m from underneath the boom = 3.8m



Gantry shown schematically only.

Refer to superstructure drawings for details.

Revision history

Revision	Date	Purpose
-	08/07/14	Design and Check Leg Loads

BD51/14, §5.27 - §5.31 (Table 5.3 & 5.4)

ID	Load	Location	Loading type
DL	Dead Load	Structural members	Permanent
SDL	Superimposed Dead Load	Equipment positions	Permanent
PT	Transverse Wind Load	Wind load in +PT direction	Variable
PL	Longitudinal Wind Load	Wind load in +PL direction	Variable
PV	Vertical Wind Load	Wind load in +PV direction	Variable
Snow	Snow Load	Snow load on members	Variable
VI (UR) - X	Vehicle Impact	Collision on leg - X direction	Accidental
VI (UR) - Y	Vehicle Impact	Collision on leg - Y direction	Accidental
VI (MR) - X	Vehicle Impact - Min. Robustness	Collision on leg 1 - X direction	Accidental
VI (MR) - Y	Vehicle Impact - Min. Robustness	Collision on leg 1 - Y direction	Accidental

Load	Load Effects					
	F_x	F_y	F_z	M_x	M_y	M_z
DL	0	0	-201	-862	-1	0
SDL	0	0	-105	-1036	-101	0
PT	-134	0	0	0	-1236	1232
PL	0	54	0	-502	0	-36
PV	0	0	-46	-440	-5	0
Snow	0	0	-15	-126	-1	0
VI (UR) X	-165	0	0	0	-645	0
VI (UR) Y	0	-85	0	332	0	0
VI (MIN) X	-85	0	0	0	-332	0
VI (MIN) Y	0	-85	0	332	0	0

Page 1 of 2

Project:	GGS		
Element:	Gantry leg loads for Gantry type:F9-S19-A3		
Job no.:	GGS	Date:	08/07/2014
Author:	JN/AL	Sheet:	See footer

Page 2 of 2

Project:	Gantry System		
Element:	Gantry leg loads for Gantry type: F14-S19-A1		
Job no.:	GGS	Date:	01/01/2016
Author:	PS	Sheet:	1 of 1

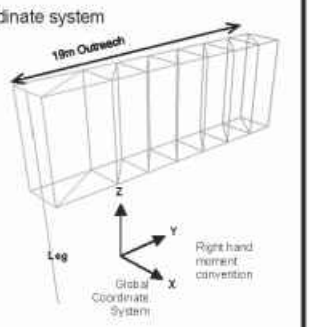
RAMBOLL

References

Gantry leg loads for Gantry type: F14-S19-A1

Notes

- All loads in kN, all moments in kNm; relative to the global coordinate system
- Loads are given at the base of the gantry leg
- Residual accidental actions included only, no main actions
- Loads to be combined as per EN1990:2002+A1:2005
- All loads are nominal ie. unfactored
- All loads, except for those shaded below, are independently reversible (i.e. opposite sign).
- Impact position calculation based on max leg height of 6.5m - 2.7m from underneath the boom = 3.8m



Gantry shown schematically only

Refer to superstructure drawings for details

Revision history

Revision	Date	Purpose
-	03/12/15	Preliminary
1	01/01/16	Checked

	ID	Load	Location	Loading type
	DL	Dead Load	Structural members	Permanent
	SDL	Superimposed Dead Load	Equipment positions	Permanent
	PT	Transverse Wind Load	Wind load in +PT direction	Variable
	PL	Longitudinal Wind Load	Wind load in +PL direction	Variable
	PV	Vertical Wind Load	Wind load in +PV direction	Variable
	Snow	Snow Load	Snow load on members	Variable
BD51/14, F.17	Imposed L.	Imposed Loading	Imposed load on flooring	Variable
	VI (UR) - X	Vehicle Impact	Collision on leg 1 - X direction	Accidental
BD51/14, §5.27 - §5.31 (Table 5.3 & 5.4)	VI (UR) - Y	Vehicle Impact	Collision on leg 1 - Y direction	Accidental
	VI (MR) - X	Vehicle Impact - Min. Robustness	Collision on leg 1 - X direction	Accidental
	VI (MR) - Y	Vehicle Impact - Min. Robustness	Collision on leg 1 - Y direction	Accidental

Load	Load Effects					
	F_x	F_y	F_z	M_x	M_y	M_z
DL	0	0	-250	-1730	0	0
SDL	0	0	-95	-1000	-80	0
PT	-200	0	0	0	-1770	1870
PL	0	70	0	-470	0	-35
PV	0	0	-75	-775	0	0
Snow	0	0	-30	-315	0	0
VI (UR) X	-165	0	0	0	-630	0
VI (UR) Y	0	-85	0	325	0	0
VI (MR) X	-85	0	0	0	-325	0
VI (MR) Y	0	-85	0	325	0	0
Live	0	0	-20	-205	0	0

Page 1 of 1

Working on behalf of highways england

Project:	Gantry System		
Element:	Gantry leg loads for Ramboll Gantry type:F15-S45-A1		
Job no.:	GGS	Date:	30/03/2016
Author:	BT	Sheet:	See footer

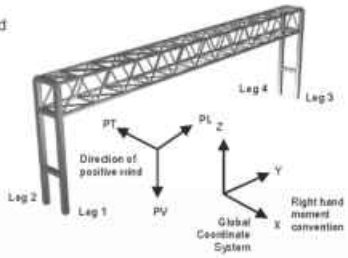
RAMBOLL

References

Gantry leg loads for Ramboll Gantry type: F15-S45-A1

Notes

- All loads in kN, all moments in kNm; relative to the global coordinate system
- Loads are given at the base of the gantry leg
- Residual accidental actions included only, no main actions included
- Loads to be combined as per EN1990:2002+A1:2005
- All loads are nominal ie. unfactored
- All loads, except for those shaded below, are independently reversible (i.e. opposite sign).
- Legs 3 and 4 are covered by the loads given for Legs 1 and 2
- Impact position calculation based on max leg height of 6.5m - 2.7m from underneath the boom = 3.8m



Gantry shown schematically only.
Refer to superstructure drawings for details.

Revision history

Revision	Date	Purpose
1	30/03/16	

ID	Load	Location	Loading type
DL	Dead Load	Structural members	Permanent
SDL	Superimposed Dead Load	Equipment positions	Permanent
PT	Transverse Wind Load	Wind load in +PT direction	Variable
PL	Longitudinal Wind Load	Wind load in +PL direction	Variable
PV	Vertical Wind Load	Wind load in +PV direction	Variable
ΔT	Temperature Change	Structural expansion/contraction	Variable
Snow	Snow Load	Structural expansion/contraction	Variable
VI (UR/MR) - X	Vehicle Impact (residual/robustness)	Collision on leg 1 - X direction	Accidental
VI (UR/MR) - Y	Vehicle Impact (residual/robustness)	Collision on leg 1 - Y direction	Accidental
LIVE	Live (Access Load)	Gantry	Variable

Load	Leg	Load Effects					
		F_x	F_y	F_z	M_x	M_y	M_z
DL	1	2	-41	-114	66	-2	9
	2	-2	-34	-111	56	-3	1
SDL	1	1	-36	-100	60	-2	8
	2	-1	-30	-91	49	-2	1
PT	1	-277	36	1092	-51	-127	26
	2	-8	-37	-1092	65	-39	15
PL	1	0	51	9	-185	0	-22
	2	0	39	9	-136	0	1
PV	1	1	-34	-68	55	1	8
	2	1	-27	-66	45	2	1
ΔT	1	119	-135	-41	325	39	35
	2	-119	-116	41	265	-125	2
Snow	1	1	-19	-44	31	1	4
	2	1	-15	-43	25	1	1
VI (UR) X	1	-165	0	330	1	-106	1
	2	0	0	-330	1	-67	0
VI (UR) Y	1	2	-85	7	122	1	-20
	2	0	0	-7	97	0	-8
VI (MR) X	1	85	0	137	0	47	0
	2	0	0	-137	0	47	0
VI (MR) Y	1	2	-85	5	107	1	7
	2	2	0	-9	107	1	11
LIVE LOAD	1	0	-3	-6	5	0	1
	2	0	-2	-6	4	0	0

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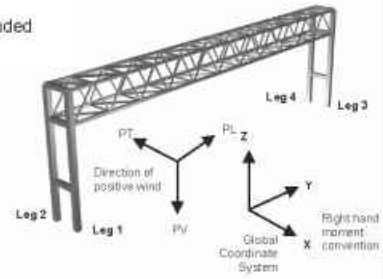
Project:	Gantry System		
Element:	Gantry leg loads for Ramboll Gantry type:F15-S51-A1		
Job no.:	GGS	Date:	22/02/2016
Author:	BT	Sheet:	See footer

References

Gantry leg loads for Ramboll Gantry type: F15-S51-A1

Notes

- All loads in kN, all moments in kNm; relative to the global coordinate system
- Loads are given at the base of the gantry leg
- Residual accidental actions included only, no main actions included
- Loads to be combined as per EN1990:2002+A1:2005
- All loads are nominal ie. unfactored
- All loads, except for those shaded below, are independently reversible (i.e. opposite sign).
- Legs 3 and 4 are covered by the loads given for Legs 1 and 2
- Impact position calculation based on max leg height of 6.5m - 2.7m from underneath the boom = 3.8m



Gantry shown schematically only

Refer to superstructure drawings for details

Revision history

Revision	Date	Purpose
1	02/12/15	preliminary , unchecked

ID	Load	Location	Loading type
DL	Dead Load	Structural members	Permanent
SDL	Superimposed Dead Load	Equipment positions	Permanent
PT	Transverse Wind Load	Wind load in +PT direction	Variable
PL	Longitudinal Wind Load	Wind load in +PL direction	Variable
PV	Vertical Wind Load	Wind load in +PV direction	Variable
ΔT	Temperature Change	Structural expansion/contraction	Variable
Snow	Snow Load	Structural expansion/contraction	Variable
VI (UR) - X	Vehicle Impact	Collision on leg 1 - X direction	Accidental
VI (UR) - Y	Vehicle Impact	Collision on leg 1 - Y direction	Accidental
LIVE	Live (Access Load)	Gantry	Variable

Load	Leg	Load Effects					
		F_x	F_y	F_z	M_x	M_y	M_z
DL	1	2	-63	-144	101	-3	14
	2	-2	-52	-140	85	-3	2
SDL	1	2	-45	-99	76	-2	10
	2	-1	-37	-100	61	-2	2
PT	1	-321	56	1212	-78	-147	38
	2	-9	-56	-1268	95	-45	21
PL	1	0	71	12	-254	0	-31
	2	0	50	11	-174	0	1
PV	1	1	-47	-83	75	2	11
	2	1	-36	-82	61	2	2
ΔT	1	119	-160	-41	377	43	41
	2	-119	-137	41	308	-125	2
Snow	1	1	-26	-52	42	1	6
	2	1	-20	-51	34	1	1
VI (UR) X	1	-165	0	330	1	-106	1
	2	0	0	-330	1	-67	0
VI (UR) Y	1	2	-85	7	120	1	-20
	2	0	0	-7	96	0	-8
LIVE LOAD	1	0	-4	-7	6	0	1
	2	0	-3	-7	5	0	0

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Appendix H. Traffic Sign Groups

Asset	SMP Reference	New or Existing	Chainage	Carriageway	Earthwork		Borehole Data					In-Situ Tests		Lab Tests		Parameters		Approx. Carriageway Level at Foundation (mAOD)	Ground Model				Sign Details			Foundation Design											Pile Summary		
					Type	Height/Depth (m)	Nearest Borehole(s)	Borehole Proximity (m)	Borehole Stratigraphy (mAOD)	Borehole Stratigraphy (mbgl)	Soil/Rock	SPT	Hand Vane Tests	MC (%)	PI (%)	Bulk Density (γb) (2)	φ' (°) (2,4)		Top of Foundation Level (mAOD) (6)	Stratigraphy from Foundation Top (mAOD)	Stratigraphy from Foundation Top (mbgl)	Soil/Rock	Height (m)	Width (m)	Sign Face Area (m^2)	Solution	Pad Size (w x l x d)	Total No of Piles Required	Freestanding Length (m)	Bored or Driven	Pile Diameter (m)	Pile Length (m)	Max Deflection (mm)	Max Bending Moment (kNm)	Max Axial Load (kN) (1)		Pile Length Required to Satisfy Load Criteria (m)	Pile Length Required to Satisfy Slope Criteria (m)	Design Pile Length (m)
Billboard Sign	M1 NB APPROACH	NEW	180600	NB	At Grade	-	SK42SE76	90	-	-	-	-	-	-	-	-	-	65.00	65.00	65.00-61.00	0.00-4.00	Embankment Fill	3.00	3.00	9.00	Pad	2.6 x 3.0 x 2.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A
									62.20-51.20	0.00-11.00	Mercia Mudstone III/IV	-	-	-	-	21	30			61.00-	4.00-	Mercia Mudstone III/IV																		
Billboard Sign	M1 NB	NEW	188350	NB	Embankment	7.0	CP1098	20	38.05-30.70	0.00-7.35	Embankment Fill	19-41 (24)	-	12-14	14-17	21	34	38.76	38.76	38.76-30.20	0.00-8.56	Embankment Fill	3.00	3.00	9.00	Pile	N/A	Single	0.7	Bored	0.45	5.0	3	21	N/A		3.0	5.0	5.0
									30.70-23.75	7.35-14.30	Glaciofluvial Deposits (Sands and Gravels)	15-130 (47)	-	15-18	5-14	21	40			30.20-24.00	8.56-14.76	Glaciofluvial Deposits (Sands and Gravels)																		
									23.75-22.86	14.30-15.19	Mercia Mudstone III/IV	167	-	24	11	21	>43			24.00-	14.76-	Mercia Mudstone III/IV																		
Billboard Sign	M1 SB APPROACH	NEW	196000	SB	Embankment	7.0	SK43NE477 SK43NE502	130	55.05-48.55	0.00-6.50	Embankment Fill	43-66 (43)	-	-	-	21	27	55.00	55.00	55.05-48.55	0.00-6.50	Embankment Fill	3.00	3.00	9.00	Pile	N/A	Single	0.7	Bored	0.45	5.0	4	22	N/A		3.0	5.0	5.0
									48.55-47.65	6.50-7.40	Coal Measures - Clay	21	-	-	24 (2)	21 (2)	25 (2)			48.55-47.65	6.50-7.40	Coal Measures - Clay																		
									47.65-43.75	7.40-11.30	Coal Measures - Mudstone	39-118 (39)	-	-	-		38			47.65-43.75	7.40-11.30	Coal Measures - Mudstone																		
									43.75-35.65	11.30-19.40	Coal Measures - Sandstone	116-333	-	-	-	22	>44			43.75-35.65	11.30-19.40	Coal Measures - Sandstone																		

Notes
(1) Axial load not applicable to single piles
(2) Parameters taken from those derived by GW report

Asset	SMP Reference	Chainage	Carriageway	Earthwork		Flood Level (mAOD)	Vegetation	Borehole Data					In-Situ Tests		Lab Tests		Parameters		Approx. Carriageway Level at Foundation (mAOD)	Ground Model			
				Type	Height/Depth (m)			Nearest Borehole(s)	Borehole Proximity (m)	Borehole Stratigraphy (mAOD)	Borehole Stratigraphy (mbgl)	Soil/Rock	SPT [1,2]	Hand Vane Tests	MC (%)	PI (%)	Bulk Density (γb) [3]	ϕ' (°) [4,5]		Top of Foundation Level (mAOD) [6]	Stratigraphy from Foundation Top (mAOD)	Stratigraphy from Foundation Top (mbgl)	Soil/Rock
Large Traffic Sign	NB03	182109	NB	Cutting	2.4	None	G	SK42SE90R	30	61.80-52.65	0.00-9.15	Mercia Mudstone III/IV	21-556 (60)	-	-	-	21	43	63.67	63.67	63.67-52.65	0.00-11.02	Mercia Mudstone III/IV
										52.65-48.30	9.15-13.50	Mercia Mudstone Sandstone	-	-	-	-	22	-			52.65-48.30	11.02-15.37	Mercia Mudstone Sandstone
										48.30-46.6	13.50-15.20	Mercia Mudstone Siltstone	300	-	-	-	22	-			48.30-	15.37-	Mercia Mudstone Siltstone
Large Traffic Sign	NB04	182413	NB	Cutting	4.7	None	G	SK42SE186 SK43SE23	100	79.05-78.05	0.00-1.00	Glacial Till	21	-	-	-	21	33	70.50	70.50	-	-	-
										78.05-69.66	1.00-9.39	Mercia Mudstone III/IV	31-131 (49)	-	-	-	21	41			70.50-	0.00-	Mercia Mudstone III/IV
Large Traffic Sign	NB07	182411	NB	Cutting	4.7	None	G	SK42SE186 SK43SE23	100	79.05-78.05	0.00-1.00	Glacial Till	21	-	-	-	21	33	70.50	70.50	-	-	-
										78.05-69.66	1.00-9.39	Mercia Mudstone III/IV	31-131 (49)	-	-	-	21	41			70.50-	0.00-	Mercia Mudstone III/IV
Large Traffic Sign	NB11	183700	NB	Cutting	6.6	None	G	SK42NE70	20	73.45-71.65	0.00-1.80	Embankment Fill	34	-	-	-	21	40	72.14	72.14	72.14-71.65	0.00-0.49	Embankment Fill
										71.65-68.45	1.80-5.00	Mercia Mudstone III/IV	47-94 (47)	-	-	-	21	40			71.65-	0.49-	Mercia Mudstone III/IV
Large Traffic Sign	NB13	184135	NB	Cutting	5.3	None	G	SK42NE7	100	75.00-73.78	0.00-1.22	Head Deposits	-	-	8-15	-	20	27	64.93	64.93	-	-	-
										73.78-62.81	1.22-12.19	Mercia Mudstone III/IV	-	-	15-22	11-22	21	30			64.93-	0.00-	Mercia Mudstone III/IV
Large Traffic Sign	NB19	184905	NB	Embankment	1.3	None	G	SK42NE9	15	40.10-39.19	0.00-0.91	Alluvium Deposits	-	-	8-20	-	20	25	43.01	43.01	-	-	-
										39.19-37.66	0.91-2.44	River Terrace Deposits	57	-	8-11	-	20	42			43.01-37.66	0.00-5.35	River Terrace Deposits
										37.66-34.00	2.44-6.10	Mercia Mudstone III/IV	-	-	18-26	15	21	34			37.66-	5.35-	Mercia Mudstone III/IV
Large Traffic Sign	NB21	185180	NB	Cutting	5.7	None	R	SK42NE10	60	39.20-35.24	0.00-3.96	Glaciofluvial Deposits (Sands and Gravels)	159	-	10-16	-	21	>43	35.59	35.59	35.59-34.70	0.00-0.89	Embankment Fill
										35.24-30.06	3.96-9.14	Mercia Mudstone III/IV	-	-	16-26	12-17	21	30			34.70-	0.89-	Mercia Mudstone III/IV
Large Traffic Sign	NB30	186480	NB	Embankment	2.9	32.3	A	SK42NE395	20	33.25-31.20	0.00-2.05	Embankment Fill	-	-	17	21	21	27	33.40	33.40	33.40-31.20	0.00-2.20	Embankment Fill
										31.20-28.55	2.05-4.70	Glaciofluvial Deposits (Sands and Gravels)	-	-	5	-	21	26			31.20-28.55	2.20-4.85	Glaciofluvial Deposits (Sands and Gravels)
										28.55-27.95	4.70-5.30	Glaciofluvial Deposits (Sands and Gravels)	-	-	16	10	21	26			28.55-27.95	4.85-5.45	Glaciofluvial Deposits (Sands and Gravels)
										27.95-25.45	5.30-7.80	River Terrace Deposits	-	-	12	9	20	38			27.95-25.45	5.45-7.95	River Terrace Deposits
										25.45-25.05	7.80-8.20	Mercia Mudstone II/I	-	-	-	-	22	-			25.45-25.05	7.95-8.35	Mercia Mudstone II/I
										25.05-18.25	8.20-15.00	Mercia Mudstone III/IV	-	-	15-17	10	21	-			25.05-	8.35-	Mercia Mudstone III/IV
Large Traffic Sign	NB31	186790	NB	Embankment	4.2	None	A	SK42NE381	40	31.26-30.56	0.00-0.70	Embankment Fill	-	-	-	-	21	27	35.54	35.54	35.54-30.56	0.00-4.98	Embankment Fill
										30.56-25.36	0.70-5.90	River Terrace Deposits	-	-	-	-	21	38			30.56-25.36	4.98-10.18	River Terrace Deposits
										25.36-21.31	5.90-9.95	Mercia Mudstone II/I	-	-	8-19	-	22	-			25.36-	10.18-	Mercia Mudstone II/I
Large Traffic Sign	NB32	186630	NB	Embankment	2.1	None	R	SK42NE397	50	33.65-31.65	0.00-2.00	Embankment Fill	15-16 (15)	-	12-19	17-18	21	32	33.96	33.96	33.96-31.65	0.00-2.31	Embankment Fill
										31.65-25.55	2.00-8.10	River Terrace Deposits	23-68 (31)	-	-	-	20	36			31.65-25.55	2.31-8.41	River Terrace Deposits
										25.55-23.65	8.10-10.00	Mercia Mudstone III/IV	66	-	13-23	-	21	>43			25.55-	8.41-	Mercia Mudstone III/IV
Large Traffic Sign	NB41	187450	NB	Embankment	3.7	31.0	A	CP1096	160	36.70-31.30	0.00-5.40	Embankment Fill	9-16 (9)	-	17	18	21	30	35.09	35.09	35.09-30.00	0.00-5.09	Embankment Fill
										31.30-23.40	5.40-13.30	Glaciofluvial Deposits (Sands and Gravels)	33-120 (39)	-	4	-	21	38			30.00-23.20	5.09-11.89	Glaciofluvial Deposits (Sands and Gravels)
										23.40-19.49	13.30-17.21	Mercia Mudstone Siltstone	143	-	-	-	22	-			23.20-	11.89-	Mercia Mudstone Siltstone
Large Traffic Sign	NB42	187630	NB	Embankment	2.3	31.1	A	NWHM1	100	34.20-31.90	0.00-2.30	Embankment Fill	-	-	-	-	21	27	33.51	33.51	33.51-31.90	0.00-1.61	Embankment Fill
										31.90-28.20	2.30-6.00	Glaciofluvial Deposits (Sands and Gravels)	78-102 (78)	-	-	-	21	>43			31.90-	1.61-	Glaciofluvial Deposits (Sands and Gravels)
Large Traffic Sign	NB46	188748	NB	Embankment	6	32.2	R	CP1100	10	36.25-30.65	0.00-5.60	Embankment Fill	24-40 (24)	-	3-10	15	21	34	36.26	36.26	36.26-30.65	0.00-5.61	Embankment Fill
										30.65-23.45	5.60-12.80	River Terrace Deposits	34-150 (41)	-	9	15	20	38			30.65-23.60	5.61-12.66	River Terrace Deposits
										23.45-21.55	12.80-14.70	Glaciofluvial Deposits (Sands and Gravels)	88-158 (120)	-	-	-	21	>43			23.60-	12.66-	Glaciofluvial Deposits (Sands and Gravels)
Large Traffic Sign	NB50	188561	NB	Embankment	8.6	31.9	R	CP1099, SK43SE9	10	38.60-30.60	0.00-8.00	Embankment Fill	17-500 (26)	-	6-9	13	21	33	38.20	38.20	38.20-29.90	0.00-8.30	Embankment Fill
										30.60-23.99	8.00-14.61	River Terrace Deposits	38	-	-	-	20	26			29.90-24.00	8.30-14.20	River Terrace Deposits
										23.99-18.81	14.61-19.79	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	26			24.00-18.50	14.20-20.20	Glaciofluvial Deposits (Sands and Gravels)
										18.81-15.76	19.79-22.84	Mercia Mudstone III/IV	-	-	-	-	21	30			18.50-	20.20-	Mercia Mudstone III/IV
Large Traffic Sign	NB58	190800	NB	Embankment	3.3	31.2	G	CP1110	180	32.95-29.55	0.00-3.40	Embankment Fill	19-103 (19)	-	15	19	21	33	34.13	34.13	34.13-30.00	0.00-4.13	Embankment Fill
										29.55-26.45	3.40-6.50	Glaciofluvial Deposits (Sands and Gravels)	37-70 (37)	-	37	32	21	38			30.00-25.10	4.13-9.03	Glaciofluvial Deposits (Sands and Gravels)
										26.45-17.60	6.50-15.35	Mercia Mudstone III/IV	28-214 (37)	-	20-23	11-17	21	38			25.10-	9.03-	Mercia Mudstone III/IV
Large Traffic Sign	NB70	192660	NB	Embankment	4.1	None	G	SK43SE28	20	-	-	-	-	-	-	-	21	27	46.40	46.40	46.40-41.00	0.00-5.40	Embankment Fill
										41.00-34.75	0.00-6.25	Head Deposits	50	-	-	-	21	27			41.00-34.75	5.40-11.65	Head Deposits
										34.75-31.86	6.25-9.14	Mercia Mudstone III/IV	-	-	-	-	21	30			34.75-	11.65-	Mercia Mudstone III/IV
Large Traffic Sign	NB75	193173	NB	Cutting	6.4	None	A	HIS0028 CP1117	100	51.35-45.20	0.00-6.15	Embankment Fill	22-35 (24)	-	9	17	21	34	45.90	45.90	-	-	-
										45.20-36.96	6.15-14.39	Mercia Mudstone III/IV	-	-	-	-	21	30			45.90-36.96	0.00-8.94	Mercia Mudstone III/IV
										36.96-30.80	14.39-20.55	Mercia Mudstone II/I	200	-	15	13	22	-			36.96-	8.94-	Mercia Mudstone II/I
Large Traffic Sign	NB76	193171	NB	Cutting	6.4	None	A	HIS0028 CP1117	100	51.35-45.20	0.00-6.15	Embankment Fill	22-35 (24)	-	9	17	21	34	45.90	45.90	-	-	-
										45.20-36.96	6.15-14.39	Mercia Mudstone III/IV	-	-	-	-	21	30			45.90-36.96	0.00-8.94	Mercia Mudstone III/IV
										36.96-30.80	14.39-20.55	Mercia Mudstone II/I	200	-	15	13	22	-			36.96-	8.94-	Mercia Mudstone II/I
Large Traffic Sign	SB03	194700	SB	Cutting	9.3	None	N/A	SK43NE225 HIS0045	20	75.38-65.80	0.00-9.58	Mercia Mudstone III/IV	-	-	-	-	21	30	69.70	69.70	69.70-65.80	0.00-3.90	Mercia Mudstone III/IV
										75.38-62.80	9.58-12.58	Mercia Mudstone Sandstone	-	-	-	-	22	-			65.80-	3.90-	Mercia Mudstone Sandstone
Large Traffic Sign	SB11	192302	SB	Embankment	7.2	None	R	NWHM66	20	42.62-36.32	0.00-6.30	Embankment Fill	17-50 (17)	-	-	-	21	32	42.69	42.69	42.69-36.32	0.00-6.37	Embankment Fill
										36.32-33.22	6.30-9.40	Glaciofluvial Deposits (Sands and Gravels)	41-49 (41)	-	-	-	21	38			36.32-33.22	6.37-9.47	Glaciofluvial Deposits (Sands and Gravels)
										33.22-27.62	9.40-15.00	Mercia Mudstone III/IV	35-50 (35)	-	27	17	21	37			33.22-	9.47-	Mercia Mudstone III/IV
Large Traffic Sign	SB12	192430	SB	Embankment	7.1	None	R	HIS0023	70	39.20-36.50	0.00-2.70	Head Deposits	10	-	-	-	20	30	44.73	44.73	44.73-37.90	0.00-6.83	Head Deposits
										36.50-34.90	2.70-4.30	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	26			37.90-33.50	6.83-11.23	Glaciofluvial Deposits (Sands and Gravels)
										34.90-20.59	4.30-18.61	Mercia Mudstone III/IV	-	-	-	-	21	30			33.50-	11.23-	Mercia Mudstone III/IV
Large Traffic Sign	SB14	191970	SB	Cutting	2.1	None	R	NWHM4	60	34.91-31.11	0.00-3.80	Glaciofluvial Deposits (Sands and Gravels)	46-51 (46)	-	3-4	-	21	39	35.67	35.67	35.67-31.00	0.00-4.67	Glaciofluvial Deposits (Sands and Gravels)
										31.11-22.56	3.80-12.35	Mercia Mudstone II/I	21-73 (37)	-	7	17	22	-			31.00-	4.67-	Mercia Mudstone II/I
Large Traffic Sign	SB28	190578	SB	Embankment	6.3	31.2	A	NWHM67	30	37.38-31.38	0.00-6.00	Embankment Fill	12-27 (19)	-	-	-	21	33	37.68	37.68	37.68-31.38	0.00-6.30	Embankment Fill
										31.38-25.38	6.00-12.00	Glaciofluvial Deposits (Sands and Gravels)	106-750 (136)	-	-	-	21	>43			31.38-23.20	6.30-14.48	Glaciofluvial Deposits (Sands and Gravels)
										-	-	-	-	-	-	-	-	-			23.20-	14.48-	Mercia Mudstone III/IV
Large Traffic Sign	SB37	189200	SB	Embankment	3.7	32.2	A	CP1102, SK43SE15	30	34.65-28.85	0.00-5.80	Embankment Fill	35-120 (35)	-	4-7	12-13	21	37	34.34	34.34	34.34-25.90	0.00-8.44	Embankment Fill
										28.85-24.35	5.80-10.30	River Terrace Deposits	38-600 (39)	-	-	-	20	38			25.90-26.40	8.44-7.94	River Terrace Deposits
										24.35-22.45	10.30-12.20	Glaciofluvial Deposits (Sands and Gravels)	83-500 (83)	-	14	18-19	21	>43			26.40-23.50	7.94-10.84	Glaciofluvial Deposits (Sands and Gravels)
										22.45-14.86	12.20-19.79	Mercia Mudstone III/IV	-	-	-	-	21	30			23.50-	10.84-	Mercia Mudstone III/IV
Large Traffic Sign	SB40	188880	SB	Embankment	2.8	32.2	R	NWHM68	50	35.28-30.88	0.00-4.40	Embankment Fill	19-50 (19)	-	-	-	21	33	35.24	35.24	35.24-30.88	0.00-4.44	Embankment Fill
										30.88-25.68	4.40-9.60	River Terrace Deposits	25-50 (28)	-	-	-	20	35			30.88-25.68	4.44-9.64	River Terrace Deposits
										25.68-24.28	9.60-11.00	Glacial Till	50	-	-	-	21	41			25.68-24.28	9.64-11.04	Glacial Till
										24.28-20.68	11.00-14.60	Glaciofluvial Deposits (Sands and Gravels)	50	-	6-12	5	21	41			24.28-	11.04-	Glaciofluvial Deposits (Sands and Gravels)
Large Traffic Sign	SB43	188522	SB	Embankment	7.8	31.1	A	CP1099, SK43SE9	20	38.60-30.60	0.00-8.00	Embankment Fill	17-500 (26)	-	6-9	13	21	33	38.49	38.49	38.49-29.70	0.00-8.79	Embankment Fill
										30.60-23.99	8.00-14.61	River Terrace Deposits	38	-	-	-	20	26			29.70-25.70	8.79-12.79	River Terrace Deposits
										23.99-18.81	14.61-19.79	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	26			25.70-20.40	12.79-18.09	Glaciofluvial Deposits (Sands and Gravels)
										18.81-15.76	19.79-22.84	Mercia Mudstone III/IV	-	-	-	-	21	30			20.40-	18.09-	Mercia Mudstone III/IV
Large Traffic Sign	SB48	188321	SB	Embankment	7.3	31.1	A	CP1098	20	38.05-30.70	0.00-7.35	Embankment Fill	19-41 (24)	-	12-14	14-17	21	34	38.76	38.76	38.76-30.20	0.00-8.56	Embankment Fill
										30.70-23.75	7.35-14.30	Glaciofluvial Deposits (Sands and Gravels)	15-130 (47)	-	15-18	5-14	21	40			30.20-24.00	8.56-14.76	Glaciofluvial Deposits (Sands and Gravels)

										23.75-22.86	14.30-15.19	Mercia Mudstone III/IV	167	-	24	11	21	>43			24.00-	14.76-	Mercia Mudstone III/IV
Large Traffic Sign	SB50	188180	SB	Embankment	6.6	31.0	A	SK43SE136 SK43SE151	60	31.00-29.50	0.00-1.50	Embankment Fill	15	-	-	-	21	31	37.92	37.92	37.92-30.40	0.00-7.52	Embankment Fill
										29.50-23.40	1.50-7.60	Glaciofluvial Deposits (Sands and Gravels)	37-140 (44)	-	-	-	21	39			30.40-23.80	7.52-14.12	Glaciofluvial Deposits (Sands and Gravels)
										23.40-19.75	7.60-11.25	Mercia Mudstone III/IV	29-210 (61)	-	-	-	21	>43			23.80-	14.12-	Mercia Mudstone III/IV
Large Traffic Sign	SB54	187712	SB	Embankment	2.5	31.0	A	TP1095	80	-	-	-	-	-	-	-	-	-	33.79	33.79	33.79-30.30	0.00-3.49	Embankment Fill
										31.00-28.50	0.00-2.50	Glaciofluvial Deposits (Sands and Gravels)	-	-	34	20	21	38			30.30-23.00	3.49-10.79	Glaciofluvial Deposits (Sands and Gravels)
										-	-	-	-	-	-	-	-	-			23.00-	10.79-	Mercia Mudstone III/IV
Large Traffic Sign	SB55	187518	SB	Embankment	2.7	30.9	A	NWHM1	10	34.20-31.90	0.00-2.30	Embankment Fill	-	-	-	-	21	27	34.40	34.40	34.40-30.1	0.00-4.30	Embankment Fill
										31.90-28.20	2.30-6.00	Glaciofluvial Deposits (Sands and Gravels)	78-136 (83)	-	-	-	21	>43			30.1-23.20	4.30-11.20	Glaciofluvial Deposits (Sands and Gravels)
										-	-	-	-	-	-	-	-	-			23.20-	11.20-	Mercia Mudstone III/IV
Large Traffic Sign	SB56	187418	SB	Embankment	3.7	30.9	A	NWHM1	100	34.20-31.90	0.00-2.30	Embankment Fill	-	-	-	-	21	27	34.40	34.40	34.40-30.1	0.00-4.30	Embankment Fill
										31.90-28.20	2.30-6.00	Glaciofluvial Deposits (Sands and Gravels)	78-136 (83)	-	-	-	21	>43			30.1-23.20	4.30-11.20	Glaciofluvial Deposits (Sands and Gravels)
										-	-	-	-	-	-	-	-	-			23.20-	11.20-	Mercia Mudstone III/IV
Large Traffic Sign	SB62	187230	SB	Embankment	6.4	30.9	A	CP1096	60	34.20-31.90	0.00-2.30	Embankment Fill	-	-	-	-	21	27	34.40	34.40	34.40-30.1	0.00-4.30	Embankment Fill
										31.90-28.20	2.30-6.00	Glaciofluvial Deposits (Sands and Gravels)	78-136 (83)	-	-	-	21	>43			30.1-23.20	4.30-11.20	Glaciofluvial Deposits (Sands and Gravels)
										-	-	-	-	-	-	-	-	-			23.20-	11.20-	Mercia Mudstone III/IV
Large Traffic Sign	SB69	186605	SB	Embankment	3.2	30.6		SK42NE76	70	33.70-30.60	0.00-3.10	Embankment Fill	38	-	-	-	21	36	33.70	33.70	33.70-30.60	0.00-3.10	Embankment Fill
										30.60-26.70	3.10-7.00	River Terrace Deposits	13-16 (13)	-	-	-	20	33			30.60-26.70	3.10-7.00	River Terrace Deposits
Large Traffic Sign	SB72	186183	SB	Embankment	2.5	30.6	A	SK42NE75	60	-	-	-	-	-	-	-	-	-	33.68	33.68	33.68-29.00	0.00-4.68	Embankment Fill
										33.80-31.10	0.00-2.70	Embankment Fill	23	-	-	-	21	34			29.00-25.00	4.68-8.68	River Terrace Deposits
										31.10-30.80	2.70-3.00	River Terrace Deposits	71	-	-	-	20	>43			25.00-	8.68-	Mercia Mudstone III/IV
Large Traffic Sign	SB76	185597	SB	Cutting	0.4	None	A	SK42NE12	60	34.70-33.48	0.00-1.22	Head Deposits	-	-	15-16	-	21	27	33.95	33.95	-	-	-
										33.48-31.65	1.22-3.05	Glaciofluvial Deposits (Sands and Gravels)	-	-	18	8	21	38			33.95-31.65	0.00-2.30	Glaciofluvial Deposits (Sands and Gravels)
										31.65-28.91	3.05-5.79	Mercia Mudstone III/IV	-	-	16-41	7	21	30			31.65-28.91	2.30-5.04	Mercia Mudstone III/IV
										28.91-25.56	5.79-9.14	Mercia Mudstone II/I	-	-	8-14	-	22	-			28.91-	5.04-	Mercia Mudstone II/I
Large Traffic Sign	SB84	184220	SB	Cutting	5.5	None	G	SK42NE8	20	66.10-58.48	0.00-7.62	Mercia Mudstone III/IV	-	-	7-21	8-19	22	30	63.14	63.14	63.14-	0.00-	Mercia Mudstone III/IV
Large Traffic Sign	SB86	183963	SB	Cutting	8.5	None	G	SK42NE7	70	75.00-73.78	0.00-1.22	Head Deposits	-	-	8-15	-	20	27	62.24	62.24	-	-	-
										73.78-62.81	1.22-12.19	Mercia Mudstone III/IV	-	-	15-22	11-22	21	30			62.24-	0.00-	Mercia Mudstone III/IV
Large Traffic Sign	SB89	183565	SB	Cutting	4.9	None	G	SK42NE5	100	79.90-70.76	0.00-9.14	Mercia Mudstone III/IV	-	-	12	8-17	21	30	74.44	74.44	74.44-	0.00-	Mercia Mudstone III/IV
Large Traffic Sign	SB92	183436	SB	Embankment	1.5	None	A	CP1078	30	76.00-75.50	0.00-0.50	Embankment Fill	-	-	-	-	21	27	76.45	76.45	76.45-75.10	0.00-1.35	Embankment Fill
										75.50-73.50	0.50-2.50	Mercia Mudstone II/I	429	-	9	16	22	-			75.10-73.50	1.35-2.95	Mercia Mudstone II/I
										73.50-72.98	2.50-3.02	Mercia Mudstone Siltstone	750	-	-	-	22	-			73.50-	2.95-	Mercia Mudstone Siltstone
Large Traffic Sign	SB96	182544	SB	Cutting	5.3	None	A	SK43SE23	20	78.80-76.67	0.00-2.13	Glacial Till	-	-	-	-	21	27	72.68	72.68	-	-	-
										76.67-69.66	2.13-9.14	Mercia Mudstone III/IV	-	-	-	-	21	30			72.68-	0.00-	Mercia Mudstone III/IV
Large Traffic Sign	SB98	196220	SB	Embankment	Unknown																		

Ground conditions for SB98 to be determined by Just in Time G

Asset	Sign Ref	Chainage	Approx Mainline Carriageway Chainage	Junction	Earthwork				Borehole Data					In-Situ Tests		Lab Tests		Parameters		Ground Model				
					Type	Height (m)	Slope Angle (°)	Flood Level (m)	Nearest Borehole(s)	Borehole Proximity (m)	Borehole Stratigraphy (mAOD)	Borehole Stratigraphy (mbgl)	Soil/Rock	SPT	Hand Vane Tests	MC (%)	PI (%)	Bulk Density (γb)	ϕ' (°)	Approx. Carriageway Level at Foundation (mAOD)	Top of Foundation Level (mAOD) (6)	Stratigraphy from Foundation Top (mAOD)	Stratigraphy from Foundation Top (mbgl)	Soil/Rock
Single Post Sign	NB01	181808	NB	NB	Embankment	2.0	No topo		SK42SE98	10	56.31-54.81	0.00-1.50	Embankment Fill	6	-	-	-	21	29	57.92	57.92	-	-	-
											54.81-49.31	1.50-7.00	Mercia Mudstone III/IV	29-124 (40)	-	-	-	21	38			57.92-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB02	181970	NB	NB	At Grade	0.0	No topo		SK42SE94	10	60.31-52.76	0.00-7.55	Mercia Mudstone III/IV	9-483 (38)	-	-	-	21	38	60.47	60.47	60.47-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB05	182460	NB	NB	Cutting	5.6	21	None	SK42SE186	40	79.05-78.05	0.00-1.00	Glacial Till	-	-	15-16	-	21	26	71.27	71.27	-	-	-
											78.05-72.05	1.00-7.00	Mercia Mudstone III/IV	-	-	12-24	17-20	21	30			71.27-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB06	182948	NB	NB	Cutting	2.3	17	None	SK42NE97	10	77.04-76.34	0.00-0.70	Embankment Fill	-	-	-	-	21	27	77.11	77.11	77.11-76.34	0.00-0.77	Embankment Fill
											76.34-73.54	0.70-3.50	Mercia Mudstone III/IV	-	-	14-19	13	21	30			76.34-73.54	0.77-3.57	Mercia Mudstone III/IV
											73.54-57.04	3.50-20.00	Mercia Mudstone Siltstone	-	-	12-14	-	22	-			73.54-	3.57-	Mercia Mudstone Siltstone
Single Post Sign	NB08	183445	NB	NB	At Grade	0.0	-	None	CP1078	30	76.00-75.50	0.00-0.50	Embankment Fill	-	-	-	-	21	27	76.40	76.40	76.40-75.10	0.00-1.30	Embankment Fill
											75.50-73.50	0.50-2.50	Mercia Mudstone I/II	429	-	9	16	22	-			75.10-73.50	1.30-2.90	Mercia Mudstone I/II
											73.50-72.98	2.50-3.02	Mercia Mudstone Siltstone	750	-	-	-	22	-			73.50-	2.90-	Mercia Mudstone Siltstone
Single Post Sign	NB09	183654	NB	NB	Cutting	5.7	19	None	SK42NE5	10	79.90-70.76	0.00-9.14	Mercia Mudstone III/IV	-	-	12	8-17	21	30	74.25	74.25	74.25-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB10	183750	NB	NB	Cutting	8.1	23	None	SK42NE64	40	72.95-71.75	0.00-1.20	Mercia Mudstone Siltstone	-	-	-	-	22	-	72.95	72.95	72.95-71.75	0.00-1.20	Mercia Mudstone Siltstone
											71.75-68.35	1.20-4.60	Mercia Mudstone III/IV	58-87 (58)	-	-	-	21	42			71.75-68.35	1.20-4.60	Mercia Mudstone III/IV
											68.35-67.90	4.60-5.05	Mercia Mudstone I/II	59	-	-	-	22	-			68.35-67.90	4.60-5.05	Mercia Mudstone I/II
											67.90-66.50	5.05-6.45	Mercia Mudstone Siltstone	-	-	-	-	22	-			67.90-66.50	5.05-6.45	Mercia Mudstone Siltstone
											66.50-66.00	6.45-6.95	Mercia Mudstone III/IV	-	-	-	-	21	30			66.50-66.00	6.45-6.95	Mercia Mudstone III/IV
											66.00-65.45	6.95-7.50	Mercia Mudstone Siltstone	-	-	-	-	22	-			66.00-65.45	6.95-7.50	Mercia Mudstone Siltstone
											65.45-64.80	7.50-8.15	Mercia Mudstone I/II	-	-	-	-	22	-			65.45-64.80	7.50-8.15	Mercia Mudstone I/II
Single Post Sign	NB12	183945	NB	NB	Cutting	9.3	20	None	SK42NE7	70	75.00-73.78	0.00-1.22	Head Deposits	-	-	8-15	-	20	27	69.53	69.53	-	-	-
											73.78-62.81	1.22-12.19	Mercia Mudstone III/IV	-	-	15-22	11-22	21	30			69.53-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB14	183995	NB	NB	Cutting	9.0	20	None	SK42NE7	20	75.00-73.78	0.00-1.22	Head Deposits	-	-	8-15	-	20	27	68.51	68.51	-	-	-
											73.78-62.81	1.22-12.19	Mercia Mudstone III/IV	-	-	15-22	11-22	21	30			68.51-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB15	184335	NB	NB	Cutting	3.2	17	None	SK42NE8	80	66.10-58.48	0.00-7.62	Mercia Mudstone III/IV	-	-	7-21	8-19	21	30	59.90	59.90	59.90-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB16	184095	NB	NB	Cutting	4.9	17	None	SK42NE7	60	75.00-73.78	0.00-1.22	Head Deposits	-	-	8-15	-	20	27	66.25	66.25	-	-	-
											73.78-62.81	1.22-12.19	Mercia Mudstone III/IV	-	-	15-22	11-22	21	30			66.25-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB17	184455	NB	NB	At Grade	0.0	-	None	SK42NE71	20	56.75-55.75	0.00-1.00	Mercia Mudstone Sandstone	-	-	-	-	21	-	56.33	56.33	56.33-55.75	0.00-0.58	Mercia Mudstone Sandstone
											55.75-53.14	1.00-3.61	Mercia Mudstone III/IV	53-375 (53)	-	-	-	21	41			55.75-	0.58-	Mercia Mudstone III/IV
Single Post Sign	NB18	184195	NB	NB	Cutting	2.2	24	None	SK42NE8	50	66.10-58.48	0.00-7.62	Mercia Mudstone III/IV	-	-	7-21	8-19	21	30	63.75	63.75	63.75-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB20	184970	NB	NB	Cutting	2.0	6	None	SK42NE9	50	40.10-39.19	0.00-0.91	Alluvium Deposits	-	-	8-20	-	20	25	41.40	41.40	-	-	-
											39.19-37.66	0.91-2.44	River Terrace Deposits	57	-	8-11	-	20	42			41.40-37.66	0.00-3.74	Glaciofluvial Deposits (Sands and Gravels)
											37.66-34.00	2.44-6.10	Mercia Mudstone III/IV	-	-	18-26	15	21	34			37.66-	3.74-	Mercia Mudstone III/IV
Single Post Sign	NB22	185227	NB	NB	Cutting	6.4	17	None	SK42NE10	60	39.20-35.24	0.00-3.96	Glaciofluvial Deposits (Sands and Gravels)	159	-	10-16	-	21	>43	35.24	35.24	-	-	-
											35.24-30.06	3.96-9.14	Mercia Mudstone III/IV	-	-	16-26	12-17	21	30			35.24-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB23	185243	NB	NB	Cutting	5.3	18	None	SK42NE10	120	39.20-35.24	0.00-3.96	Glaciofluvial Deposits (Sands and Gravels)	159	-	10-16	-	21	>43	35.10	35.10	-	-	-
											35.24-30.06	3.96-9.14	Mercia Mudstone III/IV	-	-	16-26	12-17	21	30			35.10-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB23A	185243	NB	NB	Cutting	5.3	18	None	SK42NE10	120	39.20-35.24	0.00-3.96	Glaciofluvial Deposits (Sands and Gravels)	159	-	10-16	-	21	>43	35.10	35.10	-	-	-
											35.24-30.06	3.96-9.14	Mercia Mudstone III/IV	-	-	16-26	12-17	21	30			35.10-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB24	185255	NB	NB	Cutting	6.3	18	None	SK42NE11	100	37.20-31.71	0.00-5.49	Glaciofluvial Deposits (Sands and Gravels)	-	-	2-15	9	21	26	35.00	35.00	35.00-31.71	0.00-3.29	Glaciofluvial Deposits (Sands and Gravels)
											31.71-25.01	5.49-12.19	Mercia Mudstone III/IV	-	-	14-32	7-11	21	30			31.71-	3.29-	Mercia Mudstone III/IV
Single Post Sign	NB25	185500	NB	NB	Cutting	3.5	11	None	SK42NE12	70	34.70-33.48	0.00-1.22	Head Deposits	-	-	15-16	-	20	27	34.13	34.13	34.13-33.48	0.00-0.65	Head Deposits
											33.48-31.65	1.22-3.05	Glaciofluvial Deposits (Sands and Gravels)	-	-	18	8	21	38			33.48-31.65	0.65-2.48	Glaciofluvial Deposits (Sands and Gravels)
											31.65-28.91	3.05-5.79	Mercia Mudstone III/IV	-	-	16-41	7	21	30			31.65-28.91	2.48-5.22	Mercia Mudstone III/IV
											28.91-25.56	5.79-9.14	Mercia Mudstone I/II	-	-	8-14	-	22	-			28.91-	5.22-	Mercia Mudstone I/II
Single Post Sign	NB27	185595	NB	NB	At Grade	0.0	-	None	SK42NE12	20	34.70-33.48	0.00-1.22	Head Deposits	-	-	15-16	-	20	27	33.95	33.95	33.95-33.48	0.00-0.47	Head Deposits
											33.48-31.65	1.22-3.05	Glaciofluvial Deposits (Sands and Gravels)	-	-	18	8	21	38			33.48-31.65	0.47-2.30	Glaciofluvial Deposits (Sands and Gravels)
											31.65-28.91	3.05-5.79	Mercia Mudstone III/IV	-	-	16-41	7	21	30			31.65-28.91	2.30-5.04	Mercia Mudstone III/IV
											28.91-25.56	5.79-9.14	Mercia Mudstone I/II	-	-	8-14	-	22	-			28.91-	5.04-	Mercia Mudstone I/II
Single Post Sign	NB28	186112	NB	NB	Embankment	3.0	14	32.30	CP1090	100	33.85-29.15	0.00-4.70	Embankment Fill	28-176 (28)	-	15	24	21	36	33.68	33.68	33.68-29.20	0.00-4.48	Embankment Fill
											29.15-24.85	4.70-9.00	Glaciofluvial Deposits (Sands and Gravels)	17-750 (31)	-	-	-	21	36			29.20-24.85	4.48-8.83	Glaciofluvial Deposits (Sands and Gravels)
											24.85-22.46	9.00-11.39	Mercia Mudstone I/II	40-375 (40)	-	11	14	22	38			24.85-	8.83-	Mercia Mudstone I/II
Single Post Sign	NB29	186154	NB	NB	Embankment	2.7	14	32.30	CP1090	100	33.85-29.15	0.00-4.70	Embankment Fill	28-176 (28)	-	15	24	21	36	33.65	33.65	33.65-29.20	0.00-4.45	Embankment Fill
											29.15-24.85	4.70-9.00	Glaciofluvial Deposits (Sands and Gravels)	17-750 (31)	-	-	-	21	36			29.20-24.85	4.45-8.80	Glaciofluvial Deposits (Sands and Gravels)
											24.85-22.46	9.00-11.39	Mercia Mudstone I/II	40-375 (40)	-	11	14	22	38			24.85-	8.80-	Mercia Mudstone I/II
Single Post Sign	NB33	186675	NB	NB	Embankment	4.0	27	None	SK42NE397	30	33.65-31.65	0.00-2.00	Embankment Fill	15-16 (15)	-	12-19	17-18	21	32	34.19	34.19	34.19-31.65	0.00-2.54	Embankment Fill
											31.65-25.55	2.00-8.10	River Terrace Deposits	23-68 (31)	-	-	-	20	36			31.65-25.55	2.54-8.64	River Terrace Deposits
											25.55-23.65	8.10-10.00	Mercia Mudstone III/IV	66	-	13-23	-	21	>43			25.55-	8.64-	Mercia Mudstone III/IV
Single Post Sign	NB34	186693	NB	NB	Embankment	4.0	27	None	SK42NE397	20	33.65-31.65	0.00-2.00	Embankment Fill	15-16 (15)	-	12-19	17-18	21	32	34.33	34.33	34.33-31.65	0.00-2.68	Embankment Fill
											31.65-25.55	2.00-8.10	River Terrace Deposits	23-68 (31)	-	-	-	20	36			31.65-25.55	2.68-8.78	River Terrace Deposits
											25.55-23.65	8.10-10.00	Mercia Mudstone III/IV	66	-	13-23	-	21	>43			25.55-	8.78-	Mercia Mudstone III/IV
Single Post Sign	NB35	186693	NB	NB	Embankment	4.0	27	None	SK42NE397	20	33.65-31.65	0.00-2.00	Embankment Fill	15-16 (15)	-	12-19	17-18	21	32	34.33	34.33	34.33-31.65	0.00-2.68	Embankment Fill
											31.65-25.55	2.00-8.10	River Terrace Deposits	23-68 (31)	-	-	-	20	36			31.65-25.55	2.68-8.78	River Terrace Deposits
											25.55-23.65	8.10-10.00	Mercia Mudstone III/IV	66	-	13-23	-	21	>43			25.55-	8.78-	Mercia Mudstone III/IV
Single Post Sign	NB36	186703	NB	NB	Embankment	4.0	27	None	SK42NE397	20	33.65-31.65	0.00-2.00	Embankment Fill	15-16 (15)	-	12-19	17-18	21	32	34.33	34.33	34.33-31.65	0.00-2.68	Embankment Fill
											31.65-25.55	2.00-8.10	River Terrace Deposits	23-68 (31)	-	-	-	20	36			31.65-25.55	2.68-8.78	River Terrace Deposits
											25.55-23.65	8.10-10.00	Mercia Mudstone III/IV	66	-	13-23	-	21	>43			25.55-	8.78-	Mercia Mudstone III/IV
Single Post Sign	NB39	187120	NB	NB	Embankment	7.8	20	None	CP1094	20	38.10-31.60	0.00-6.50	Embankment Fill	7-14 (7)	-	17-18	12-18	21	29	38.79	38.79	38.79-30.90	0.00-7.89	Embankment Fill
											31.60-26.00	6.50-12.10	Glaciofluvial Deposits (Sands and Gravels)	13-111 (44)	-	-	-	21	39			30.90-26.00	7.89-12.79	Glaciofluvial Deposits (Sands and Gravels)
											26.00-21.60	12.10-16.50	Mercia Mudstone III/IV	13-38 (13)	-	24	19	21	31			26.00-21.60	12.79-17.19	Mercia Mudstone III/IV
											21.60-21.05	16.50-17.05	Mercia Mudstone I/II	750-1154	-	-	-	22	>44			21.60-	17.19-	Mercia Mudstone I/II
Single Post Sign	NB40	187500	NB	NB	Embankment	3.3	17	31.08	NWHM1	30	34.20-31.90	0.00-2.30	Embankment Fill	-	-	-	-	21	27	34.56	34.56	34.56-31.90	0.00-2.66	Embankment Fill
											31.90-28.20	2.30-6.00	Glaciofluvial Deposits (Sands and Gravels)	78-102 (78)	-	-	-	21	>43			31.90-	2.66-	Glaciofluvial Deposits (Sands and Gravels)
Single Post Sign	NB43	187598	NB	NB	Embankment	2.9	10	31.15	NWHM1	70	34.20-31.90	0.00-2.30	Embankment Fill	-	-	-	-	21	27	33.90	33.90	33.90-31.90	0.00-2.00	Embankment Fill

Single Post Sign	NB43	187990	NB	NB	Embankment	2.9	16	31.19	NWHM1	70	31.90-28.20	2.30-6.00	Glaciofluvial Deposits (Sands and Gravels)	78-102 (78)	-	-	-	21	>43	35.90	35.90	31.90-	2.00-	Glaciofluvial Deposits (Sands and Gravels)
Single Post Sign	NB44	188167	NB	NB	Embankment	7.2	16	31.58	SK43SE151	60	31.00-29.50	0.00-1.50	Embankment Fill	15	-	-	-	21	31	38.14	38.14	38.14-30.40	0.00-7.74	Embankment Fill
											29.50-23.40	1.50-7.60	Glaciofluvial Deposits (Sands and Gravels)	37-140 (44)	-	-	-	21	39			30.40-23.80	7.74-14.34	Glaciofluvial Deposits (Sands and Gravels)
											23.40-19.75	7.60-11.25	Mercia Mudstone III/IV	29-210 (61)	-	-	-	21	>43			23.80-	14.34-	Mercia Mudstone III/IV
Single Post Sign	NB45	188089	NB	NB	Embankment	6.5	16	31.51	SK43SE151	60	31.00-29.50	0.00-1.50	Embankment Fill	15	-	-	-	21	31	37.40	37.40	37.40-30.40	0.00-7.00	Embankment Fill
											29.50-23.40	1.50-7.60	Glaciofluvial Deposits (Sands and Gravels)	37-140 (44)	-	-	-	21	39			30.40-23.80	7.00-13.60	Glaciofluvial Deposits (Sands and Gravels)
											23.40-19.75	7.60-11.25	Mercia Mudstone III/IV	29-210 (61)	-	-	-	21	>43			23.80-	13.60-	Mercia Mudstone III/IV
Single Post Sign	NB47	188793	NB	NB	Embankment	6.1	17	32.20	CP1100	10	36.25-30.65	0.00-5.60	Embankment Fill	24-40 (24)	-	3-10	15	21	34	35.93	35.93	35.93-30.65	0.00-5.28	Embankment Fill
											30.65-23.45	5.60-12.80	River Terrace Deposits	34-150 (41)	-	9	15	20	38			30.65-23.60	5.28-12.33	River Terrace Deposits
											23.45-21.55	12.80-14.70	Glaciofluvial Deposits (Sands and Gravels)	88-158 (120)	-	-	-	21	>43			23.60-	12.33-	Glaciofluvial Deposits (Sands and Gravels)
Single Post Sign	NB48	189013	NB	NB	Embankment	3.0	18	32.20	SK43SE14	80	-	-	-	-	-	-	-	-	-	34.81	34.81	34.81-29.30	0.00-5.51	Embankment Fill
											29.30-25.03	0.00-4.27	River Terrace Deposits	93-110	-	-	-	20	>43			29.30-25.03	5.51-9.78	River Terrace Deposits
											25.03-19.24	4.27-10.06	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	38			25.03-19.24	9.78-15.57	Glaciofluvial Deposits (Sands and Gravels)
											19.24-14.06	10.06-15.24	Mercia Mudstone III/IV	-	-	-	-	21	30			19.24-	15.57-	Mercia Mudstone III/IV
Single Post Sign	NB48A	189013	NB	NB	Embankment	3.0	18	32.20	SK43SE14	80	-	-	-	-	-	-	-	-	-	34.81	34.81	34.81-29.30	0.00-5.51	Embankment Fill
											29.30-25.03	0.00-4.27	River Terrace Deposits	93-110	-	-	-	20	>43			29.30-25.03	5.51-9.78	River Terrace Deposits
											25.03-19.24	4.27-10.06	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	38			25.03-19.24	9.78-15.57	Glaciofluvial Deposits (Sands and Gravels)
											19.24-14.06	10.06-15.24	Mercia Mudstone III/IV	-	-	-	-	21	30			19.24-	15.57-	Mercia Mudstone III/IV
Single Post Sign	NB49	189024	NB	NB	Embankment	3.0	18	32.20	SK43SE14	70	-	-	-	-	-	-	-	-	-	34.79	34.79	34.79-29.30	0.00-5.49	Embankment Fill
											29.30-25.03	0.00-4.27	River Terrace Deposits	93-110	-	-	-	20	>43			29.30-25.03	5.49-9.76	River Terrace Deposits
											25.03-19.24	4.27-10.06	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	38			25.03-19.24	9.76-15.55	Glaciofluvial Deposits (Sands and Gravels)
											19.24-14.06	10.06-15.24	Mercia Mudstone III/IV	-	-	-	-	21	30			19.24-	15.55-	Mercia Mudstone III/IV
Single Post Sign	NB51	188977	NB	NB	Embankment	4.6	18	32.20	CP1101	20	35.25-29.25	0.00-6.00	Embankment Fill	31-103 (31)	-	9-13	13-14	21	36	34.91	34.91	34.91-29.25	0.00-5.66	Embankment Fill
											29.25-25.45	6.00-9.80	River Terrace Deposits	13-79 (13)	-	10	NP	20	31			29.25-25.45	5.66-9.46	River Terrace Deposits
											25.45-21.25	9.80-14.00	Glaciofluvial Deposits (Fine Grained)	38-47 (38)	-	20	12	21	38			25.45-21.25	9.46-13.66	Glaciofluvial Deposits (Fine Grained)
											21.25-20.63	14.00-14.62	Mercia Mudstone Siltstone	120	-	-	-	22	-			21.25-	13.66-	Mercia Mudstone Siltstone
Single Post Sign	NB52	189250	NB	NB	Embankment	4.1	19	32.20	NWHCCTV2	20	34.49-30.89	0.00-3.60	Embankment Fill	20-22 (20)	-	-	-	21	33	34.21	34.21	34.21-30.89	0.00-3.32	Embankment Fill
											30.89-25.59	3.60-8.90	Glaciofluvial Deposits (Sands and Gravels)	20-54 (23)	-	-	-	21	34			30.89-25.59	3.32-8.62	Glaciofluvial Deposits (Sands and Gravels)
											25.59-24.49	8.90-10.00	Mercia Mudstone III/IV	30	-	-	-	21	30			25.59-	8.62-	Mercia Mudstone III/IV
Single Post Sign	NB53	189492	NB	NB	At Grade	2.0	10	32.20	CP1103	10	34.10-30.80	0.00-3.30	Embankment Fill	19	-	11	18	21	33	33.70	33.70	33.70-30.80	0.00-2.90	Embankment Fill
											30.80-26.10	3.30-8.00	Glaciofluvial Deposits (Sands and Gravels)	10-44 (19)	-	-	-	21	33			30.80-26.10	2.90-7.60	Glaciofluvial Deposits (Sands and Gravels)
											26.10-22.71	8.00-11.39	Mercia Mudstone III/IV	110-233	-	22	11	21	>43			26.10-	7.60-	Mercia Mudstone III/IV
Single Post Sign	NB55	189976	NB	NB	Embankment	6.0	17	None	CP1105	100	38.85-31.75	0.00-7.10	Embankment Fill	16-64 (18)	-	10-16	9-18	21	33	38.81	38.81	38.81-31.75	0.00-7.06	Embankment Fill
											31.75-25.05	7.10-13.80	Glaciofluvial Deposits (Sands and Gravels)	43-103 (43)	-	-	-	21	39			31.75-25.05	7.06-13.76	Glaciofluvial Deposits (Sands and Gravels)
											25.05-24.10	13.80-14.75	Mercia Mudstone III/IV	128-192	-	-	-	21	>43			25.05-	13.76-	Mercia Mudstone III/IV
Single Post Sign	NB56	190063	NB	NB	Embankment	7.6	17	None	CP1105	100	38.85-31.75	0.00-7.10	Embankment Fill	16-64 (18)	-	10-16	9-18	21	33	39.63	39.63	39.63-31.75	0.00-7.88	Embankment Fill
											31.75-25.05	7.10-13.80	Glaciofluvial Deposits (Sands and Gravels)	43-103 (43)	-	-	-	21	39			31.75-25.05	7.88-14.58	Glaciofluvial Deposits (Sands and Gravels)
											25.05-24.10	13.80-14.75	Mercia Mudstone III/IV	128-192	-	-	-	21	>43			25.05-	14.58-	Mercia Mudstone III/IV
Single Post Sign	NB57	190449	NB	NB	Embankment	7.1	15	31.20	CP1108	20	38.80-31.40	0.00-7.40	Embankment Fill	15-49 (15)	-	14-16	19-21	21	32	39.25	39.25	39.25-31.40	0.00-7.85	Embankment Fill
											31.40-25.90	7.40-12.90	Glaciofluvial Deposits (Sands and Gravels)	31-90 (31)	-	-	-	21	36			31.40-25.90	7.85-13.35	Glaciofluvial Deposits (Sands and Gravels)
											25.90-22.00	12.90-16.80	Mercia Mudstone III/IV	24	-	32	10	21	35			25.90-22.00	13.35-17.25	Mercia Mudstone III/IV
											22.00-21.70	16.80-17.10	Mercia Mudstone Siltstone	-	-	-	-	22	-			22.00-	17.25-	Mercia Mudstone Siltstone
Single Post Sign	NB59	190845	NB	NB	Embankment	3.5	26	31.20	CP1110	130	32.95-29.55	0.00-3.40	Embankment Fill	19-103 (19)	-	15	19	21	33	33.97	33.97	33.97-30.00	0.00-3.97	Embankment Fill
											29.55-26.45	3.40-6.50	Glaciofluvial Deposits (Sands and Gravels)	37-70 (37)	-	37	32	21	38			30.00-25.10	3.97-8.87	Glaciofluvial Deposits (Sands and Gravels)
											26.45-17.60	6.50-15.35	Mercia Mudstone III/IV	28-214 (37)	-	20-23	11-17	21	38			25.10-	8.87-	Mercia Mudstone III/IV
Single Post Sign	NB60	190866	NB	NB	Embankment	3.2	24	None	CP1110	100	32.95-29.55	0.00-3.40	Embankment Fill	19-103 (19)	-	15	19	21	33	33.74	33.74	33.74-30.00	0.00-3.74	Embankment Fill
											29.55-26.45	3.40-6.50	Glaciofluvial Deposits (Sands and Gravels)	37-70 (37)	-	37	32	21	38			30.00-25.10	3.74-8.64	Glaciofluvial Deposits (Sands and Gravels)
											26.45-17.60	6.50-15.35	Mercia Mudstone III/IV	28-214 (37)	-	20-23	11-17	21	38			25.10-	8.64-	Mercia Mudstone III/IV
Single Post Sign	NB60	190866	NB	NB	Embankment	3.2	24	None	CP1110	100	32.95-29.55	0.00-3.40	Embankment Fill	19-103 (19)	-	15	19	21	33	33.74	33.74	33.74-30.00	0.00-3.74	Embankment Fill
											29.55-26.45	3.40-6.50	Glaciofluvial Deposits (Sands and Gravels)	37-70 (37)	-	37	32	21	38			30.00-25.10	3.74-8.64	Glaciofluvial Deposits (Sands and Gravels)
											26.45-17.60	6.50-15.35	Mercia Mudstone III/IV	28-214 (37)	-	20-23	11-17	21	38			25.10-	8.64-	Mercia Mudstone III/IV
Single Post Sign	NB62	190872	NB	NB	Embankment	3.2	24	None	CP1110	100	32.95-29.55	0.00-3.40	Embankment Fill	19-103 (19)	-	15	19	21	33	33.70	33.70	33.70-30.00	0.00-3.70	Embankment Fill
											29.55-26.45	3.40-6.50	Glaciofluvial Deposits (Sands and Gravels)	37-70 (37)	-	37	32	21	38			30.00-25.10	3.70-8.60	Glaciofluvial Deposits (Sands and Gravels)
											26.45-17.60	6.50-15.35	Mercia Mudstone III/IV	28-214 (37)	-	20-23	11-17	21	38			25.10-	8.60-	Mercia Mudstone III/IV
Single Post Sign	NB63	190947	NB	NB	Embankment	2.2	17	31.20	CP1110	30	32.95-29.55	0.00-3.40	Embankment Fill	19-103 (19)	-	15	19	21	33	33.29	33.29	33.29-30.00	0.00-3.29	Embankment Fill
											29.55-26.45	3.40-6.50	Glaciofluvial Deposits (Sands and Gravels)	37-70 (37)	-	37	32	21	38			30.00-25.10	3.29-8.19	Glaciofluvial Deposits (Sands and Gravels)
											26.45-17.60	6.50-15.35	Mercia Mudstone III/IV	28-214 (37)	-	20-23	11-17	21	38			25.10-	8.19-	Mercia Mudstone III/IV
Single Post Sign	NB65	191476	NB	NB	Cutting	2.3	10	None	CP1111	100	32.05-28.35	0.00-3.70	Embankment Fill	5	-	11	20	21	27	33.22	33.22	33.22-29.00	0.00-4.22	Embankment Fill
											28.35-23.45	3.70-8.60	Glaciofluvial Deposits (Sands and Gravels)	34-66	-	14-39	8	21	26			29.00-24.40	4.22-8.82	Glaciofluvial Deposits (Sands and Gravels)
											23.45-20.05	8.60-12.00	Mercia Mudstone III/IV	49-212 (73)	-	-	-	21	>43			24.40-22.00	8.82-11.22	Mercia Mudstone III/IV
											20.05-19.54	12-12.51	Mercia Mudstone I/II	350	-	-	-	22	-			22.00-	11.22-	Mercia Mudstone I/II
Single Post Sign	NB66	191850	NB	NB	Cutting	1.4	20	None	NWHM4	60	34.91-31.11	0.00-3.80	Glaciofluvial Deposits (Sands and Gravels)	46-51 (46)	-	3-4	-	21	39	34.43	34.43	34.43-31.00	0.00-3.43	Glaciofluvial Deposits (Sands and Gravels)
											31.11-22.56	3.80-12.35	Mercia Mudstone I/II	21-73 (37)	-	7	17	22	-			31.00-	3.43-	Mercia Mudstone I/II
Single Post Sign	NB68	192240	NB	NB	Embankment	5.9	23	None	CP1113	40	40.05-35.95	0.00-4.10	Embankment Fill	15	-	12	22	21	31	41.44	41.44	41.44-35.95	0.00-5.49	Embankment Fill
											35.95-31.85	4.10-7.20	Glaciofluvial Deposits (Sands and Gravels)	29-42 (29)	-	16	20	21	36			35.95-31.85	5.49-9.59	Glaciofluvial Deposits (Sands and Gravels)
											31.85-25.95	7.20-14.10	Mercia Mudstone III/IV	21-198 (34)	-	17	23	21	37			31.85-25.95	9.59-15.49	Mercia Mudstone III/IV
											25.95-25.45	14.10-14.60	Mercia Mudstone I/II	350	-	-	-	22	-			25.95-	15.49-	Mercia Mudstone I/II
Single Post Sign	NB69	192635	NB	NB	Embankment	4.9	24	None	CP1115	60	46.00-39.50	0.00-6.50	Embankment Fill	19-28 (28)	-	16-19	17-18	21	35	46.06	46.06	46.06-39.50	0.00-6.56	Embankment Fill
											39.50-35.40	6.50-10.60	Head Deposits	19-23 (19)	-	12-20	12-29	20	33			39.50-35.40	6.56-10.66	Head Deposits
											35.40-33.80	10.60-12.20	Glaciofluvial Deposits (Sands and Gravels)	32	-	19	17	21	36			35.40-33.80	10.66-12.26	Glaciofluvial Deposits (Sands and Gravels)
											33.80-31.00	12.20-15.00	Mercia Mudstone III/IV	25-28 (25)	-	-	-	21	34			33.80-31.00	12.26-15.06	Mercia Mudstone III/IV
											31.00-30.65	15.00-15.35	Mercia Mudstone Siltstone	750	-	-	-	22	-			31.00-	15.06-	Mercia Mudstone Siltstone
Single Post Sign	NB71	192725	NB	NB	Embankment	3.3	16	None	SK43SE28	100	-	-	-	-	-	-	-	-	27	45.94	45.94	45.94-41.00	0.00-4.94	Embankment Fill
											41.00-34.75	0.00-6.25	Head Deposits	50	-	-	-	20	27			41.00-34.75	4.94-11.19	Head Deposits
											34.75-31.86	6.25-9.14	Mercia Mudstone III/IV	-	-	-	-	21	30			34.75-	11.19-	Mercia Mudstone III/IV
Single Post Sign	NB72	192731	NB	NB	Embankment	3.3	16	None	SK43SE28	100	-	-	-	-	-	-	-	-	27	45.92	45.92	45.92-41.00	0.00-4.92	Embankment Fill
											41.00-34.75	0.00-6.25	Head Deposits	50	-	-	-	20	27			41.00-34.75	4.92-11.17	Head Deposits
											34.75-31.86	6.25-9.14	Mercia Mudstone III/IV	-	-	-	-	21	30			34.75-	11.17-	Mercia Mudstone III/IV

Single Post Sign	NB73	192811	NB	NB	Embankment	1.5	17	None	SK43SE28	200	-	-	-	-	-	-	-	-	27	45.58	45.58	45.58-41.00	0.00-4.58	Embankment Fill
											41.00-34.75	0.00-6.25	Head Deposits	50	-	-	-	20	27			41.00-34.75	4.58-10.83	Head Deposits
											34.75-31.86	6.25-9.14	Mercia Mudstone III/IV	-	-	-	-	21	30			34.75-	10.83-	Mercia Mudstone III/IV
Single Post Sign	NB77	193171	NB	NB	Cutting	6.1	20	None	HIS0028	100	45.20-36.96	0.00-8.24	Mercia Mudstone III/IV	-	-	-	-	21	30	45.90	45.90	45.90-	0.00-	Mercia Mudstone III/IV
Single Post Sign	NB78	193300	NB	NB	Cutting	3.0	21	None	NWHM5	100	47.66-46.06	0.00-1.60	Embankment Fill	-	-	-	-	21	27	46.91	46.91	46.91-46.06	0.00-1.60	Embankment Fill
											46.06-38.66	1.60-9.00	Mercia Mudstone I/II	40-50 (40)	-	9-12	12	22	-			46.06-38.66	1.60-9.00	Mercia Mudstone I/II
											38.66-36.96	9.00-10.70	Mercia Mudstone III/IV	50	-	-	-	21	38			38.66-36.96	9.00-10.70	Mercia Mudstone III/IV
											36.96-35.66	10.70-12.00	Mercia Mudstone I/II	49	-	-	-	22	-			36.96-	10.70-12.00	Mercia Mudstone I/II
Single Post Sign	NB80	193547	NB	NB	Cutting	2.3	18	None	HIS0032	40	51.20-40.68	0.00-10.52	Mercia Mudstone III/IV	-	-	-	-	21	30	49.39	49.39	49.39-	0.00-	Mercia Mudstone III/IV
Single Post Sign	SB07	193535	SB	SB	Cutting	5.0	24	None	HIS0032	30	51.20-40.68	0.00-10.52	Mercia Mudstone III/IV	-	-	-	-	21	30	49.19	49.19	49.19-	0.00-	Mercia Mudstone III/IV
Single Post Sign	SB08	193450	SB	SB	Cutting	5.0	26	None	HIS0032	60	51.20-40.68	0.00-10.52	Mercia Mudstone III/IV	-	-	-	-	21	30	48.38	48.38	48.38-	0.00-	Mercia Mudstone III/IV
Single Post Sign	SB09	192798	SB	SB	Embankment	2.3	25	None	SK43SE28	180	-	-	-	-	-	-	-	-	27	45.58	45.58	45.58-41.00	0.00-4.58	Embankment Fill
											41.00-34.75	0.00-6.25	Head Deposits	50	-	-	-	20	27			41.00-34.75	4.58-10.83	Head Deposits
											34.75-31.86	6.25-9.14	Mercia Mudstone III/IV	-	-	-	-	21	30			34.75-	10.83-	Mercia Mudstone III/IV
Single Post Sign	SB10	192684	SB	SB	Embankment	5.0	27	None	SK43SE28	40	-	-	-	-	-	-	-	-	27	46.06	46.06	46.06-41.00	0.00-5.06	Embankment Fill
											41.00-34.75	0.00-6.25	Head Deposits	50	-	-	-	20	27			41.00-34.75	5.06-11.31	Head Deposits
											34.75-31.86	6.25-9.14	Mercia Mudstone III/IV	-	-	-	-	21	30			34.75-	11.31-	Mercia Mudstone III/IV
Single Post Sign	SB13	192250	SB	SB	Embankment	5.6	20	None	CP1113	50	40.05-35.95	0.00-4.10	Embankment Fill	15	-	12	22	21	31	41.66	41.66	41.66-35.95	0.00-5.71	Embankment Fill
											35.95-31.85	4.10-7.20	Glaciofluvial Deposits (Sands and Gravels)	29-42 (29)	-	16	20	21	36			35.95-31.85	5.71-9.81	Glaciofluvial Deposits (Sands and Gravels)
											31.85-25.95	7.20-14.10	Mercia Mudstone III/IV	21-198 (34)	-	17	23	21	37			31.85-25.95	9.81-15.71	Mercia Mudstone III/IV
											25.95-25.45	14.10-14.60	Mercia Mudstone I/II	350	-	-	-	22	-			25.95-	15.71-	Mercia Mudstone I/II
Single Post Sign	SB15	191944	SB	SB	At Grade	0.0	0	None	NWHM4	50	34.91-31.11	0.00-3.80	Glaciofluvial Deposits (Sands and Gravels)	46-51 (46)	-	3-4	-	21	39	35.53	35.53	35.53-31.00	0.00-4.53	Glaciofluvial Deposits (Sands and Gravels)
											31.11-22.56	3.80-12.35	Mercia Mudstone I/II	21-73 (37)	-	7	17	22	-			31.00-	4.53-	Mercia Mudstone I/II
Single Post Sign	SB17	191902	SB	SB	At Grade	0.0	0	None	NWHM4	20	34.91-31.11	0.00-3.80	Glaciofluvial Deposits (Sands and Gravels)	46-51 (46)	-	3-4	-	21	39	34.98	34.98	34.98-31.00	0.00-3.98	Glaciofluvial Deposits (Sands and Gravels)
											31.11-22.56	3.80-12.35	Mercia Mudstone I/II	21-73 (37)	-	7	17	22	-			31.00-	3.98-	Mercia Mudstone I/II
Single Post Sign	SB18	191902	SB	SB	At Grade	0.0	0	None	NWHM4	20	34.91-31.11	0.00-3.80	Glaciofluvial Deposits (Sands and Gravels)	46-51 (46)	-	3-4	-	21	39	34.98	34.98	34.98-31.00	0.00-3.98	Glaciofluvial Deposits (Sands and Gravels)
											31.11-22.56	3.80-12.35	Mercia Mudstone I/II	21-73 (37)	-	7	17	22	-			31.00-	3.98-	Mercia Mudstone I/II
Single Post Sign	SB19	191887	SB	SB	At Grade	0.0	0	None	NWHM4	40	34.91-31.11	0.00-3.80	Glaciofluvial Deposits (Sands and Gravels)	46-51 (46)	-	3-4	-	21	39	34.86	34.86	34.86-31.00	0.00-3.86	Glaciofluvial Deposits (Sands and Gravels)
											31.11-22.56	3.80-12.35	Mercia Mudstone I/II	21-73 (37)	-	7	17	22	-			31.00-	3.86-	Mercia Mudstone I/II
Single Post Sign	SB22	191550	SB	SB	Cutting	2.7	12	None	SK43SE25	80	35.40-30.52	0.00-4.88	River Terrace Deposits	67-68 (67)	-	-	-	20	43	33.29	33.29	33.29-30.52	0.00-2.77	River Terrace Deposits
											30.52-27.78	4.88-7.62	Mercia Mudstone III/IV	-	-	-	-	21	30			30.52-	2.77-	Mercia Mudstone III/IV
Single Post Sign	SB24	191347	SB	SB	Embankment	4.2	14	31.20	CP1111	30	32.05-28.35	0.00-3.70	Embankment Fill	5	-	11	20	21	27	33.22	33.22	33.22-29.00	0.00-4.22	Embankment Fill
											28.35-23.45	3.70-8.60	Glaciofluvial Deposits (Sands and Gravels)	34-66	-	14-39	8	21	26			29.00-24.40	4.22-8.82	Glaciofluvial Deposits (Sands and Gravels)
											23.45-20.05	8.60-12.00	Mercia Mudstone III/IV	49-212 (73)	-	-	-	21	>43			24.40-22.00	8.82-11.22	Mercia Mudstone III/IV
											20.05-19.54	12-12.51	Mercia Mudstone I/II	350	-	-	-	22	-			22.00-	11.22-	Mercia Mudstone I/II
Single Post Sign	SB25	191140	SB	SB	Embankment	3.8	13	31.20	NWHM3	20	33.07-31.22	0-1.85	Embankment Fill	19	-	-	-	21	33	33.27	33.27	33.27-30.50	0.00-2.77	Embankment Fill
											31.22-25.77	1.85-7.30	Glaciofluvial Deposits (Sands and Gravels)	9.0-29	-	-	-	21	26			30.50-25.30	2.77-7.97	Glaciofluvial Deposits (Sands and Gravels)
											25.77-22.57	7.30-10.50	Mercia Mudstone III/IV	19-37 (19)	-	-	-	21	33			25.30-22.57	7.97-10.70	Mercia Mudstone III/IV
											22.57-21.27	10.50-11.80	Mercia Mudstone Sandstone	750	-	-	-	21	-			22.57-	10.70-	Mercia Mudstone Sandstone
Single Post Sign	SB26	191040	SB	SB	Embankment	3.8	13	31.20	NWHM3	20	33.07-31.22	0-1.85	Embankment Fill	19	-	-	-	21	33	33.27	33.27	33.27-30.50	0.00-2.77	Embankment Fill
											31.22-25.77	1.85-7.30	Glaciofluvial Deposits (Sands and Gravels)	9.0-29	-	-	-	21	26			30.50-25.30	2.77-7.97	Glaciofluvial Deposits (Sands and Gravels)
											25.77-22.57	7.30-10.50	Mercia Mudstone III/IV	19-37 (19)	-	-	-	21	33			25.30-22.57	7.97-10.70	Mercia Mudstone III/IV
											22.57-21.27	10.50-11.80	Mercia Mudstone Sandstone	750	-	-	-	21	-			22.57-	10.70-	Mercia Mudstone Sandstone
Single Post Sign	SB29	190550	SB	SB	Embankment	6.7	26	31.20	NWHM67	50	37.38-31.38	0.00-6.00	Embankment Fill	12-27 (19)	-	-	-	21	33	38.14	38.14	38.14-31.38	0.00-6.76	Embankment Fill
											31.38-25.38	6.00-12.00	Glaciofluvial Deposits (Sands and Gravels)	106-750 (136)	-	-	-	21	>43			31.38-23.20	6.76-14.94	Glaciofluvial Deposits (Sands and Gravels)
											-	-	-	-	-	-	-	-	-			23.20-	14.94-	Mercia Mudstone III/IV
Single Post Sign	SB30	190532	SB	SB	Embankment	7.9	26	31.20	NWHM67	70	37.38-31.38	0.00-6.00	Embankment Fill	12-27 (19)	-	-	-	21	33	38.40	38.40	38.40-31.38	0.00-7.02	Embankment Fill
											31.38-25.38	6.00-12.00	Glaciofluvial Deposits (Sands and Gravels)	106-750 (136)	-	-	-	21	>43			31.38-23.20	7.02-15.20	Glaciofluvial Deposits (Sands and Gravels)
											-	-	-	-	-	-	-	-	-			23.20-	15.20-	Mercia Mudstone III/IV
Single Post Sign	SB31	190532	SB	SB	Embankment	7.9	26	31.20	NWHM67	70	37.38-31.38	0.00-6.00	Embankment Fill	12-27 (19)	-	-	-	21	33	38.40	38.40	38.40-31.38	0.00-7.02	Embankment Fill
											31.38-25.38	6.00-12.00	Glaciofluvial Deposits (Sands and Gravels)	106-750 (136)	-	-	-	21	>43			31.38-23.20	7.02-15.20	Glaciofluvial Deposits (Sands and Gravels)
											-	-	-	-	-	-	-	-	-			23.20-	15.20-	Mercia Mudstone III/IV
Single Post Sign	SB32	190514	SB	SB	Embankment	8.0	26	31.20	NWHM67	90	37.38-31.38	0.00-6.00	Embankment Fill	12-27 (19)	-	-	-	21	33	38.60	38.60	38.60-31.38	0.00-7.22	Embankment Fill
											31.38-25.38	6.00-12.00	Glaciofluvial Deposits (Sands and Gravels)	106-750 (136)	-	-	-	21	>43			31.38-23.20	7.22-15.40	Glaciofluvial Deposits (Sands and Gravels)
											-	-	-	-	-	-	-	-	-			23.20-	15.40-	Mercia Mudstone III/IV
Single Post Sign	SB34	189873	SB	SB	Embankment	5.8	16	32.20	CP1105	100	38.85-31.75	0.00-7.10	Embankment Fill	16-64 (18)	-	10-16	9-18	21	33	37.41	37.41	37.41-31.75	0.00-5.66	Embankment Fill
											31.75-25.05	7.10-13.80	Glaciofluvial Deposits (Sands and Gravels)	43-103 (43)	-	-	-	21	39			31.75-25.05	5.66-12.36	Glaciofluvial Deposits (Sands and Gravels)
											25.05-24.10	13.80-14.75	Mercia Mudstone III/IV	128-192	-	-	-	21	>43			25.05-	12.36-	Mercia Mudstone III/IV
Single Post Sign	SB35	189570	SB	SB	Embankment	3.0	10	32.20	HIS0002	30	-	-	-	-	-	-	-	-	-	33.85	33.85	33.85-31.80	0.00-2.05	Glaciofluvial Deposits (Sands and Gravels)
											31.80-27.20	0.00-4.60	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	38			31.80-27.20	2.05-6.65	Embankment Fill
											27.20-25.40	4.60-6.40	Glaciofluvial Deposits (Fine Grained)	-	-	-	-	21	26			27.20-25.40	6.65-8.45	Glaciofluvial Deposits (Fine Grained)
											25.40-24.20	6.40-7.60	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	38			25.40-24.20	8.45-9.65	Glaciofluvial Deposits (Sands and Gravels)
											24.20-16.90	7.60-14.90	Mercia Mudstone III/IV	-	-	-	-	21	30			24.20-	9.65-	Mercia Mudstone III/IV
Single Post Sign	SB36	189540	SB	SB	Cutting	4.0	19	32.20	HIS0002	10	-	-	-	-	-	-	-	-	-	33.73	33.73	33.73-31.80	0.00-1.93	Glaciofluvial Deposits (Sands and Gravels)
											31.80-27.20	0.00-4.60	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	38			31.80-27.20	1.93-6.53	Embankment Fill
											27.20-25.40	4.60-6.40	Glaciofluvial Deposits (Fine Grained)	-	-	-	-	21	26			27.20-25.40	6.53-8.33	Glaciofluvial Deposits (Fine Grained)
											25.40-24.20	6.40-7.60	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	38			25.40-24.20	8.33-9.53	Glaciofluvial Deposits (Sands and Gravels)
											24.20-16.90	7.60-14.90	Mercia Mudstone III/IV	-	-	-	-	21	30			24.20-	9.53-	Mercia Mudstone III/IV
Single Post Sign	SB38	189275	SB	SB	Embankment	3.6	21	32.20	NWHM2A	20	34.59-31.09	0.00-3.50	Embankment Fill	20-60 (20)	-	-	-	21	33	34.15	34.15	34.15-31.09	0.00-3.06	Embankment Fill
											31.09-24.19	3.50-10.40	Glaciofluvial Deposits (Sands and Gravels)	10-68 (19)	-	-	-	21	33			31.09-24.19	3.06-9.96	Glaciofluvial Deposits (Sands and Gravels)
											24.19-22.59	10.40-12.00	Mercia Mudstone III/IV	30	-	-	-	21	36			24.19-22.59	9.96-11.56	Mercia Mudstone III/IV
											22.59-20.59	12.00-14.00	Mercia Mudstone I/II	75-112 (75)	-	-	-	22	>43			22.59-20.59	11.56-13.56	Mercia Mudstone I/II
											20.59-19.59	14.00-15.00	Mercia Mudstone III/IV	-	-	-	-	21	30			20.59-	13.56-	Mercia Mudstone III/IV
Single Post Sign	SB39	188971	SB	SB	Embankment	4.6	18	32.20	CP1101	20	35.25-29.25	0.00-6.00	Embankment Fill	31-103 (31)	-	9-13	13-14	21	36	34.91	34.91	34.91-29.25	0.00-5.66	Embankment Fill
											29.25-25.45	6.00-9.80	River Terrace Deposits	13-79 (13)	-	10	NP	20	31			29.25-25.45	5.66-9.46	River Terrace Deposits
											25.45-21.25	9.80-14.00	Glaciofluvial Deposits (Fine Grained)	38-47 (38)	-	20	12	21	38			25.45-21.25	9.46-13.66	Glaciofluvial Deposits (Fine Grained)
											21.25-20.63	14.00-14.62	Mercia Mudstone Siltstone	120	-	-	-	22	-			21.25-	13.66-	Mercia Mudstone Siltstone
											36.25-30.65	0.00-5.60	Embankment Fill	24-40 (24)	-	3-10	15	21	34			36.62-30.65	0.00-5.97	Embankment Fill

Single Post Sign	SB41	188728	SB	SB	Embankment	5.1	21	32.20	CP1100	40	30.65-23.45	5.60-12.80	River Terrace Deposits	34-150 (41)	-	9	15	20	38	36.62	36.62	30.65-23.60	5.97-13.02	River Terrace Deposits
											23.45-21.55	12.80-14.70	Glaciofluvial Deposits (Sands and Gravels)	88-158 (120)	-	-	-	21	>43			23.60-	13.02-	Glaciofluvial Deposits (Sands and Gravels)
Single Post Sign	SB44	188474	SB	SB	Embankment	7.1	21	31.05	CP1099, SK43SE9	70	38.60-30.60	0.00-8.00	Embankment Fill	17-500 (26)	-	6-9	13	21	33	38.59	38.59	38.59-29.80	0.00-8.79	Embankment Fill
											30.60-23.99	8.00-14.61	River Terrace Deposits	38	-	-	-	20	26			29.80-28.00	8.79-10.59	River Terrace Deposits
											23.99-18.81	14.61-19.79	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	26			28.00-21.80	10.59-16.79	Glaciofluvial Deposits (Sands and Gravels)
											18.81-15.76	19.79-22.84	Mercia Mudstone III/IV	-	-	-	-	21	30			21.80-	16.79-	Mercia Mudstone III/IV
Single Post Sign	SB45	188454	SB	SB	Embankment	7.4	23	31.05	CP1099, SK43SE9	70	38.60-30.60	0.00-8.00	Embankment Fill	17-500 (26)	-	6-9	13	21	33	38.64	38.64	38.64-29.80	0.00-8.84	Embankment Fill
											30.60-23.99	8.00-14.61	River Terrace Deposits	38	-	-	-	20	26			29.80-28.00	8.84-10.64	River Terrace Deposits
											23.99-18.81	14.61-19.79	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	26			28.00-21.80	10.64-16.84	Glaciofluvial Deposits (Sands and Gravels)
											18.81-15.76	19.79-22.84	Mercia Mudstone III/IV	-	-	-	-	21	30			21.80-	16.84-	Mercia Mudstone III/IV
Single Post Sign	SB46	188454	SB	SB	Embankment	7.4	23	31.05	CP1099, SK43SE9	70	38.60-30.60	0.00-8.00	Embankment Fill	17-500 (26)	-	6-9	13	21	33	38.64	38.64	38.64-29.80	0.00-8.84	Embankment Fill
											30.60-23.99	8.00-14.61	River Terrace Deposits	38	-	-	-	20	26			29.80-28.00	8.84-10.64	River Terrace Deposits
											23.99-18.81	14.61-19.79	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	26			28.00-21.80	10.64-16.84	Glaciofluvial Deposits (Sands and Gravels)
											18.81-15.76	19.79-22.84	Mercia Mudstone III/IV	-	-	-	-	21	30			21.80-	16.84-	Mercia Mudstone III/IV
Single Post Sign	SB47	188434	SB	SB	Embankment	7.1	21	31.04	SK43SE8	40	30.60-29.38	0.00-1.52	Embankment Fill	-	-	-	-	21	27	38.68	38.68	38.68-29.38	0.00-9.30	Embankment Fill
											29.38-23.89	1.52-6.71	Glaciofluvial Deposits (Sands and Gravels)	66-72 (66)	-	-	-	21	43			29.38-23.89	9.30-14.79	Glaciofluvial Deposits (Sands and Gravels)
											23.89-18.41	6.71-12.19	Mercia Mudstone III/IV	-	-	-	-	21	30			23.89-	14.79-	Mercia Mudstone III/IV
Single Post Sign	SB49	188192	SB	SB	Embankment	6.1	25	31.01	SK43SE151	60	31.00-29.50	0.00-1.50	Embankment Fill	15	-	-	-	21	31	38.14	38.14	38.14-30.40	0.00-7.74	Embankment Fill
											29.50-23.40	1.50-7.60	Glaciofluvial Deposits (Sands and Gravels)	37-140 (44)	-	-	-	21	39			30.40-23.80	7.74-14.34	Glaciofluvial Deposits (Sands and Gravels)
											23.40-19.75	7.60-11.25	Mercia Mudstone III/IV	29-210 (61)	-	-	-	21	>43			23.80-	14.34-	Mercia Mudstone III/IV
Single Post Sign	SB53	187783	SB	SB	Embankment	2.7	16	30.94	NWHM1	30	34.20-31.90	0.00-2.30	Embankment Fill	-	-	-	-	21	27	34.56	34.56	34.56-31.90	0.00-2.66	Embankment Fill
											31.90-28.20	2.30-6.00	Glaciofluvial Deposits (Sands and Gravels)	78-102 (78)	-	-	-	21	>43			31.90-	2.66-	Glaciofluvial Deposits (Sands and Gravels)
Single Post Sign	SB57	187383	SB	SB	Embankment	6.0	17	30.88	CP1096	100	36.70-31.30	0.00-5.40	Embankment Fill	9-16 (9)	-	17	18	21	30	36.06	36.06	36.06-30.00	0.00-6.06	Embankment Fill
											31.30-23.40	5.40-13.30	Glaciofluvial Deposits (Sands and Gravels)	33-120 (39)	-	4	-	21	38			30.00-23.20	6.06-12.86	Glaciofluvial Deposits (Sands and Gravels)
											23.40-19.49	13.30-17.21	Mercia Mudstone Siltstone	143	-	-	-	22	-			23.20-	12.86-	Mercia Mudstone Siltstone
Single Post Sign	SB58	187280	SB	SB	Embankment	6.3	20	30.87	CP1096	40	36.70-31.30	0.00-5.40	Embankment Fill	9-16 (9)	-	17	18	21	30	37.58	37.58	37.58-30.00	0.00-7.58	Embankment Fill
											31.30-23.40	5.40-13.30	Glaciofluvial Deposits (Sands and Gravels)	33-120 (39)	-	4	-	21	38			30.00-23.20	7.58-14.38	Glaciofluvial Deposits (Sands and Gravels)
											23.40-19.49	13.30-17.21	Mercia Mudstone Siltstone	143	-	-	-	22	-			23.20-	14.38-	Mercia Mudstone Siltstone
Single Post Sign	SB59	187310	SB	SB	Embankment	6.2	20	30.86	CP1096	40	36.70-31.30	0.00-5.40	Embankment Fill	9-16 (9)	-	17	18	21	30	37.15	37.15	37.15-30.00	0.00-7.15	Embankment Fill
											31.30-23.40	5.40-13.30	Glaciofluvial Deposits (Sands and Gravels)	33-120 (39)	-	4	-	21	38			30.00-23.20	7.15-13.95	Glaciofluvial Deposits (Sands and Gravels)
											23.40-19.49	13.30-17.21	Mercia Mudstone Siltstone	143	-	-	-	22	-			23.20-	13.95-	Mercia Mudstone Siltstone
Single Post Sign	SB60	187188	SB	SB	Embankment	7.7	25	30.72	CP1094	50	38.10-31.60	0.00-6.50	Embankment Fill	7-14 (7)	-	17-18	12-18	21	29	38.79	38.79	38.79-30.90	0.00-7.89	Embankment Fill
											31.60-26.00	6.50-12.10	Glaciofluvial Deposits (Sands and Gravels)	13-111 (44)	-	-	-	21	39			30.90-26.00	7.89-12.79	Glaciofluvial Deposits (Sands and Gravels)
											26.00-21.60	12.10-16.50	Mercia Mudstone III/IV	13-38 (13)	-	24	19	21	31			26.00-21.60	12.79-17.19	Mercia Mudstone III/IV
											21.60-21.05	16.50-17.05	Mercia Mudstone I/II	750-1154	-	-	-	22	>44			21.60-	17.19-	Mercia Mudstone I/II
Single Post Sign	SB63	186746	SB	SB	Embankment	3.6	20	30.52	SK42NE398	40	30.78-29.83	0.00-0.95	Embankment Fill	-	-	-	-	21	27	35.12	35.12	35.12-29.83	0.00-5.29	Embankment Fill
											29.83-25.88	0.95-4.90	River Terrace Deposits	-	-	7	9	20	38			29.83-25.88	5.29-9.24	River Terrace Deposits
											25.88-20.68	4.90-10.10	Mercia Mudstone III/IV	-	-	-	-	21	30			25.88-	9.24-	Mercia Mudstone III/IV
Single Post Sign	SB64	186730	SB	SB	Embankment	3.4	21	30.52	SK42NE398	50	30.78-29.83	0.00-0.95	Embankment Fill	-	-	-	-	21	27	34.81	34.81	34.81-29.83	0.00-4.98	Embankment Fill
											29.83-25.88	0.95-4.90	River Terrace Deposits	-	-	7	9	20	38			29.83-25.88	4.98-8.93	River Terrace Deposits
											25.88-20.68	4.90-10.10	Mercia Mudstone III/IV	-	-	-	-	21	30			25.88-	8.93-	Mercia Mudstone III/IV
Single Post Sign	SB65	186650	SB	SB	Embankment	2.8	19	None	SK42NE397	30	33.65-31.65	0.00-2.00	Embankment Fill	15-16 (15)	-	12-19	17-18	21	32	33.96	33.96	33.96-31.65	0.00-2.31	Embankment Fill
											31.65-25.55	2.00-8.10	River Terrace Deposits	23-68 (31)	-	-	-	20	36			31.65-25.55	2.31-8.41	River Terrace Deposits
											25.55-23.65	8.10-10.00	Mercia Mudstone III/IV	66	-	13-23	-	21	>43			25.55-	8.41-	Mercia Mudstone III/IV
Single Post Sign	SB66	186570	SB	SB	Cutting	4.9	28	None	SK42NE399	10	33.80-28.90	0.00-4.90	Embankment Fill	-	-	2-13	12-21	21	27	33.74	33.74	33.74-28.90	0.00-4.84	Embankment Fill
											28.90-26.00	4.90-7.80	Glaciofluvial Deposits (Sands and Gravels)	-	-	9-11	12	21	38			28.90-26.00	4.84-7.74	Glaciofluvial Deposits (Sands and Gravels)
											26.00-24.60	7.80-9.20	Mercia Mudstone III/IV	-	-	11-17	12	21	30			26.00-24.60	7.74-9.14	Mercia Mudstone III/IV
											24.60-23.70	9.20-10.10	Mercia Mudstone Sandstone	-	-	16-19	16	21	-			24.60-23.70	9.14-10.04	Mercia Mudstone Sandstone
											23.70-18.00	10.10-15.80	Mercia Mudstone III/IV	-	-	-	-	21	30			23.70-18.00	10.04-15.74	Mercia Mudstone III/IV
											18.00-16.40	15.80-17.40	Mercia Mudstone Sandstone	-	-	-	-	21	-			18.00-16.40	15.74-17.34	Mercia Mudstone Sandstone
											16.40-14.18	17.40-19.62	Mercia Mudstone I/II	-	-	-	-	22	-			16.40-14.18	17.34-19.56	Mercia Mudstone I/II
											14.18-8.80	19.62-25.00	Mercia Mudstone Sandstone	-	-	13	-	21	-			14.18-	19.56-	Mercia Mudstone Sandstone
Single Post Sign	SB68	186463	SB	SB	At Grade	0.0	-	None	SK42NE395	100	30.93-28.63	0.00-2.30	Embankment Fill	20	-	10-31	12	21	33	33.70	33.70	33.70-28.63	0.00-5.07	Embankment Fill
											28.63-25.63	2.30-5.30	River Terrace Deposits	43-56 (43)	-	7	-	20	38			28.63-25.63	5.07-8.07	River Terrace Deposits
											25.63-22.93	5.30-8.00	Glaciofluvial Deposits (Fine Grained)	49	-	-	-	21	40			25.63-22.93	8.07-10.77	Glaciofluvial Deposits (Fine Grained)
											22.93-20.93	8.00-10.00	Mercia Mudstone III/IV	80-82	-	-	-	21	>43			22.93-	10.77-	Mercia Mudstone III/IV
Single Post Sign	SB73	186095	SB	SB	Embankment	3.0	14	32.30	CP1090	100	33.85-29.15	0.00-4.70	Embankment Fill	28-176 (28)	-	15	24	21	36	33.68	33.68	33.68-29.20	0.00-4.48	Embankment Fill
											29.15-24.85	4.70-9.00	Glaciofluvial Deposits (Sands and Gravels)	17-750 (31)	-	-	-	21	36			29.20-24.85	4.48-8.83	Glaciofluvial Deposits (Sands and Gravels)
											24.85-22.46	9.00-11.39	Mercia Mudstone I/II	40-375 (40)	-	11	14	22	38			24.85-	8.83-	Mercia Mudstone I/II
Single Post Sign	SB75	186450	SB	SB	At Grade	0.0	-	None	SK42NE395	80	30.93-28.63	0.00-2.30	Embankment Fill	20	-	10-31	12	21	33	33.70	33.70	33.70-28.63	0.00-5.07	Embankment Fill
											28.63-25.63	2.30-5.30	River Terrace Deposits	43-56 (43)	-	7	-	20	38			28.63-25.63	5.07-8.07	River Terrace Deposits
											25.63-22.93	5.30-8.00	Glaciofluvial Deposits (Fine Grained)	49	-	-	-	21	40			25.63-22.93	8.07-10.77	Glaciofluvial Deposits (Fine Grained)
											22.93-20.93	8.00-10.00	Mercia Mudstone III/IV	80-82	-	-	-	21	>43			22.93-	10.77-	Mercia Mudstone III/IV
Single Post Sign	SB79	184974	SB	SB	Cutting	1.7	13	None	SK42NE9	50	40.10-39.19	0.00-0.91	Alluvium Deposits	-	-	8-20	-	20	25	41.40	41.40	-	-	-
											39.19-37.66	0.91-2.44	River Terrace Deposits	57	-	8-11	-	20	42			41.40-37.66	0.00-3.74	River Terrace Deposits
											37.66-34.00	2.44-6.10	Mercia Mudstone III/IV	-	-	18-26	15	21	34			37.66-	3.74-	Mercia Mudstone III/IV
Single Post Sign	SB83	184450	SB	SB	At Grade	0.0	-	None	SK42NE71	20	56.75-55.75	0.00-1.00	Mercia Mudstone Sandstone	-	-	-	-	21	-	56.33	56.33	56.33-55.75	0.00-0.58	Mercia Mudstone Sandstone
											55.75-53.14	1.00-3.61	Mercia Mudstone III/IV	53-375 (53)	-	-	-	21	41			55.75-	0.58-	Mercia Mudstone III/IV
Single Post Sign	SB85	184202	SB	SB	Cutting	2.2	24	None	SK42NE8	50	66.10-58.48	0.00-7.62	Mercia Mudstone III/IV	-	-	7-21	8-19	21	30	63.75	63.75	63.75-	0.00-	Mercia Mudstone III/IV
Single Post Sign	SB87	183945	SB	SB	Cutting	8.8	23	None	SK42NE7	70	75.00-73.78	0.00-1.22	Head Deposits	-	-	8-15	-	20	27	69.53	69.53	-	-	-
											73.78-62.81	1.22-12.19	Mercia Mudstone III/IV	-	-	15-22	11-22	21	30			69.53-	0.00-	Mercia Mudstone III/IV
Single Post Sign	SB91	183456	SB	SB	At Grade	0.0	-	None	CP1078	30	76.00-75.50	0.00-0.50	Embankment Fill	-	-	-	-	21	27	76.35	76.35	76.35-75.10	0.00-1.25	Embankment Fill
											75.50-73.50	0.50-2.50	Mercia Mudstone I/II	429	-	9	16	22	-			75.10-73.50	1.25-2.85	Mercia Mudstone I/II
											73.50-72.98	2.50-3.02	Mercia Mudstone Siltstone	750	-	-	-	22	-			73.50-	2.85-	Mercia Mudstone Siltstone
Single Post Sign	SB95	182945	SB	SB	Embankment	1.1	27	None	SK42NE97	10	77.04-76.34	0.00-0.70	Embankment Fill	-	-	-	-	21	27	77.11	77.11	77.11-76.34	0.00-0.77	Embankment Fill
											76.34-73.54	0.70-3.50	Mercia Mudstone III/IV	-	-	14-19	13	21	30			76.34-73.54	0.77-3.57	Mercia Mudstone III/IV
											73.54-57.04	3.50-20.00	Mercia Mudstone Siltstone	-	-	12-14	-	22	-			73.54-	3.57-	Mercia Mudstone Siltstone
											30.40-29.03	0.00-1.37	Glaciofluvial Deposits (Fine Grained)	-	-	28	27	21	26			33.67-29.03	0.00-4.64	Glaciofluvial Deposits (Fine Grained)

Single Post Sign	SB97	185820	SB	SB	At Grade	0.0	0	None	SK42NE13	80	29.03-26.89	1.37-3.51	Glaciofluvial Deposits (Sands and Gravels)	-	-	-	-	21	38	33.67	33.67	29.03-26.89	4.64-6.78	Glaciofluvial Deposits (Sands and Gravels)
											26.89-25.60	3.51-4.80	Mercia Mudstone III/IV	-	-	-	-	21	30			26.89-25.60	6.78-8.07	Mercia Mudstone III/IV
											25.60-25.22	4.80-5.18	Mercia Mudstone Siltstone	-	-	-	8	22	-			25.60-25.22	8.07-8.45	Mercia Mudstone Siltstone
											25.22-24.46	5.18-5.94	Mercia Mudstone III/IV	-	-	21	2	21	30			25.22-24.46	8.45-9.21	Mercia Mudstone III/IV
											24.46-21.26	5.94-9.14	Mercia Mudstone Sandstone	-	-	17	-	21	-			24.46-	9.21-	Mercia Mudstone Sandstone
Single Post Sign	NBS01	0 + 62.5	182015	23a Entry Slip					SK42SE94 SK42SE94R	100	60.31-58.81	0.00-1.50	Embankment Fill	9	-	-	-	21	29		0.00			
											58.81-51.06	1.50-9.25	Mercia Mudstone III/IV	38-453 (50)	-	-	-	21	40					
											51.06-46.46	9.25-13.85	Mercia Mudstone Siltstone	-	-	-	-	22	-					
											46.46-44.66	13.85-15.65	Mercia Mudstone Sandstone	-	-	-	-	21	-					
											44.66-42.76	15.65-17.55	Mercia Mudstone Siltstone	-	-	-	-	22	-					
											42.76-42.26	17.55-18.05	Mercia Mudstone III/IV	-	-	-	-	21	30					
											42.26-41.01	18.05-19.30	Mercia Mudstone Siltstone	273	-	-	-	22	-					
											41.01-40.61	19.30-19.70	Mercia Mudstone III/IV	-	-	-	-	21	30					
											40.61-40.17	19.70-20.14	Mercia Mudstone Siltstone	-	-	-	-	22	-					
Single Post Sign	NBS06	0 + 120	185520	24 Entry Slip	Embankment			None	SK42NE9	100	40.10-39.19	0.00-0.91	Alluvium Deposits	-	-	8-20	-	20	25		0.00	-	-	-
											39.19-37.66	0.91-2.44	River Terrace Deposits	57	-	8-11	-	20	42			41.40-37.66	0.00-3.74	River Terrace Deposits
											37.66-34.00	2.44-6.10	Mercia Mudstone III/IV	-	-	18-26	15	21	34			37.66-	3.74-	Mercia Mudstone III/IV
Single Post Sign	NBS09	0 + 192	186840	24a Entry Slip																	0.00			
Single Post Sign	SBS03	0 - 8	193455	25 Entry Slip																	0.00			
Single Post Sign	SBS09	0 + 180	186710	24a Exit Slip																	0.00			
Single Post Sign	SBS10	0	185815	24a Entry Slip																	0.00			
Single Post Sign	SBS17	0 - 23	185025	24 Entry Slip	Embankment			None	SK42NE9	100	40.10-39.19	0.00-0.91	Alluvium Deposits	-	-	8-20	-	20	25		0.00	-	-	-
											39.19-37.66	0.91-2.44	River Terrace Deposits	57	-	8-11	-	20	42			41.40-37.66	0.00-3.74	River Terrace Deposits
											37.66-34.00	2.44-6.10	Mercia Mudstone III/IV	-	-	18-26	15	21	34			37.66-	3.74-	Mercia Mudstone III/IV
Single Post Sign	SBS20	0 + 230	186660	24a Exit Slip																	0.00			

Appendix I. Traffic Sign Loadings

TRAFFIC SIGNS LOADINGS

Project Title: **SMP - M1 J23A to J25**

Client: **Highways England**

The factoring of the actions for each case is conducted according to NA+A1:2014 to BS EN 1997 – 1:2004+A1:2013.

LARGE TRAFFIC SIGNS: <7m2 sign face area (NB11)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		32.75		**1**	0	32.75	0	**1.35**	0	44.2125	0	**1**	0	32.75	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			12.61	**1**	0	0	12.61	**1.5**	0	0	18.915	**1.3**	0	0	16.393
Variable	Live Load (Shear Force)	Base of Post	4.27			**1**	4.27	0	0	**1.5**	6.405	0	0	**1.3**	5.551	0	0
		SUM	4.27	36.25	12.61		4.27	36.25	12.61		6.405	49.4625	18.915		5.551	37.3	16.393

LARGE TRAFFIC SIGNS: 7-11m2 sign face area (SBS07)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		51.5		**1**	0	51.5	0	**1.35**	0	69.525	0	**1**	0	51.5	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			32.72	**1**	0	0	32.72	**1.5**	0	0	49.08	**1.3**	0	0	42.536
Variable	Live Load (Shear Force)	Base of Post	8.06			**1**	8.06	0	0	**1.5**	12.09	0	0	**1.3**	10.478	0	0
		SUM	8.06	55	32.72		8.06	55	32.72		12.09	74.775	49.08		10.478	56.05	42.536

LARGE TRAFFIC SIGNS: 11-17m2 sign face area (SB50)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		79.55		**1**	0	79.55	0	**1.35**	0	107.3925	0	**1**	0	79.55	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			50.61	**1**	0	0	50.61	**1.5**	0	0	75.915	**1.3**	0	0	65.793
Variable	Live Load (Shear Force)	Base of Post	12.23			**1**	12.23	0	0	**1.5**	18.345	0	0	**1.3**	15.899	0	0
		SUM	12.23	83.05	50.61		12.23	83.05	50.61		18.345	112.6425	75.915		15.899	84.1	65.793

LARGE TRAFFIC SIGNS: 35-39m2 sign face area (SB48 embankment)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		193		**1**	0	193	0	**1.35**	0	260.55	0	**1**	0	193	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			103.983	**1**	0	0	103.983	**1.5**	0	0	155.9745	**1.3**	0	0	135.1779
Variable	Live Load (Shear Force)	Base of Post	17.371			**1**	17.371	0	0	**1.5**	26.0565	0	0	**1.3**	22.5823	0	0
		SUM	17.371	196.5	103.983		17.371	196.5	103.983		26.0565	265.8	155.9745		22.5823	197.55	135.1779

LARGE TRAFFIC SIGNS: 35-39m2 sign face area (TS03 cutting)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		178.5		**1**	0	178.5	0	**1.35**	0	240.975	0	**1**	0	178.5	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			89.65	**1**	0	0	89.65	**1.5**	0	0	134.475	**1.3**	0	0	116.545
Variable	Live Load (Shear Force)	Base of Post	15.42			**1**	15.42	0	0	**1.5**	23.13	0	0	**1.3**	20.046	0	0
		SUM	15.42	182	89.65		15.42	182	89.65		23.13	246.225	134.475		20.046	183.05	116.545

LARGE TRAFFIC SIGNS: 55-56m2 sign face area (TS01)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		278.25		**1**	0	278.25	0	**1.35**	0	375.6375	0	**1**	0	278.25	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			133.33	**1**	0	0	133.33	**1.5**	0	0	199.995	**1.3**	0	0	173.329
Variable	Live Load (Shear Force)	Base of Post	18.78			**1**	18.78	0	0	**1.5**	28.17	0	0	**1.3**	24.414	0	0
		SUM	18.78	281.75	133.33		18.78	281.75	133.33		28.17	380.8875	199.995		24.414	282.8	173.329

SINGLE POST TRAFFIC SIGNS: <1m2 sign face area (SB60)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		4.2		**1**	0	4.2	0	**1.35**	0	5.67	0	**1**	0	4.2	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			2.79	**1**	0	0	2.79	**1.5**	0	0	4.185	**1.3**	0	0	3.627
Variable	Live Load (Shear Force)	Base of Post	1.1			**1**	1.1	0	0	**1.5**	1.65	0	0	**1.3**	1.43	0	0
		SUM	1.1	7.7	2.79		1.1	7.7	2.79		1.65	10.92	4.185		1.43	8.75	3.627

SINGLE POST TRAFFIC SIGNS: 1-3m2 sign face area (SBS09)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		12.75		**1**	0	12.75	0	**1.35**	0	17.2125	0	**1**	0	12.75	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			10.46	**1**	0	0	10.46	**1.5**	0	0	15.69	**1.3**	0	0	13.598
Variable	Live Load (Shear Force)	Base of Post	3.88			**1**	3.88	0	0	**1.5**	5.82	0	0	**1.3**	5.044	0	0
		SUM	3.88	16.25	10.46		3.88	16.25	10.46		5.82	22.4625	15.69		5.044	17.3	13.598

SINGLE POST TRAFFIC SIGNS: 6-9m2 sign face area (NB01)

			Unfactored				SLS Factored				STR Factored				GEO Factored		
Loading Type	**Load**	**Location**	**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**		**Fx (kN)**	**Fz (kN)**	**My (kNm)**
Permanent	Dead Load (Sign Weight)	Structural members		41.55		**1**	0	41.55	0	**1.35**	0	56.0925	0	**1**	0	41.55	0
Variable	Live Load (Snow)	Structural members		3.5		**1**	0	3.5	0	**1.5**	0	5.25	0	**1.3**	0	4.55	0
Variable	Live Moment (Bending Moment)	Base of Post			47.4	**1**	0	0	47.4	**1.5**	0	0	71.1	**1.3**	0	0	61.62
Variable	Live Load (Shear Force)	Base of Post	12.86			**1**	12.86	0	0	**1.5**	19.29	0	0	**1.3**	16.718	0	0
		SUM	12.86	45.05	47.4		12.86	45.05	47.4		19.29	61.3425	71.1		16.718	46.1	61.62

Appendix J. Environmental Barrier Table

Asset	SMP Reference	New or Existing	Chainage Start	Chainage End	Length (m)	Carriageway	Marker Post Start	Marker Post End	Earthwork		Flood Level (mAOD)	Borehole Data					In-Situ Tests		Lab Tests		Parameters					Approx. Carriageway Level at Foundation (mAOD)	Ground Model			
									Earthwork Type	Max Earthwork Height (m)		Nearest Borehole(s)	Borehole Proximity (m)	Borehole Stratigraphy (mbgl)	Borehole Stratigraphy (mAOD)	Soil/Rock	SPT 'N' Values*	Hand Shear Vane (kN/m²)	Plasticity Index (%)	Undrained Triaxial (kN/m²)	Bulk Density (kN/m³)	Angle of Friction (°)	Cohesion (kN/m²)	Undrained shear Strength (kN/m²)	Young's Modulus (MN/m²)		Top of Foundation Level (mAOD) (4)	Stratigraphy from Foundation Top (mbgl)	Stratigraphy from Foundation Top (mAOD)	Soil/Rock
Noise Barrier	NB7_1	New	187865	187870	5	NB	187/8A+65	188/1A+70	Bridge	4.4	31.6	N/A Environmental Barrier fixed to existing bridge parapet																		
Noise Barrier	NB7_2	New	187870	187945	75	NB	187/8A+70	187/9A+45	Embankment	4.0	31.6	CP1097, SK43SE140, SK43SE139, SK43SE151, SK43SE138		0.00-6.60	35.95-29.35	Embankment Fill	14-150	-	17	63	21	27	0		6.2	38.00	38.00	0-7.6	30.8-38.0	Embankment Fill
														6.60-7.90	29.35-28.05	Alluvium	36	-	21	18			0		3			7.6-14.6	23.4-30.8	Glaciofluvial Deposits (coarse grained)
														7.90-12.90	28.05-23.05	Glaciofluvial Deposits (coarse grained	37-56	-	-	-	21	38	-		19.2			>14.6	<23.4	Mercia Mudstone III/IV
														12.90-13.50	23005-22.45	Mercia Mudstone - III/IV	29-150	-	-	174	21	30	2		13.4					
Noise Barrier	NB7_3	New	187945	188000	55	NB	187/9A+45	188/0A+00	Bridge	3.7	31.6	N/A Environmental Barrier fixed to existing bridge parapet																		
Noise Barrier	NB7_4	New	188000	188195	195	NB	188/8A+00	188/1A+95	Embankment	5.0-6.0	31.6	CP1097, SK43SE140, SK43SE139, SK43SE151, SK43SE138		0.00-6.60	35.95-29.35	Embankment Fill	14-150	-	17	63	21	27	0		6.2	38.00	38.00	0-7.6	30.8-38.0	Embankment Fill
														6.60-7.90	29.35-28.05	Alluvium	36	-	21	18			0		3			7.6-14.6	23.4-30.8	Glaciofluvial Deposits (coarse grained)
														7.90-12.90	28.05-23.05	Glaciofluvial Deposits (coarse grained	37-56	-	-	-	21	38	-		19.2			>14.6	<23.4	Mercia Mudstone III/IV
														12.90-13.50	23005-22.45	Mercia Mudstone - III/IV	29-150	-	-	174	21	30	2		13.4					
Noise Barrier	ENS3_1	New	190395	190490	95	SB	190/3B+95	190/4B+90	Embankment	7.0	31.2	HIS0014, HIS0012, CP1108	0	0.00-7.40	38.80-31.40	Embankment Fill	15-49 (31)	-	19-21	105	21	27	0		6.2	39.41	39.41	0.00-8.30	39.41-31.11	Embankment Fill
														7.40-12.90	31.40-25.90	Glaciofluvial Deposits (coarse grained	31-90 (31)	-	-	-	21	38	-		19.2			8.30-13.90	31.10-25.50	Glaciofluvial Deposits
														12.90-16.80	25.90-22.00	Mercia Mudstone III/IV	24-90 (57)	-	10		21	30	2		13.4			13.90-17.60	25.50-21.80	Mercia Mudstone III/IV
														16.80-25.70	22.00-13.10	Mercia Mudstone II/I	120	-	-		22	-	2		100			17.60<	21.80>	Mercia Mudstone II/I
			190490	190540	50	SB	190/4B+90	190/5B+40	Embankment	6.0-7.0	31.2	NWHM67, CP1108, SK43SE22	20	0.00-6.00	37.38-31.38	Embankment Fil	12-27 (19)	-	-		21	27	0		6.2	38.53	38.53	0.00-7.50	38.53-31.03	Embankment Fil
														6.00-13.65	31.38-23.73	Glaciofluvial Deposits (coarse grained	106-150 (150)	-	-		21	38	-		19.2			7.5-14.5	31.03-24.03	Glaciofluvial Deposits
														13.65-15.38	23.73-22.00	Mercia Mudstone III/IV	-	-	10		21	30	2		13.4			14.5-16.6	24.03-21.93	Mercia Mudstone III/IV
														15.38-15.68	22-21.7	Mercia Mudstone-Siltstone	-	-	-		22	-	2		75.0			16.6<	21.93>	Mercia Mudstone-Siltstone
			190540	190655	115	SB	190/5B+40	190/6B+55	Embankment	6.0	31.2	NWHM67, HIS0016,	0	0.00-6.00	37.38-31.38	Embankment Fil	12-27 (19)	-	-		21	27	0		6.2	36.97	36.97	0.00-6.50	36.97-30.47	Embankment Fil
														6.00-12.18	31.38-25.20	Glaciofluvial Deposits (coarse grained	106-150 (150)	-	-		21	38	-		19.2			6.50-12.40	30.47-24.57	Glaciofluvial Deposits
														12.18-14.98	25.20-22.4	Mercia Mudstone III/IV	-	-	-		22	30	2		13.4			12.40-15.00	24.57-21.97	Mercia Mudstone III/IV
														14.98-15.73	22.40-21.65	Mercia Mudstone Siltstone	-	-	-		22	-	2		75			15.00<	21.97>	Mercia Mudstone Siltstone
Noise Barrier	ENS3_2	New	190655	190660	5	SB	190/6B+55	190/6B+60	Bridge	4.5	31.2	N/A Environmental Barrier fixed to new bridge parapet																		
Noise Barrier	ENS3_3	New	190660	190680	20	SB	190/6B+60	190/6B+80	Embankment	5.7	31.2	CP1110	0	0.00-3.40	32.95-29.55	Embankment Fill	19-103 (19)	-	19		21	27	0		6.2	34.29	34.29	0.00-4.20	34.29-30.09	Embankment Fill
														3.40-6.50	29.55-26.45	Glaciofluvial Deposits (coarse grained)	37-70 (37)	-	32		21	38	-		19.2			4.20-9.70	30.09-24.59	Glaciofluvial Deposits
														6.50-15.35	26.45-17.6	Mercia Mudstone III/IV	28-150 (44)	-	11.0-17.0		21	30	2		13.4			9.70<	24.59>	Mercia Mudstone III/IV
			190680	191030	350	SB	190/6B+80	191/0B+30	Embankment	3.6-5.7	31.2	CP1110	0	0.00-3.40	32.95-29.55	Embankment Fill	19-103 (19)	-	19		21	27	0		6.2	34.29	34.29	0.00-4.20	34.29-30.09	Embankment Fill
														3.40-6.50	29.55-26.45	Glaciofluvial Deposits (coarse grained)	37-70 (37)	-	32		21	38	-		19.2			4.20-9.70	30.09-24.59	Glaciofluvial Deposits
														6.50-15.35	26.45-17.6	Mercia Mudstone III/IV	28-150 (44)	-	11.0-17.0		21	30	2		13.4			9.70<	24.59>	Mercia Mudstone III/IV
Noise Barrier	ENS3_6	New	191400	191455	55	SB	191/4B+00	191/4B+55	Embankment	3.6	-	CP1110, NWHM3	0	0.00-3.40	32.95-29.55	Embankment Fill	19-103 (19)	-	19		21	27	0		6.2	33.24	33.24	0.00-4.50	33.24-28.74	Embankment Fil
														3.40-6.50	29.55-26.45	Glaciofluvial Deposits (coarse grained	37-70 (37)	-	32		21	38	-		19.2			4.50-9.10	28.74-24.14	Glaciofluvial Deposits
														6.50-15.35	26.45-17.6	Mercia Mudstone III/IV	28-150 (44)	-	11.0-17.0		21	30	2		13.4			9.10<	24.14>	Mercia Mudstone III/IV
Noise Barrier	ENS4_1	New	190835	190900	65	NB	190/8A+35	190/9A+00	Embankment	3.0-3.6	31.2	HIS0017, HIS0019, HIS0015	10	Not recorded	Not recorded	Embankment Fil	-	-	-		21	27	0		6.2	33.77	33.77	0-3.70	33.77-30.07	Embankment Fil
														0-5.50	30.80-25.30	Glaciofluvial Deposits (coarse grained	15-22 (19)	-	-		21	38	-		19.2			3.70-8.20	30.07-25.57	Glaciofluvial Deposits
														5.50-8.50	25.30-22.30	Mercia Mudstone III/IV	-	-	-		21	30	2		8.6			8.20-11.20	25.57-22.57	Mercia Mudstone III/IV
														8.50-10.20	22.30-20.60	Mercia Mudstone Sandstone	-	-	-		22	-	-		180			11.20-12.90	22.57-20.87	Mercia Mudstone Sandstone
														10.20-14.03	20.60-16.77	Mercia Mudstone II/	-	-	-		22	-	2		100			12.90<	20.87>	Mercia Mudstone II/
			190900	191000	100	NB	190/9A+00	191/0A+00	Embankment	3.0	31.2	CP1110	10	0.00-3.40	32.95-29.55	Embankment Fil	19-103 (19)	-	19		21	27	0		6.2	33.29	33.29	0.00-3.30	33.29-29.99	Embankment Fil
														3.40-6.50	29.55-26.45	Glaciofluvial Deposits (coarse grained	37-70 (37)	-	32		21	38	-		19.2			3.30-7.40	29.99-25.89	Glaciofluvial Deposits
														6.50-15.35	26.45-17.6	Mercia Mudstone III/IV	28-150 (44)	-	11.0-17.0		21	30	2		8.6			7.40<	25.89>	Mercia Mudstone III/IV
			191000	191025	25	NB	191/0A+00	191/0A+25	Embankment	3.0	31.2	NWHM3	0	Not recorded	Not recorded	Embankment Fil	-	-	-		-	27	0		6.2	33.26	33.26	0.00-2.80	33.26-30.46	Embankment Fil
														0.00-7.30	33.07-25.77	Glaciofluvial Deposits (coarse grained	9-29 (19)	-	-		21	38	-		19.2			2.80-7.70	30.46-25.96	Glaciofluvial Deposits
														7.30-10.50	25.77-22.57	Mercia Mudstone III/IV	19-37 (33)	-	-		21	30	2		8.6			7.70-10.80	25.96-22.46	Mercia Mudstone III/IV
														10.50-11.80	22.57-21.27	Mercia Mudstone Sandstone	150	-	-		22	-	-		180			10.80<	22.46>	Mercia Mudstone Sandstone
Noise Barrier	ENS4_2	New	191025	191060	35	NB	191/0A+25	191/0A+60	Embankment	1.9-2.8	31.2	NWHM3	0	Not recorded	Not recorded	Embankment Fil	-	-	-		21	27	0		6.2	33.26	33.26	0.00-2.76	33.26-30.50	Embankment Fil
														0.00-7.30	33.07-25.77	Glaciofluvial Deposits (coarse grained	9-29 (19)	-	-		21	38	-		19.2			2.76-7.66	30.50-25.60	Glaciofluvial Deposits
														7.30-10.50	25.77-22.57	Mercia Mudstone III/IV	19-37 (33)	-	-		21	30	2		8.6			7.66-10.76	25.60-22.50	Mercia Mudstone III/IV
														10.50-11.80	22.57-21.27	Mercia Mudstone Sandstone	150	-	-		22	-	-		180			10.76<	22.50>	Mercia Mudstone Sandstone
			191060	191080	20	NB	191/0A+60	191/0A+80	Embankment	1.5	31.2	NWHM3	60	Not recorded	Not recorded	Embankment Fil	-	-	-		21	27	0		6.2	33.26	33.26	0.00-2.96	33.26-30.30	Embankment Fil
														0.00-7.30	33.07-25.77	Glaciofluvial Deposits (coarse grained	9-29 (19)	-	-		21	38	-		19.2			2.96-8.16	30.30-25.10	Glaciofluvial Deposits
														7.30-10.50	25.77-22.57	Mercia Mudstone III/IV	19-37 (33)	-	-		21	30	2		8.6			8.16-10.76	25.10-22.50	Mercia Mudstone III/IV
														10.50-11.80	22.57-21.27	Mercia Mudstone Sandstone	150	-	-		22	-	-		180			10.76>	22.50>	Mercia Mudstone Sandstone
			191080	191310	230	NB	191/0A+80	191/3A+10	Embankment	1.5-2.5	31.2	NWHM3	110	Not recorded	Not recorded	Embankment Fil	-	-	-		21	27	0		6.2	33.26	33.26	0.00-3.26	33.26-30.00	Embankment Fil
														0.00-7.30	33.07-25.77	Glaciofluvial Deposits (coarse grained	9-29 (19)	-	-		21	38	-		19.2			3.26-8.26	30.00-25.00	Glaciofluvial Deposits
														7.30-10.50	25.77-22.57	Mercia Mudstone III/IV	19-37 (33)	-	-		21	30	2		8.6			8.26-10.76	25.00-22.50	Mercia Mudstone III/IV
														10.50-11.80	22.57-21.27	Mercia Mudstone Sandstone	150	-	-		22	-	-		180			10.76<	22.50>	Mercia Mudstone Sandstone
			191310	191360	50	NB	191/3A+10	191/3A+60	Embankment	2.5	31.2	CP1111	20	0.00-3.70	32.05-28.35	Embankment Fil	5	-	20		21	27	0		6.2	33.25	33.25	0.00-4.15	33.25-29.10	Embankment Fil
														3.70-8.60	28.35-23.45	Glaciofluvial Deposits (coarse grained	34-66 (34)	-	8		21	38	-		19.2			4.15-9.15	29.10-24.10	Glaciofluvial Deposits
														8.60-12.00	23.45-20.05	Mercia Mudstone III/IV	49-150 (73)	-	-		21	30	2		8.6			9.15-13.25	24.1-20.00	Mercia Mudstone III/IV
														12.00-12.61	20.05-19.44	Mercia Mudstone II/	150	-	-		22	-	2		100			13.25<	20>	Mercia Mudstone II/
Noise Barrier	ENS4_4	New	191365	191480	115	NB	191/3A+65	191/4A+80	At Grade	0.4	31.2	CP1111	20	0.00-3.70	32.05-28.35	Embankment Fil	5	-	20		21	27	0		6.2	33.24	33.24	0.00-4.84	33.24-28.4	Embankment Fil
														3.70-8.60	28.35-23.45	Glaciofluvial Deposits (coarse grained	34-66 (34)	-	8		21	38	-		19.2			4.84-9.44	28.4-23.8	Glaciofluvial Deposits
														8.60-12.00	23.45-20.05	Mercia Mudstone III/IV	49-150 (73)	-	-		21	30	2		13.4			9.44-13.24	23.8-20	Mercia Mudstone III/IV
														12.00-12.61	20.05-19.44	Mercia Mudstone II/	150	-	-		22	-	2		100			13.24<	20>	Mercia Mudstone II/
Noise Barrier	ENS5_2	New	192000	192020	20	SB	191/2B+00	192/0B+20	At Grade	0.5	-	NWHM4	20	0.00-3.80	34.91-31.11	Glaciofluvial Deposits (coarse grained	46-51 (46)	-	-		21	38	-		19.2	35.67	35.67	0.00-4.67	35.67-31	Glaciofluvial Deposits
														3.80-12.35	31.11-22.56	Mercia Mudstone II/	21-73	-	17		22	40	2		8.6			4.67<	31>	Mercia Mudstone I/I
			192020	192140	120	SB	192/0B+20	192/1B+40	Embankment	3.0-3.6	-	NWHM4	105	Not recorded	Not recorded	Embankment Fil	-	-	-		21	27	0		6.2	37.08	37.08	0.00-1.48	37.08-35.6	Embankment Fil
														0.00-3.80	34.91-31.11	Glaciofluvial Deposits (coarse grained	46-51 (46)	-	-		21	38	-		19.2			1.48-5.88	35.6-31.2	Glaciofluvial Deposits
														3.80-12.35	31.11-22.56	Mercia Mudstone II/	21-73	-	17		22	40	2		100			5.88<	31.2>	Mercia Mudstone II/
			192140	192165	25	SB	192/1B+40	192/1B+65	Embankment	3.6-4.2	-	CP1113	30	0.00-4.10	40.05-35.95	Embankment Fil	15	-	22		21	27	0		6.2	38.67	38.67	0.00-2.77	38.67-35.9	Embankment Fil
														4.10-7.20	35.95-32.85	Glaciofluvial Deposits (coarse grained	29-42 (29)	-	-		21	38	-		19.2			2.77-7.17	35.9-31.5	Glaciofluvial Deposits
														7.20-14.10	32.85-25.95	Mercia Mudstone III/IV	21-150 (34)	-	20		21	30	2		8.6			7.17-12.67	31.5-26	Mercia Mudstone III/IV
														14.10-14.60	25.95-29.45	Mercia Mudstone II/	150	-	23		22	40	2		100			12.67<	26>	Mercia Mudstone II/
Noise Barrier	ENS5_3	New	192165	192265	100	SB	192/1B+65	192/2B+65	Embankment	4.0-5.8	-	NWHM66	0	0.00-6.30	42.62-36.32	Embankment Fil	17-150 (19)	-	-		21	27	0		6.2	45.28	45.28	0.00-6.58	45.28-38.7	Embankment Fil
														6.30-9.40	36.32-33.22	Glaciofluvial Deposits (coarse grained	41-49 (42)	-	-		21	38	-		19.2			6.58-11.68	38.7-33.6	Glaciofluvial Deposits
														9.40-15.00	33.44-27.64	Mercia Mudstone III/IV	34-150 (37)	-	17		21	30	2		13.4			11.68<	33.60>	Mercia Mudstone III/IV
			192265	192530	265	SB	192/2B+65	192/5B+30	Embankment	4.0-7.7	-	HIS0025	0	Not recorded	Not recorded	Embankment Fil	-	-	-		21	27	0		6.2	45.62	45.62	0.00-6.62	45.62-39.00	Embankment Fil
														0.00-2.40	38.60-36.20	Head Deposits	-	-	-		20	27	0		6.2			6.62-9.32	39.00-36.30	Head Deposits
														2.40-4.90	36.20-33.70	Glaciofluvial Deposits (coarse grained	15	-	-		21	38	-		19.2			9.32-12.02	36.30-33.60	Glaciofluvial Deposits
														4.90-17.10	33.70-21.50	Mercia Mudstone III/IV	-	-	-		22	30	2		13.4			12.02<	33.60>	Mercia Mudstone III/IV
Noise Barrier	ENS2_2	New	189560	189690	130	SB	189/5B+60	189/6B+90	Embankment	1.5-3.3	32.2	CP1104, HIS0002		Not recorded	Not recorded	Embankment Fil	-	-	19	-	21	27	0		6.2	34.00	34.00	0-3.5	30.5-34.0	Embankment Fil
														0.00-7.60	31.80-24.20	Glaciofluvial Deposits (coarse grained	24-53	-	-	-	21	38	-		19.2			3.5-8.5	25.5-30.5	Glaciofluvial Deposits (coarse grained
														7.60-14.90	24.20-16.90	Mercia Mudstone - III/IV	49-150	-	11-13	48-254	21	30	2		8.6			>8.5	<25.5	Mercia Mudstone III/IV
Noise Barrier	ENS2_3	New	189690	189935	245	SB	189/6B+90	189/9B+35	Embankment	2.8-6.2	32.2	HIS0003-HIS0008, SK43SE18		Not recorded	Not recorded	Embankment Fil	-	-	-	-	21	27	0		6.2	38.20	38.20	0-5.6	32.4-38.2	Embankment Fil
														0.00-8.20	31.70-23.50	Glaciofluvial Deposits (coarse grained	9-67	-	-	-	21	38	-		19.2			5.6-12.2	26.0-32.4	Glaciofluvial Deposits (coarse grained
														8.20-8.84	23.50-22.86	Mercia Mudstone - III/IV	-	-	-	22-151	21	30	2		13.4			>12.2	<26.0	Mercia Mudstone III/IV
Noise Barrier	ENS2_5	New	189950	190115	165	SB	189/9B+50	190/1B+15	Embankment	6.3-9.5	32.2	HIS0003-HIS0008, HIS0009-HIS0014, CP1105, TP1106, CP1107		Not recorded	Not recorded	Embankment Fill	16-64	-	9-22	85-210	21	27	0		6.2	40.00	40.00	0-10.1	29.9-40.0	Embankment Fill
			190115	190125	10		190/1B+15	190/1B+25																						
			190125	190245	120		190/1B+25							0.00-5.80	31.70-25.90	Glaciofluvial Deposits (coarse grained)					21	38	-		19.2			10.1-13.0	27.0-29.9	Glaciofluvial Deposits (coarse grained)
			190245	190265	20		0										9-103	-	-	-										
			190265	190375	110		0	190/3B+75						5.80-8.54	25.90-23.16	Mercia Mudstone- III/IV	60-150	-	17	19-350	21	30	2		13.4			>13.0	<27.0	Mercia Mudstone III/IV

Appendix K. Waste Classification Report

[redacted]

Waste Classification Report

Job name

SMP1 GDR M1 Junction 23a to 25

Waste Stream

Default Contaminated Land

Comments

Four tests on available samples from AGS Data

Project

Smart Motorways Project 1

Site

M1 Junction 23a to 25

Classified by

Name:
[redacted]
Date:
18/08/2016 11:06 UTC
Telephone:
[redacted]

Company:
Amey plc
International Design Hub, Colmore Plaza
20 Colmore Circus Queensway
Birmingham
B4 6AT

Report

Created by: [redacted]
Created date: 18/08/2016 11:06 UTC

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazardous properties	Page
1	TP1063 181635	1.5	Non Hazardous		2
2	CP1096 187290	2.8	Non Hazardous		4
3	TP1095 187775	1.5	Non Hazardous		6
4	CP1097 188015	1.8	Non Hazardous		8
5	CP1097 188015[2]	3.8	Non Hazardous		10

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	11
Appendix B: Notes	12
Appendix C: Version	12

Classification of sample: TP1063 181635

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP1063 181635
Sample Depth:
1.5 m
Moisture content: **0%**
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands (Moisture content: 0%, no correction)

arsenic trioxide: (Cation conc. entered: 1.5 mg/kg, converted to compound conc.:1.98 mg/kg or 0.000198%)
benzene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
boron tribromide/trichloride/trifluoride (combined): (Cation conc. entered: 1.75 mg/kg, converted to compound conc.:23.502 mg/kg or 0.00235%)
cadmium sulfide: (Cation conc. entered: 0.15 mg/kg, converted to compound conc.:0.193 mg/kg or 0.0000193%, Note 1 conc.: 0.000015%)
chromium(III) oxide: (Cation conc. entered: 44 mg/kg, converted to compound conc.:64.308 mg/kg or 0.00643%)
chromium(VI) oxide: (Cation conc. entered: 0.15 mg/kg, converted to compound conc.:0.288 mg/kg or 0.0000288%)
copper (I) oxide: (Cation conc. entered: 11 mg/kg, converted to compound conc.:12.385 mg/kg or 0.00124%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:0.942 mg/kg or 0.0000942%)
dibenz[a,h]anthracene: (Whole conc. entered as: 5 mg/kg or 0.0005%)
ethylbenzene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
lead chromate: (Cation conc. entered: 5 mg/kg, converted to compound conc.:7.799 mg/kg or 0.00078%, Note 1 conc.: 0.0005%)
mercury dichloride: (Cation conc. entered: 0.3 mg/kg, converted to compound conc.:0.406 mg/kg or 0.0000406%)
nickel dihydroxide: (Cation conc. entered: 48 mg/kg, converted to compound conc.:75.816 mg/kg or 0.00758%)
pH: (Whole conc. entered as: 8.1 pH, converted to conc.:8.1 pH or 8.1 pH)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (Cation conc. entered: 1.5 mg/kg, converted to compound conc.:3.83 mg/kg or 0.000383%)
toluene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
xylene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
zinc chromate: (Cation conc. entered: 84 mg/kg, converted to compound conc.:233.028 mg/kg or 0.0233%)
polychlorobiphenyls; PCB: (Whole conc. entered as: 0.004 mg/kg or 0.0000004%)

Test Settings

HP 2 on Ox. Gas 1; H270, Ox. Liq. 1; H271, Ox. Sol. 1; H271, Ox. Liq. 2; H272, Ox. Sol. 2; H272, Ox. Liq. 3; H272, Ox. Sol. 3; H272: Force this test to non hazardous because: "Waste Stream does not display oxidising properties. Concentration not sufficient to produce hazard."
HP 3(i) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this test to non hazardous because: "The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration."

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(VI) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "dibenz[a,h]anthracene"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "polychlorobiphenyls; PCB"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
determinand: "zinc chromate"

Note C , used on:

determinand: "xylene"
determinand: "polychlorobiphenyls; PCB"

Classification of sample: CP1096 187290

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
CP1096 187290
Sample Depth:
2.8 m
Moisture content: **0%**
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands (Moisture content: 0%, no correction)

arsenic trioxide: (Cation conc. entered: 1.5 mg/kg, converted to compound conc.:1.98 mg/kg or 0.000198%)
benzene: (Whole conc. entered as: <0.005 mg/kg or <0.0000005%) IGNORED Because: "<LOD"
boron tribromide/trichloride/trifluoride (combined): (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:6.715 mg/kg or 0.000672%)
cadmium sulfide: (Cation conc. entered: 0.15 mg/kg, converted to compound conc.:0.193 mg/kg or 0.0000193%, Note 1 conc.: 0.000015%)
chromium(III) oxide: (Cation conc. entered: 34 mg/kg, converted to compound conc.:49.693 mg/kg or 0.00497%)
chromium(VI) oxide: (Cation conc. entered: <0.15 mg/kg, converted to compound conc.:<0.288 mg/kg or <0.0000288%) IGNORED Because: "<LOD"
copper (I) oxide: (Cation conc. entered: 59 mg/kg, converted to compound conc.:66.427 mg/kg or 0.00664%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:0.942 mg/kg or 0.0000942%)
ethylbenzene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
lead chromate: (Cation conc. entered: 6 mg/kg, converted to compound conc.:9.359 mg/kg or 0.000936%, Note 1 conc.: 0.0006%)
mercury dichloride: (Cation conc. entered: 0.3 mg/kg, converted to compound conc.:0.406 mg/kg or 0.0000406%)
nickel dihydroxide: (Cation conc. entered: 34.3 mg/kg, converted to compound conc.:54.177 mg/kg or 0.00542%)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (Cation conc. entered: 1.5 mg/kg, converted to compound conc.:3.83 mg/kg or 0.000383%)
toluene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 42 mg/kg or 0.0042%)
xylene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
zinc chromate: (Cation conc. entered: 70.3 mg/kg, converted to compound conc.:195.023 mg/kg or 0.0195%)
polychlorobiphenyls; PCB: (Whole conc. entered as: 0.004 mg/kg or 0.0000004%)

Test Settings

HP 3(i) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this test to non hazardous because: "The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration."

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "polychlorobiphenyls; PCB"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"

Note 1 , used on:

Test: "HP 5 on STOT SE 1; H370, STOT RE 1; H372" for determinand: "cadmium sulfide"
Test: "HP 5 on STOT SE 2; H371, STOT RE 2; H373" for determinand: "cadmium sulfide"
Test: "HP 6 on Acute Tox. 4; H302" for determinand: "cadmium sulfide"
Test: "HP 7 on Carc. 1A; H350, Carc. 1B; H350, Carc. 1A; H350i, Carc. 1B; H350i" for determinand: "cadmium sulfide"
Test: "HP 10 on Repr. 1A; H360, Repr. 1A; H360D, Repr. 1A; H360Df, Repr. 1A; H360F, Repr. 1A; H360Fd, Repr. 1A; H360FD, Repr. 1B; H360, Repr. 1B; H360D, Repr. 1B; H360Df, Repr. 1B; H360F, Repr. 1B; H360Fd, Repr. 1B; H360FD " for determinand: "lead chromate"
Test: "HP 10 on Repr. 2; H361, Repr. 2; H361d, Repr. 2; H361f, Repr. 2; H361fd" for determinand: "cadmium sulfide"
Test: "HP 11 on Muta. 2; H341" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
determinand: "zinc chromate"

Note C , used on:

determinand: "xylene"
determinand: "polychlorobiphenyls; PCB"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Classification of sample: TP1095 187775

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP1095 187775
Sample Depth:
1.5 m
Moisture content: **0%**
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands (Moisture content: 0%, no correction)

arsenic trioxide: (Cation conc. entered: 1.5 mg/kg, converted to compound conc.:1.98 mg/kg or 0.000198%)
benzene: (Whole conc. entered as: <0.005 mg/kg or <0.0000005%) IGNORED Because: "<LOD"
boron tribromide/trichloride/trifluoride (combined): (Cation conc. entered: 1.75 mg/kg, converted to compound conc.:23.502 mg/kg or 0.00235%)
cadmium sulfide: (Cation conc. entered: 0.15 mg/kg, converted to compound conc.:0.193 mg/kg or 0.0000193%, Note 1 conc.: 0.000015%)
chromium(III) oxide: (Cation conc. entered: 13 mg/kg, converted to compound conc.:19 mg/kg or 0.0019%)
chromium(VI) oxide: (Cation conc. entered: <1.5 mg/kg, converted to compound conc.:<2.885 mg/kg or <0.000288%) IGNORED Because: "<LOD"
copper (I) oxide: (Cation conc. entered: 9 mg/kg, converted to compound conc.:10.133 mg/kg or 0.00101%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:0.942 mg/kg or 0.0000942%)
ethylbenzene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
lead chromate: (Cation conc. entered: 13 mg/kg, converted to compound conc.:20.278 mg/kg or 0.00203%, Note 1 conc.: 0.0013%)
mercury dichloride: (Cation conc. entered: 0.3 mg/kg, converted to compound conc.:0.406 mg/kg or 0.0000406%)
nickel dihydroxide: (Cation conc. entered: 7.9 mg/kg, converted to compound conc.:12.478 mg/kg or 0.00125%)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (Cation conc. entered: 1.5 mg/kg, converted to compound conc.:3.83 mg/kg or 0.000383%)
toluene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 5 mg/kg or 0.0005%)
xylene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
zinc chromate: (Cation conc. entered: 29 mg/kg, converted to compound conc.:80.45 mg/kg or 0.00805%)

Test Settings

HP 3(i) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this test to non hazardous because: "The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration."

Notes utilised in assessment

C14: Step 5

"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
determinand: "zinc chromate"

Note C , used on:

determinand: "xylene"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Classification of sample: CP1097 188015

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
CP1097 188015
Sample Depth:
1.8 m
Moisture content: **0%**
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands (Moisture content: 0%, no correction)

arsenic trioxide: (Cation conc. entered: 5 mg/kg, converted to compound conc.:6.602 mg/kg or 0.00066%)
benzene: (Whole conc. entered as: <0.005 mg/kg or <0.0000005%) IGNORED Because: "<LOD"
boron tribromide/trichloride/trifluoride (combined): (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:6.715 mg/kg or 0.000672%)
cadmium sulfide: (Cation conc. entered: 0.15 mg/kg, converted to compound conc.:0.193 mg/kg or 0.0000193%, Note 1 conc.: 0.000015%)
chromium(III) oxide: (Cation conc. entered: 35.4 mg/kg, converted to compound conc.:51.739 mg/kg or 0.00517%)
chromium(VI) oxide: (Cation conc. entered: <0.15 mg/kg, converted to compound conc.:<0.288 mg/kg or <0.0000288%) IGNORED Because: "<LOD"
copper (I) oxide: (Cation conc. entered: 99 mg/kg, converted to compound conc.:111.463 mg/kg or 0.0111%)
salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex: (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:0.942 mg/kg or 0.0000942%)
ethylbenzene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
lead chromate: (Cation conc. entered: 8 mg/kg, converted to compound conc.:12.479 mg/kg or 0.00125%, Note 1 conc.: 0.0008%)
mercury dichloride: (Cation conc. entered: 0.3 mg/kg, converted to compound conc.:0.406 mg/kg or 0.0000406%)
nickel dihydroxide: (Cation conc. entered: 38.5 mg/kg, converted to compound conc.:60.811 mg/kg or 0.00608%)
pH: (Whole conc. entered as: 9.04 pH, converted to conc.:9.04 pH or 9.04 pH)
selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex: (Cation conc. entered: 1.5 mg/kg, converted to compound conc.:3.83 mg/kg or 0.000383%)
toluene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
TPH (C6 to C40) petroleum group: (Whole conc. entered as: 13 mg/kg or 0.0013%)
xylene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
zinc chromate: (Cation conc. entered: 82 mg/kg, converted to compound conc.:227.48 mg/kg or 0.0227%)

Test Settings

HP 3(i) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this test to non hazardous because: "The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration."

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "arsenic trioxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "chromium(III) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "copper (I) oxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "mercury dichloride"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "nickel dihydroxide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "zinc chromate"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "TPH (C6 to C40) petroleum group"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "cadmium sulfide"

Note 1 , used on:

Test: "HP 5 on STOT SE 1; H370, STOT RE 1; H372" for determinand: "cadmium sulfide"
Test: "HP 5 on STOT SE 2; H371, STOT RE 2; H373" for determinand: "cadmium sulfide"
Test: "HP 6 on Acute Tox. 4; H302" for determinand: "cadmium sulfide"
Test: "HP 7 on Carc. 1A; H350, Carc. 1B; H350, Carc. 1A; H350i, Carc. 1B; H350i" for determinand: "cadmium sulfide"
Test: "HP 10 on Repr. 1A; H360, Repr. 1A; H360D, Repr. 1A; H360Df, Repr. 1A; H360F, Repr. 1A; H360Fd, Repr. 1A; H360FD, Repr. 1B; H360, Repr. 1B; H360D, Repr. 1B; H360Df, Repr. 1B; H360F, Repr. 1B; H360Fd, Repr. 1B; H360FD " for determinand: "lead chromate"
Test: "HP 10 on Repr. 2; H361, Repr. 2; H361d, Repr. 2; H361f, Repr. 2; H361fd" for determinand: "cadmium sulfide"
Test: "HP 11 on Muta. 2; H341" for determinand: "cadmium sulfide"
Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "lead chromate"

Determinand notes

Note 1 , used on:

determinand: "cadmium sulfide"
determinand: "lead chromate"

Note A , used on:

determinand: "salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex"
determinand: "selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex"
determinand: "zinc chromate"

Note C , used on:

determinand: "xylene"

WM3: Unknown oil , used on:

determinand: "TPH (C6 to C40) petroleum group"

Classification of sample: CP1097 188015[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
CP1097 188015[2]
Sample Depth:
3.8 m
Moisture content: **0%**
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands (Moisture content: 0%, no correction)

benzene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
ethylbenzene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
toluene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
xylene: (Whole conc. entered as: 0.005 mg/kg or 0.0000005%)
polychlorobiphenyls; PCB: (Whole conc. entered as: 0.004 mg/kg or 0.0000004%)

Test Settings

HP 3(i) on Flam. Liq. 1; H224, Flam. Liq. 2; H225, Flam. Liq. 3; H226: Force this test to non hazardous because: "The risk phrase HP 3 (i) Flammable is unlikely to apply to this waste stream. This is due to the solid soil and natural moisture content of the sample. The concentration required to provide a flammability risk is likely to be >10,000mg. This risk of flammability from solid state soils <1000mg/kg TPH is negligible and has been deemed non-hazardous if below this concentration."

Notes utilised in assessment

C14: Step 5
"identify whether any individual ecotoxic substance is present at or above a cut-off value ..." , used on:

Test: "HP 14 on R50, R50/53, R51/53, R52/53, R52, R53" for determinand: "polychlorobiphenyls; PCB"

Determinand notes

Note C , used on:

determinand: "xylene"
determinand: "polychlorobiphenyls; PCB"

Appendix A: Classifier defined and non CLP determinands

boron tribromide/trichloride/trifluoride (combined) (CAS Number: 10294-33-4, 10294-34-5, 7637-07-2)

Conversion factor: 13.43
Comments: Combines the hazard statements and the average of the conversion factors for boron tribromide, boron trichloride and boron trifluoride
Data source: N/A
Data source date: 06/08/2015
Risk Phrases: R14, T+; R26/28, C; R34, C; R35
Hazard Statements: EUH014, Acute Tox. 2; H330, Acute Tox. 2; H300, Skin Corr. 1A; H314, Skin Corr. 1B; H314

chromium(III) oxide (CAS Number: 1308-38-9)

Conversion factor: 1.462
Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17/07/2015
Risk Phrases: R20, R22, R36, R37, R38, R42, R43, R50/53, R60, R61
Hazard Statements: Acute Tox. 4; H332, Acute Tox. 4; H302, Eye Irrit. 2; H319, STOT SE 3; H335, Skin Irrit. 2; H315, Resp. Sens. 1; H334, Skin Sens. 1; H317, Repr. 1B; H360FD, Aquatic Acute 1; H400, Aquatic Chronic 1; H410

salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex

CLP index number: 006-007-00-5
Data source: Commission Regulation (EC) No 790/2009 - 1st Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP1)
Additional Risk Phrases: None.
Additional Hazard Statements: EUH032>= 0.2%
Reason:
14/12/2015 - EUH032>= 0.2% hazard statement sourced from: WM3, Table C12.2

ethylbenzene (CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Risk Phrases: None.
Additional Hazard Statements: Carc. 2; H351
Reason:
03/06/2015 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25/05/2015
Risk Phrases: R10, R45, R46, R51/53, R63, R65
Hazard Statements: Flam. Liq. 3; H226, Asp. Tox. 1; H304, STOT RE 2; H373, Muta. 1B; H340, Carc. 1B; H350, Repr. 2; H361d, Aquatic Chronic 2; H411

polychlorobiphenyls; PCB (CAS Number: 1336-36-3)

CLP index number: 602-039-00-4
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Risk Phrases: None.
Additional Hazard Statements: Carc. 1A; H350
Reason:
29/09/2015 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

pH (CAS Number: PH)

Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25/05/2015
Risk Phrases: None.
Hazard Statements: None.

Appendix B: Notes

C14: Step 5

from section: WM3: C14 in the document: "WM3 - Waste Classification"

"identify whether any individual ecotoxic substance is present at or above a cut-off value ..."

Note 1

from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"

"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note A

from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"

"Without prejudice to Article 17(2), the name of the substance must appear on the label in the form of one of the designations given in Part 3. In Part 3, use is sometimes made of a general description such as '... compounds' or '... salts'. In this case, the supplier is required to state on the label the correct name, due account being taken of section 1.1.1.4."

Note C

from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"

"Some organic substances may be marketed either in a specific isomeric form or as a mixture of several isomers. In this case the supplier must state on the label whether the substance is a specific isomer or a mixture of isomers."

WM3: Unknown oil

from section: Chapter 3: 4. Waste oils and other wastes containing or contaminated with oil in the document: "WM3 - Waste Classification"

"If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic due to the presence of oil if all three of the following criteria are met:

- the waste contains **benzo[a]pyrene (BaP)** at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.2 of the CLP for BaP)
- this has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D, and
- the analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel

"

Appendix C: Version

Classification utilises the following:

- CLP Regulations - Regulation 1272/2008/EC of 16 December 2008
- 1st ATP - Regulation 790/2009/EC of 10 August 2009
- 2nd ATP - Regulation 286/2011/EC of 10 March 2011
- 3rd ATP - Regulation 618/2012/EU of 10 July 2012
- 4th ATP - Regulation 487/2013/EU of 8 May 2013
- Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
- 5th ATP - Regulation 944/2013/EU of 2 October 2013
- 6th ATP - Regulation 605/2014/EU of 5 June 2014
- WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
- Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
- WM3 - Waste Classification - May 2015
- 7th ATP - Regulation 2015/1221/EU of 24 July 2015
- 8th ATP - Regulation (EU) 2016/918 of 19 May 2016
- POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
- 1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
- 2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

HazWasteOnline Engine: WM3 1st Edition, May 2015
HazWasteOnline Engine Version: 2016.201.3095.6119 (19 Jul 2016)
HazWasteOnline Database: 2016.201.3095.6119 (19 Jul 2016)

Appendix L. Series 600 Specification

highways england

amey ARUP

06 Product Development & Production

Preconstruction and Construction services

Smart Motorways Programme

M1 Junction 23a to 25

Volume 2 Works Information

Specification Appendices Series 600 EARTHWORKS

April 2017

Notice

This document and its contents have been prepared and are intended solely for Highways England's information and use in relation to the Smart Motorways Programme.

Document history

Amey Arup assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

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P02	Not Issued					
P03	DF5 Issue	RM	SB	SG	TB	03/11/2016
P04	Post DF5 / Inclusion of Gabions	RM	AB	GS	TB	07/12/2016
P05	Construction Issue – internal only	RM	AB	GS	TB	--
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1. Appendix 6/1: Requirements for Acceptability and Testing etc. of Earthworks Materials

2.1 General

2.1.1 The permitted clauses of construction materials are defined in the following tables:

2.1.1.1 Table 1/5/1 Testing Requirements;

2.1.1.2 Table 6/1/1 Classification and Compaction Requirements;

2.1.1.3 Table 6/2/1 Grading Requirements; and

2.1.1.4 Table 6/4 Method of Compaction for Fill.

2.1.2 The area where each earthwork material may be used in is defined on the Contract Drawings and shall conform to the requirements of the Manual of Contract Documents for Highway Works (MCHW), Volume 1, Series 600, and Table 6/1/1 and Table 6/2/1. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

2.1.3 Any surplus unacceptable material excavated from site shall be classified U1 and shall be removed from site in accordance with Appendix 6/2.

2.1.4 Where the determination of the Effective Angle of Internal Friction (φ') and Effective Cohesion (c') is required by Table 6/1/1 and Table 6/2/1, shear box tests will be carried out in accordance with Clauses 636.2.

2.1.5 The classification and confirmation of acceptability of the earthworks materials shall be carried out by the Contractor, at the point of excavation for on-site materials, and at the point of deposition for imported materials. If, in the opinion of the Designer, the material has altered its classification or become unacceptable for whatever reason, the Designer may require the Contractor to repeat the classification and acceptability tests given in Table 6/1/1 and 6/2/1 of the Specification.

2.1.6 The Contractor shall be responsible for monitoring the continuing acceptability of the earthworks materials. Where the quantity of material used in the Works is less than that stated in the frequency schedule the Contractor shall perform two tests of each type required, on the quantity used.

2.1.7 Prior to sampling of materials for the purpose of classification, the Contractor will give reasonable notice to the Designer, of the time and location of their sampling so as to afford the Designer an opportunity to witness the taking of any sample, and permit the Designer to take a joint sample for testing to confirm the results of the Contractor.

2.1.8 The Contractor shall submit two copies of all test results to the Designer within three working days of the completion of tests electronically. The copies shall be signed by the Contractor's responsible Supervisor/Technician. All original test sheets shall be filed in the site laboratory/testing facilities after signing in accordance with UKAS requirements.

2.1.9 Any material imported shall not contain slag or burnt colliery shale.

2.1.10 All material imported shall be tested at source for contaminants.

2.1.11 Material excavated will be removed off site.

2.1.12 The Contractor shall provide Class 6N material optimum moisture content test results and moisture content test results to Designer for review. The moisture content value for the Class 6N material shall be agreed with the Designer.

2.1.13 Unacceptable material U1A or U1B as defined in Clause 601.2 (i) of the Specification for Highways Works Series 600: material excavated from within the site which, unless processed so that it meets with the requirements of Table 6/1/1 and 6/2/1, shall not be used in the permanent works.

2.2 Requirements for Removal Off Site of Excavated Acceptable Material or Unacceptable

2.2.1 The Contractor shall obtain suitable soil and water samples from areas of known or suspected Class U1B or Class U2 materials in advance of the excavation works. Such samples shall be tested by an approved laboratory in order to characterise any Class U1B or Class U2 materials prior to excavation and disposal.

2.2.2 Additional chemical tests shall be carried out on any suspected Class U1B or Class U material encountered during excavation and as required by the relevant Waste Regulation Authority.

2.2.3 The Contractor shall maintain full records relating to the export or import of fill materials to site, including the disposal of Class U1A, U1B or U2 materials to licensed facilities.

2.2.4 Testing of samples to determine limiting values of water soluble (ws) sulphate, oxidisable sulphides and total potential sulphate in accordance with TRL report 447, Test numbers 1 to 5, are mandatory for materials that are to be used as structural backfill and all infills where they are placed within 500mm of concrete or metallic elements. Testing shall be in accordance with Clause 644 of the Specification for Highways Works Series 600 and Clause NG644 of Notes for Guidance on the Specification for Highways Works Series NG 600.

2.2.5 Earthworks are to be kept free of groundwater, infiltration water and the effects of weather, and the subgrade should be protected against water infiltration in accordance with Specification Clause 613.

2.2.6 No chalk is expected to be encountered, and consequently Class 3 material is not expected to be used on this scheme.

Table 6/1/1 – Acceptable Earthworks Materials: Classification and Compaction Requirements for Earthwork Material

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements In Clause 612
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
						Lower	Upper	
5A	Topsoil, or turf, existing on Site	Topsoiling	Topsoil or turf designated as Class 5A in the Contract	(i) grading	Clause 618	-	Clause 618	-
5B	Imported Topsoil	Topsoiling	General purpose grade complying with BS3882	-	-	-	-	-
6N	Selected well graded granular material	Fill to structures and widening of high earthwork embankment	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt.	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 95 % of maximum dry density of BS 1377: Part 4 (vibrating hammer method)
					BS EN 933-2 (Off-site)	Tab 6/5	Tab 6/5	
				(ii) uniformity coefficient	See Note 5	10	-	
				(iii) Los Angeles coefficient	Clause 635	-	40	
				(iv) effective angle of internal friction (ø')	Clause 636	36°	NR	
				(v) mc	BS1377: Part 2	OMC-2%	OMC +2%	
6G	Selected granular material	Gabion Filling	Natural gravel, crushed rock, crushed concrete or any combination thereof. None of these constituents shall include any argillaceous rock. Where material is imported on site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, See Notes 8,9 and 10. P (natural aggregates – except shale, siltstone or slate, see Note 7) A2 (crushed concrete)	(i) grading	BS 1377: Part 2 (on-site)	See Clause 10.3.8	See Clause 10.3.8	None
					BS EN 933-2 (imported onto site)	See Clause 10.3.8	See Clause 10.3.8	
				(ii) Los Angeles coefficient	Clause 635	-	50	

Footnotes to Table 6/1/1

App = Appendix
Tab = Table
Where in the acceptable limits column reference is made to App 6/1, only those properties having limits ascribed to them in Appendix 6/1 shall apply. Where appendix 6/1 gives limits for other properties not listed in this Table such limits shall also apply.
Where BS 1377:Part2 is specified for mc, this shall mean BS1377:Part 2 or BS EN 1097-5 as appropriate.
Uniformity coefficient is defined as the ratio of the particle diameters D_{60} to D_{10} on the particle size distribution curve, where:
D_{60}= particle diameter at which 60% of the soil by weight is finer.
D_{10} = particle diameter at which 10% of the soil weight is finer.

Table 6/2/1 – Grading Requirements for Acceptable Earthworks Materials Other Than Classes 6F4, 6F5 and 6S

Percentage by Mass Passing the size shown																					
Class	Size (mm)		Size (mm) BS Series													Size(microns) BS Series				Size (Microns)	Class
	500	*300*	*125*	*90*	*75*	*37.5*	*28*	*20*	*14*	*10*	*6.3*	*5*	*3.35*	*2*	*1.18*	*600*	*300*	*150*	*63*	*2*	
6N					100														<15		6N

3. Appendix 6/2: (11/04) Requirements for Dealing with Clause U1B and Class U2 Unacceptable Materials

3.1 General

3.1.1 All excavated soils will be tested as per Appendices 1/5, 6/14/1 and 6/15/1. Figure 6/2/2 summarises the process of waste classification and determination of appropriate disposal of unacceptable materials.

3.1.2 Where material is surplus to requirement and therefore requiring disposal off site, material will be classified as waste, in accordance with the 'List of Wastes' (formerly known as the European Waste Catalogue). Waste Acceptance Criteria testing shall be undertaken in accordance with the Environment Agency Guidance on sampling and testing of wastes if the material is to be disposed to landfill. The waste acceptance procedures and criteria are set out in the Council Decision (2003/33/EC), and in Schedule 10 of the Environmental Permitting (England and Wales) Regulations 2007.

3.1.3 Class U1A material is material which is deemed to be physically unsuitable for re-use (as per Series 601, para 2(ii), Specification for Highways Works, 2005) but excluding all hazardous waste.

3.1.4 Class U1B material is contaminated material whose level of contamination is above that given in either Appendix 6/14 or Appendix 6/15 (see clause 601, para 2(ii), Specification for Highways Works, 2009) but excluding all hazardous wastes.

3.1.5 Class U2 material is unacceptable material classified as hazardous waste (see clause 601, para 3(i), Specification for Highways Works, 2009). The Contractor is to determine whether Class U2 material is present at the site by reviewing existing information relating to the site and by assessing results from testing.

3.1.6 The Contractor shall also be responsible for the preparation of any additional specific methodologies for dealing with wastes, hazardous materials and contaminated ground, groundwater and surface water. All methodologies shall be pre-agreed with the necessary Environmental Authority. Additional site investigations, field tests or laboratory tests may be necessary to define further the nature of Class U1B/U2 materials encountered and shall be agreed between the Designer land contamination specialist and Contractor.

3.2 Material Handling, Classification and Disposal

3.2.1 Potentially contaminated materials shall be handled and disposed of in accordance with the requirements of the Designer, the Council Decision 2003/33/EC and appropriate Environment Agency guidance. Classification and disposal of contaminated material shall be in accordance with the Council Decision and Hazardous Waste Regulations and shall be the responsibility of the Contractor.

3.2.2 Testing shall comprise the appropriate determinands as identified by a review of historical mapping and Envirocheck reports. Where additional contaminants are known or suspected, these should be added to the testing suite (where appropriate). The sampling rate will be:

3.2.2.1 Approximately one sample per 250m^3 of the proposed material to be disposed of; 100m^3 where visually or known to be contaminated;

3.2.2.2 Vertical coverage specifically within the depth of material to be disposed of at one sample per stratum or one sample per 2m depth (whichever is sooner).

3.2.3 Material classed as unacceptable for re-use on-site on the basis of contamination shall be removed from the site unless otherwise agreed with the Designer land contamination specialist and relevant authorities.

3.2.4 Where materials are to be disposed of to a licensed facility, the landfill operators should be contacted in advance to ensure material can be accepted. Waste Acceptance Criteria testing should be carried out (see Figure 6/2/2).

3.2.5 If any material classifies as U1B or U2 material, the Contractor will submit their proposals to the Designer for excavation, handling on-site and off-site transportation and disposal / treatment and details of all relevant permits, licences, authorisations or notifications required for the proposed works. Agreement will be obtained from the Designer prior to the start of the work to remove or treat the substances.

3.2.6 There are no existing authorizations (including registered exemptions) with the Regulator for the disposal, reuse or temporary stockpiling of material from the site. The Contractor shall obtain all necessary authorisations for the disposal, reuse or stockpiling of materials in accordance with the Environmental Permitting Regulations (England and Wales) 2010 and subsequent amendments.

3.2.7 The Contractor shall ensure appropriate written evidence is collected which states that waste material has been taken to a disposal site that is licensed to accept such waste materials. This shall include details of the proposed disposal site or sites, provided five days in advance of the commencement of the works, together with all relevant documentation, certificates of registration as a waste carrier, transfer notes, consignment notes and evidence that the proposed sites hold the appropriate Environmental permits, supplied to the Designer land contamination specialist prior to the removal of waste(s) from the site.

3.2.8 Where U2 material is encountered the Contractor shall transport U2 material in accordance with Hazardous Waste Regulations (2005) as amended 2009 and CHIP4. In addition, the Contractor has a duty of care for the transportation of non-hazardous or hazardous materials. The Contractor will submit their proposals for the transport of hazardous and non-hazardous waste to the Designer and to the Local Environmental Health Officer for approval. This agreement will be obtained prior to the start of the work to remove the materials.

3.2.9 Material excavated and designated for disposal based on visual and olfactory evidence and/or chemical analysis shall be transported direct to the appropriate stockpile for necessary pre-treatment. The pre-treatment methodology shall be agreed between the Contractor and Designer, based on the identified contaminants and concentrations together with the determined classification and cost-benefit analysis.

3.2.10 If material is suspected of being contaminated / controlled waste / special waste / other Class U2 Unacceptable material then it shall be left in-situ while classification is being carried out. The Contractor shall allow for whatever testing and other work that is necessary to classify the material in accordance with the requirements of the appropriate Authorities.

3.2.11 A method statement shall be submitted by the Contractor to the DSR detailing how any material suspected to be Class U2 will be sampled and tested. The Contractor shall arrange for chemical testing to be carried out by a UKAS approved laboratory approved by the Employers Agent.

3.2.12 Throughout the works, the Contractor shall pay particular attention to the following:

3.2.12.1 Handling and disposal or contaminated soils and water;

3.2.12.2 Waste material shall be kept safe and stored separately and not in the vicinity of any site personnel;

3.2.12.3 Waste may be handed onto an authorized person for transportation and shall be done so in an appropriate container and clearly labelled as waste;

3.2.12.4 Waste is collected regularly and stockpiling on contaminated material is not permitted at any time;

3.2.12.5 Contractor shall nominate the waste carrier who must be registered with a Waste Regulation Authority in accordance with the Control of Pollution Act 1989; and

3.2.12.6 The Contractor is to ensure that requirements under the Environmental Protection (Duty of Care) Regulations 1991 are followed. Detailed records of waste dispatched from site, including each and every waste transfer note are to be made available to the Waste Regulation Authority on request and to the Engineer. All transferred waste must be documented with the records being kept for at least two years by the Contractor. The Contractor shall ensure that copies of all landfill gate receipts handed to the delivery drivers are copied daily to the Engineer.

3.3 Identification of Potentially Contaminated Materials

3.3.1 The Contractor shall ensure that the working faces and arising from excavations are closely observed for signs of potential contamination such as:

3.3.1.1 Fuel and oil contamination, including the presence of free phase hydrocarbon product;

3.3.1.2 Tar and tarry wastes;

3.3.1.3 Putrescible waste materials;

3.3.1.4 Medical waste;

3.3.1.5 Suspected ordnance;

3.3.1.6 Drums, tanks, underground structures, redundant services, canisters or other containers containing unknown materials;

3.3.1.7 Asbestos containing materials (ACM); and

3.3.1.8 Other visually or olfactory impacted material, including contaminated liquids or sludge.

3.3.2 If suspected contamination or unusual materials are identified, the Designer shall be notified immediately.

3.3.3 All areas of known or suspected contamination shall be delineated on site plans, which shall be updated as required throughout the construction period. Prior to excavation works in these areas, the Contractor shall ensure that relevant site staff are fully briefed on the site management procedures and shall be given appropriate health and safety inductions and briefed in the identification, recording, segregation and handling of potentially contaminated materials.

3.3.4 During the work in areas of known or suspected contamination, the Contractor shall employ an appropriately qualified and experienced Environmental Specialist who shall be on-site to inspect potential contamination as it is encountered and advise on segregation, handling and disposal.

3.3.5 The Contractor shall record the location, volume, nature and extent of all suspected contamination and shall provide the data to the Designer for inclusion in the post-construction feedback report. In some cases, validation sampling and testing may be required, at greater frequencies than that included in the general sampling strategy in Appendix 1/5, to confirm the complete removal of the contaminated material, in agreement with the Designer.

3.4 Health and Safety Requirements

3.4.1 The Contractor's health and safety measures shall incorporate all the issues identified in the appropriate method statements, risk assessments, health and safety plan(s), together with all the requirements of the various Health and Safety legislation and Codes of Practice to ensure that all appropriate facilities and personal protective equipment (PPE) are provided, used and maintained.

3.4.2 Under the Environmental Protection Act 1990, certain materials leaving site without notifying the appropriate Statutory Authorities, may be considered an offence. If materials are to be stockpiled, the Contractor shall ensure that this is undertaken in a safe manner and in a separate well defined, appropriately prepared area, remote from the area of working and adjacent land users. Classification and disposal of stockpiled materials shall be carried out in accordance with Specification Appendix 6/1 and 6/2.

3.4.3 Handling of materials and Health and Safety of site personnel and adjacent land users shall be in accordance with the Construction Design & Management (CDM) Regulations 2015 and the Health & Safety Executive.

3.4.4 If unexpectedly severe contamination is encountered on-site, which cannot be safely transported to the designated stockpile area without compromising health and safety of the site staff, landowners and members of the public, work shall be stopped immediately in the affected area and specialist advice shall be required regarding the additional health and safety measures.

3.4.5 The Contractor shall ensure the health and safety protocols for dealing with ACM are in place before any works begin. Where necessary the Contractor shall employ a specialist Contractor to collect and dispose of any ACM.

3.4.6 If any radioactive materials are encountered, the Health and Safety Executive (HSE) shall be contacted immediately for advice.

3.5 Health and Safety Implementation

3.5.1 The Contractor shall be responsible for ensuring that all work with Class U1B and U2 materials is carried out in accordance with all relevant Health and Safety legislation, including the CDM Regulations, 2015. The primary duty under the Control of Substances Hazardous to Health (COSHH) Regulations 2002 is to prevent exposure to hazardous substances, but where this is not reasonably practicable, the requirement is to ensure that exposure is adequately controlled. Site-specific requirements for protection of the workforce shall be determined by discussion between the Contractor and the HSE as appropriate.

3.5.2 The Contractor shall prepare appropriate method statements and safety plans for all work with Class U1B and U2 materials and substances for approval by the Designer five working days prior to the commencement of the work and shall comply with any further requirements that the Designer may instruct.

3.5.3 The Contractor shall provide, during relevant stages of the work, at least one member of site staff who is suitably qualified and experienced to ensure the implementation of all relevant health and safety requirements.

3.5.4 In the event that contaminated material is encountered within the site, the Contractor shall provide all protective plant, equipment and clothing necessary for work on contaminated ground both for his own staff and for the Designer's staff. All personnel shall wear appropriate protective clothing at all times where contact with potentially contaminated material is likely.

3.5.5 The Contractor shall maintain washing and drying facilities at the place of working. These facilities shall be available for use by all personnel working with known or suspected contaminated material.

3.5.6 In the event that contaminated material is encountered within the site, the Contractor shall provide sufficient decontamination facilities, for male and female personnel within the work zone. The decontamination facilities or hygiene unit shall be in accordance with the Construction Industry Research and Information Association (CIRIA) document "A guide for safe working on contaminated sites" (Report R132) and HSG66 'Protection of workers and the general public during development of contaminated land'. These facilities shall include a shower(s), separate dirty and clean changing rooms and shall not be used for messing facilities. Protective clothing shall be stored in a dry room area and not taken off-site. The units shall be available for use by the Designer and other site visitors.

3.5.7 Smoking, eating and drinking shall be prohibited within areas of known or suspected contamination.

3.6 Stockpiling of Potentially Contaminated Materials

3.6.1 Unclassified material suspected of being contaminated or other wastes shall be stockpiled and tested prior to disposal. Stockpiles should be segregated depending on the source of the material and the apparent nature of the contamination. Stockpiles should be placed on a low permeability liner, suitably protected from damage by earthmoving plant and leachate appropriately collected and disposed off-site or treated and disposed under licensed consent. Proposed stockpile areas should be adequately tested prior to and after use to prove that no cross-contamination has occurred.

3.6.2 The locations of stockpiles shall be approved by the Designer at least five working days before excavation commences. The Contractor shall ensure that the stockpiles will not contaminate or increase the contamination in areas where they are located.

3.6.3 Suitable barriers or sheeting shall be erected and maintained to prevent the escape of windblown wastes, vapours and odours from the site. This is of particular importance given the proximity of the site to the live motorway and other adjacent land users.

3.6.4 Stockpiles of suspected contaminated material shall not be more than 250m^3 in volume and shall be located away from adjacent human, surface water and the local natural receptors. Stockpiles shall be shaped to allow surface water run-off to be directed for collection for disposal off-site or treatment and disposal under licensed consent. Highly contaminated stockpiles may require sheeting to control water ingress as well as odour or vapour emissions.

3.6.5 Liquid and sludge contaminated materials shall be stored in suitable tanks or purpose-built lagoons prior to testing and treatment/disposal in accordance with current guidelines.

3.6.6 Three composite soil leachate samples shall be taken from each stockpile and tested against the Class U1B criteria. Stockpiles classified as Class U1B shall also be sampled and tested to allow waste classification and where necessary shall be subject to Waste Acceptance Criteria (WAC) testing prior to disposal at an appropriate waste treatment facility.

3.6.7 Each stockpile shall be uniquely numbered and its source, classification and destination recorded. Stockpile samples and test results shall be uniquely numbered and traceable to the stockpile.

3.7 Disposal of Contaminated Materials off Site

3.7.1 The Contractor shall undertake the classification and necessary pre-treatment of all wastes and shall pay all fees in relation to its handling, haulage and disposal. The Contractor shall pay all landfill taxes at the rate prevailing at the time of disposal.

3.7.2 Contaminated materials classified as U1B or U2 shall be sent off-site to an appropriately permitted waste disposal facility. The transport of such material shall be managed in accordance with the requirement of the Duty of Care Regulations The Contractor shall maintain adequate waste disposal records to enable waste audits to be undertaken at regular intervals throughout the works.

3.7.3 All wastes which are to be removed from the site shall be classed as one of the following categories, prior to the required pre-treatment:

3.7.3.1 Inert;

3.7.3.2 Non-hazardous; or

3.7.3.3 Hazardous.

3.7.4 Individual landfill operators should be contacted in advance prior to off-site disposal of materials to ensure the material can be accepted by the appropriate landfill.

3.7.5 All wastes shall be subject to classification and any necessary pre-treatment processing as required under the Council Decision and the Hazardous Waste Regulations.

3.7.6 The Contractor shall provide the Designer with appropriate written evidence that waste material has been taken to a disposal site that is licensed to accept such waste materials. This shall include details of the proposed disposal site or sites, provided five days in advance of the commencement of the works, together with all relevant documentation, certificates of registration as a waste carrier, transfer notes, consignment notes and evidence that the proposed sites hold the appropriate waste management licences or Pollution, Prevention and Control permits, supplied to the Designer prior to the removal of waste(s) from the site.

3.7.7 The Contractor shall keep all records related the handling and disposal of waste for a minimum of two years.

3.7.8 Material excavated and designated for disposal based on visual and olfactory evidence and/or chemical analysis shall be transported direct to the appropriate stockpile for necessary pre-treatment in accordance with the Council Decision. The pre-treatment methodology shall be selected by the Contractor and approved by the Designer, based on the identified contaminants and concentrations together with the determined classification and cost-benefit analysis.

3.7.9 Following any waste assessment and pre-treatment, the Contractor shall determine the appropriate landfill based upon soil concentrations and if necessary WAC testing.

3.7.10 Wet materials shall be allowed to drain under controlled conditions i.e. without discharging to land or surface water, before disposal.

3.7.11 The Contractor shall ensure that all necessary precautions are taken to prevent waste transported off-site being shed by spillage or wind blow. All loads shall be suitably covered.

3.7.12 Waste volumes leaving site shall be monitored by the Contractor and regularly reported to the Designer.

3.8 Disposal of Groundwater/Leachate

3.8.1 Groundwater or leachate from contaminated areas shall not be discharged to any surfacewater, foul sewers or groundwaters, without prior approval from the appropriate Statutory Authority. Should contaminated groundwater or leachate be encountered it shall be contained to prevent cross-contamination and treated prior to disposal, as agreed by the appropriate Statutory Authority.

3.8.2 Where contaminated materials are to be stockpiled, the Contractor shall construct impermeable hard-standings and all drainage arisings and leakage shall be collected and stored in secure containers prior to appropriate off-site disposal. The Contractor shall ensure that contaminated waters do not discharge into the ground. All such waters shall be transferred by tanker off-site for appropriate disposal unless other suitable disposal arrangements are agreed with the relevant Statutory Authorities.

3.8.3 Details of the stockpile drainage and leachate collection system shall be supplied to the Designer for approval five working days before excavation commences.

3.8.4 Chemical testing shall be carried out by a UKAS and where available MCerts approved laboratory, acceptable to the Designer. The UKAS and MCerts approval shall cover all of the analytical tests that are required by Appendix 6/14 and 6/15 of this Specification. The results shall be made available to the Designer within ten working days of collection of the samples on-site. Test methods to be used for chemical analysis of contaminated soil, groundwater or leachate shall be carried out in accordance with current Environment Agency guidance.

3.9 Transport of Class U1B/U2 Materials

3.9.1 The Contractor shall take all practicable measures to prevent the deposition of soils, slurries or rubbish, etc. on any highway (including pavements or footways) or on any land adjoining or adjacent to the site. The Contractor shall immediately remove any such material deposited and cleanse the area.

3.9.2 Vehicle wheels, bodies and cabs shall be thoroughly washed and cleaned before leaving site. All loads are to be covered during transportation. Drivers shall wear appropriate PPE if leaving their vehicles within areas of known or suspected contamination.

3.9.3 Vehicles shall exhibit the appropriate markings and signs in respect of the load they are carrying.

3.9.4 The Contractor shall take the steps necessary to prevent fly tipping of any material removed from site and shall obtain fully completed consignment or waste transfer notes for each load, a copy of which shall be provided to the Designer.

3.9.5 All vehicle drivers shall be fully instructed and equipped as to the nature and hazard of their loads and the containment methods to be used in the event of a vehicle accident or spillage.

3.9.6 The Contractor shall prepare contingency plans for use in the event of an emergency such as spillages or vehicle accidents. These shall be fully co-ordinated with representatives from the appropriate emergency services.

3.9.7 All vehicles used for the carriage of Class U1B or U2 material on-site shall be washed down at appropriate intervals to remove contamination. This is to ensure that no cross-contamination of subsequent “clean” material occurs. Hazardous materials are not to be stored in vehicles overnight.

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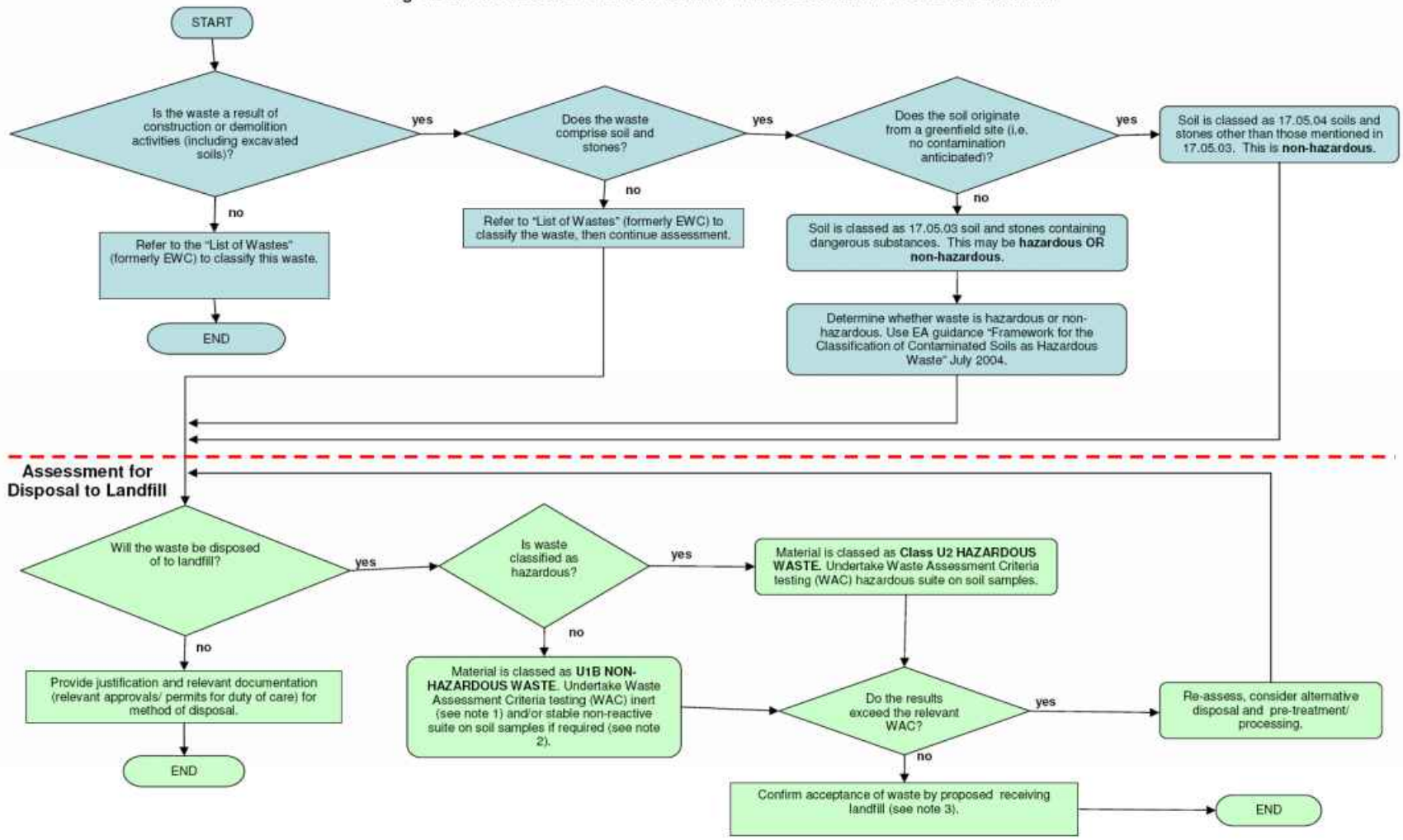
Waste Classification

Fig 6/2/2: WASTE SOILS CLASSIFICATION & ASSESSMENT PROCESS DIAGRAM



Note 1: EA Guidance for Waste Destined for Disposal in Landfills (June 2006), vers 2 states that waste accepted at an inert landfill must exclude soil or stones from contaminated sites. Therefore, waste from contaminated sites must be classified as hazardous or non-hazardous (as per waste classification chart above) and be disposed of at a hazardous or non-hazardous landfill (as appropriate).
Note 2: EA guidance (2006, see note 1), states that there are no WAC for non-hazardous landfill. The only criteriion is that waste must not be hazardous. The stable non-reactive WAC are specific to special circumstances such as asbestos and gypsum waste & are not enforced for landfills accepting non-hazardous waste.
Note 3: Following initial characterisation of the waste, compliance checking must be carried out to ensure the character or nature of the waste has not changed over time (which is likely as soil, particularly made ground, is often heterogeneous).

4. Appendix 6/3: Requirements for Excavation, Deposition, Compaction (Other than Dynamic Compaction)

4.1 General

4.1.1 Earthwork requirements are shown on the Contract Drawings. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

4.1.2 For details of any required Topsoil strip, refer to Appendix 6/8.

4.1.3 The requirements for dealing with unacceptable materials are given in Appendix 6/2.

4.1.4 Any voids in the earthworks as a result of removal of lighting columns, shall be backfilled with Class 6N Granular Fill and compacted to the required standard (refer to section 4.6).

4.2 Blasting

4.2.1 Blasting is not permitted, conventional excavation only.

4.3 Cutting Faces

4.3.1 Cuttings shall be constructed with a maximum gradient of 1V:2H unless specified otherwise on the Contract Drawings.

4.3.2 The installation of drains or other requirements for excavation at the toe of cuttings and embankments slopes shall be undertaken by the Contractor without any damage to the adjacent earthworks. This shall include restriction of open length of operational excavations greater than 1.2m depth as required to suit site conditions and working methods.

4.3.3 Temporary ditches shall be provided within 2m of the toe of all cuttings to facilitate drainage and maintained until permanent drainage measures are constructed.

4.3.4 The Contractor shall produce method statements for all temporary works detailing how they propose to address all potential issues.

4.3.5 Undercutting at the toe of cutting and embankment slopes shall be adequately supported to prevent slop failure. Undercutting shall be kept free of standing water.

4.3.6 All cutting faces will require inspection by an experienced geotechnical engineer or engineering geologist from both the Contractor and the Designer to allow the ground conditions assumed in the design to be confirmed before topsoiling.

4.3.7 In areas where no topsoiling is required, loose material should be treated in accordance with Clause 603.6 of Specification for Highway Works (SHW).

4.3.8 The facings of cuttings requiring attention prior to topsoiling shall be treated in accordance with Clause 603.7.

4.3.9 Any areas of loose or soft material shall be excavated and replaced with well compacted granular fill or ST2 concrete without creating “hard spots”. The Contractor shall notify the Engineer of any such areas and agree a method for excavation and replacement.

4.4 Watercourses (including Ditches)

4.4.1 The Contractor shall refer to drainage specifications (Series 500) for information relating to watercourses.

4.5 Embankment Construction/ Widening

4.5.1 The extent of filling for embankment widening sections is as defined on the Contract Drawings. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

4.5.2 Surcharging of embankments other than as specified by the Designer is not permitted.

4.5.3 Embankments shall not have side slopes steeper than indicated in the design drawings at any stage of construction.

4.5.4 Unless otherwise approved by the Designer, the Contractor shall restrict the time between excavation and deposition in areas of sequential excavation and backfilling to 24hours.

4.5.5 Benched excavation is required to tie-in earthworks widening with existing earthworks. The extents and limitations for benched excavation prior to backfilling and compaction for new embankments taking account the position of existing and proposed services is as per the Contract Drawings and should be confirmed on-site. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

4.5.6 Maximum height of benches shall be 500mm and benches shall have a minimum slope gradient of 5 percent.

4.5.7 All areas of the benching to accept new fill shall be proof-rolled prior to fill replacement. The proof-rolling shall consist of at least one pass of a smooth wheel vibratory roller having a minimum mass per metre roll width of 2100kg, or other suitable method agreed with the Designer.

4.5.8 The extent of any soft spots shall be determined by inspection during proof-rolling. Soft spots shall be inspected and tested for strength to ensure strength greater than 40kPa. Where the strength is less than 40kPa, the soft spots shall be excavated and backfilled with Class 6N fill. Records of the foundation inspections carried out and any remedial measures necessary including location and depths of soft spots shall be submitted to the Designer.

4.5.9 Protection to the formation or sub-formation against weather should be carried out in accordance with Clause 608.9(i)a or 608.9(ii).

4.5.10 Interface between cohesive and granular materials shall be constructed such that the drainage of the interface is towards the edge of the embankment. The slope of the interface shall be such that any water drains to the outside of the embankment. No pockets of granular material shall be formed within cohesive material.

4.5.11 Earthwork materials for embankments shall be Class 6N material in accordance with Table 1/5/1, 6/1/1 and 6/2/1.

4.5.12 Sequential excavation and benching shall be adopted where required.

4.5.13 The Contractor shall restrict the unsupported lengths of any over-steepened excavated faces to 20m where possible in agreement with the Designer.

4.5.14 The Contractor shall undertake sufficient temporary works design to satisfy the Designer that the risk of temporary works instability has been minimised as far as reasonably practical.

4.5.15 Acceptable earthworks materials shall be deposited to form layers no greater than 0.25m thick.

4.5.16 Construction of the engineered slope shall be to the extents and levels defined on the Contract Drawings except to permit adequate compaction (to allow for settlement if required) at the edges before trimming back to the final profile. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

4.5.17 All temporary cut faces will be 1(V): 1(H) or shallower where possible to do so. Support measures will need to be used if the excavation is to be left open for longer periods of time. Excavations shall be protected from surface water and rainfall with waterproof tarpaulins.

4.5.18 The mixing of acceptable and unacceptable material is not permitted.

4.6 Compaction

4.6.1 The Contractor's attention is drawn to Clause 612 and Table 6/4 of the Specification for Highway Works which gives the approved methods of compaction for the highway embankments.

4.6.2 Requirements of compaction shall comply with Clause 612 to form layers no greater than 0.25m thick.

4.6.3 Temporary over-widening to achieve adequate compaction of the shoulders of the embankment will be permitted where required.

4.6.4 The frequency of field dry density testing shall be as set out in Table 1/5/1, 6/1/1 and 6/2/1.

4.6.5 A nuclear density gauge (NDG) will be permitted only where it has been calibrated with sand replacement density (SRD) tests in the same material.

4.7 Temporary Works

4.7.1 The Contractor shall be responsible for the stability, safety and practicality of any temporary works necessary for the Contract.

4.7.2 The Contractor shall be liable for additional costs or any damage caused by inadequate temporary works.

4.7.3 Details of temporary works proposals to be submitted for the approval of the Designer.

4.7.4 No excavation shall be left unsupported at the end of a shift.

4.8 Benching

4.8.1 Benches shall be constructed as detailed in the Contract Drawings. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

4.8.2 Fill material in areas of benching shall be carefully placed and compacted such that no voids occur at the steps of the benching.

4.8.3 Benches formed in sidelong ground shall be inspected by the Design Engineer for signs of seepage.

5. Appendix 6/5: Geotextiles Used to Separate Earthworks Materials

5.1 General

5.1.1 Geotextile separator layers will be used as a material separator where shown on the Contract Drawings and shall comply with Clause 609. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

5.1.2 Material/filter geotextiles shall be Terram T700 GT or similar and have a life expectancy in excess of 120 years. The Contractor shall seek approval of the geotextile to be used prior to the start of the works. All geotextile separator layers and reinforcement geogrids shall be laid and lapped in accordance with Clause 609.5 or with the manufacturers guidance whichever is the greater.

5.1.3 All geotextile separator layers which are to be incorporated in the permanent works shall be BBA accredited.

5.1.4 No sampling or testing for material/filter geotextiles is required subsequent to approval.

5.1.5 The geotextiles shall be laid in a direction parallel to the centre line of the carriageway and jointing shall be by lapping only. Physical jointing is not permitted. The lap width shall be a minimum of 500mm at any location. Laps shall overlap in the direction of placing of the capping material.

5.1.6 Care shall be taken to avoid damaging the geotextiles on removal of any wrappings and during the installation process or at any other time when the Contractor is responsible for the Works. Any resulting damage, or any geotextile susceptible to UV damage is exposed to daylight for longer than the period specified in Clause 609, this shall be inspected by the Designer who will instruct whether or not the material is acceptable. The Designer may also conduct random inspections of any works involving geotextiles to determine the acceptability of materials.

5.1.7 The Contractor shall submit proposals for remedial work required for damaged geotextiles. Damaged lengths of geotextile shall be replaced, at the Contractor's expense, with new material unless the Designer authorises repair by an approved method.

5.1.8 Handling and laying of Geotextiles shall be such that the individual components of the Geotextiles, such as yarns, webs or layers, shall retain their intended orientations and relative positions with respect to one another.

5.1.9 The method of installation and positioning of the geotextile and the placing of the adjacent materials shall ensure that the geotextile is at all times in continuous contact with the surfaces to be separated without undue ripples or folds. The geotextile shall not be stretched across hollows or strained over humps. Care shall be taken to prevent damage to the geotextile from sharp stones or obstructions.

5.1.10 The procedures for cutting geotextiles shall not impair the procedures or functions of the geotextile and shall be approved in writing by the Designer.

5.1.11 The Contractor shall keep daily records of the geotextile and placing the contiguous material(s) being protected / separated. Copies of these records shall be submitted daily to the Designer.

5.1.12 The daily record shall include the following:

5.1.12.1 Date;

5.1.12.2 Area and location of geotextile installation;

5.1.12.3 Any variations from the Contract Drawings or schedules for major structures, ERAs or mainline widening earthworks;

5.1.12.4 Type of material being protected / separated;

5.1.12.5 Consignment reference of each roll or sheet;

5.1.12.6 Levels and positions of installed geotextile;

5.1.12.7 Details and locations of any damage to the geotextile;

5.1.12.8 Details and locations of any repairs; and

5.1.12.9 Any unforeseen conditions encountered and consequent action taken and obstructions and delays.

6. Appendix 6/6: Fill to structures and fill above structural Foundations

6.1 General

6.1.1 The backfill to structures shall be placed in accordance with the Contract Drawings. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

6.2 Material

6.2.1 Materials used for backfill to structures and fill above structural concrete foundations shall be in accordance with the Contract Drawings and be in accordance with Appendix 6/1 and Clause 610 and 611. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

7. Appendix 6/7: Sub- formation and Capping and Preparation and Surface Treatment of Formation

7.1 General

7.1.1 Details of the preparation and surface treatment of formation and sub-formation, including the typical thicknesses of the capping and sub-base to be used, are provided within the Series 700 Appendix and Contract Drawings. These drawings are for illustrative purposes only and show a sub-base only arrangement located onto formation. The Contractor will be required to determine the suitability of this proposal on site and if necessary alter the detail to suit the on-site conditions. Any changes to the formation / sub-formation arrangement shall be approved in advance by the Designer and the Contractor will provide all necessary calculations in support of his application.

7.1.2 The Contractor's particular attention is also drawn to Clauses 613 to 617.

7.1.3 If the on-site testing of the formation in relation to the CBR values as detailed in the relevant Appendix are found to be lower than expected, then the Contractor shall provide to the Designer proposals for a re-design of the relevant areas of road formation and sub-formation for their approval. This may include the requirement for a capping and sub-base design as opposed to the illustrative sub-base only design, in which case the relevant clauses in the MCHW Specification will be followed.

7.1.4 Preparation and surface treatment of formation and sub-formation shall be carried out only after completion of sub-grade drainage and unless otherwise agreed by the Designer immediately prior to laying capping or sub-base and shall be in accordance with Clause 616.

7.1.5 Should capping be required, it will be constructed in accordance with the relevant clauses and shall consist of one class of capping material throughout its depth laid in one or more layers of compacted thickness, or be formed of not more than two elements of different capping materials. Each element shall be formed of one or more layers of the same capping material, each of compacted thickness.

7.1.6 Sub-formation details are shown in Series 700 Contract Drawings.

7.1.7 Lime stabilisation should not to be used.

8. Appendix 6/8: (05/01) Topsoiling

8.1 General

8.1.1 Topsoiling details and thicknesses are shown on the Contract Drawings.

8.1.2 Topsoil is to be stripped off and stockpiled for re-use (pending acceptability testing) in accordance to Clause 602.10. Surplus or unacceptable materials shall be disposed of by the Contractor. The Contractor shall provide a method statement for the stripping and stockpiling of topsoil on-site to the Designer prior to the start of works.

8.1.3 Topsoil shall be stored separately from subsoil and other excavated materials. The depth to be stripped in each area shall be determined on site.

8.1.4 Topsoil shall be stored in mounds not exceeding 2m in height with maximum side slopes of 1(V):1.5(H).

8.1.5 Topsoil mounds to be stored for periods of greater than six months shall be seeded with a mix of slow growth grass seed.

8.1.6 Management of weeds that do appear shall be undertaken during the summer months, either by spraying to kill them or by mowing or strimming to prevent their seeds being shed

8.1.7 No stockpiles of Topsoil, or any other material, shall be stored within the root zone of mature trees or in areas where existing trees/habitats may be damaged, or where surface runoff to watercourses would be detrimental to water quality.

8.1.8 Imported Topsoil Class 5B is permitted where insufficient site derived quantities and quality are available.

8.1.9 Topsoil shall have all materials exceeding 50mm in size removed and disposed off-site in accordance to Appendix 6/2.

8.1.10 The requirements of Clause 618.3 apply.

8.1.11 Topsoil shall be in accordance with BS 4428.

8.1.12 Final Topsoil grading, preparation and seeding operations shall be carried out in accordance with the requirements of the Specification for Highway works, Series 3000 Landscape and Ecology, as applicable. Where hydraulic seeding is specified on Contract Drawings, it shall be carried out in accordance with Appendix 30/5.

8.1.13 Multiple handling of topsoil must be minimised. All Contractor method statements pertaining to the handling of soil shall comply with the Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. Where Contractor works render any existing Topsoil unsuitable, the Topsoil shall be replaced by the Contractor at his own cost.

9. Appendix 6/9

9.1 Earthwork Environmental Bunds

9.1.1 Clause 619 not required.

9.2 Landscape Areas

9.2.1 Landscape areas shall be constructed using Class 4 Landscape Fill in accordance with the slope height and gradient limits, to be provided in Design Fix 5.

9.2.2 Class 4 material shall be compacted in accordance with Clause 620 (2) unless directed by Clause 612.

9.2.3 Landscape areas shall be topsoiled in accordance with Appendix 6/8.

9.3 Strengthened Embankments

9.3.1 Strengthened embankments using geogrids are not required for this scheme.

10. Appendix 6/10 Ground Anchorages, Crib Walling and Gabions

10.1 Ground Anchorages

10.1.1 Not used.

10.2 Crib Walls

10.2.1 Not used.

10.3 Gabions

10.3.1 The location and details for gabions are shown in Contract Drawings.

10.3.2 The gabion mesh shall be manufactured from wire complying with BS EN 10218-2 & BS EN 10223-3 with a minimum core diameter of 2.7mm.

10.3.3 Selvedge steel wire shall be in accordance with BS EN 10218-2 and BS EN 10223-3 with a minimum diameter of 3.4mm.

10.3.4 Gabion baskets will be filled with Class 6G (Table 6/1)

10.3.5 Gabions over 1.5m in length will be fitted with diaphragms at 1m centres.

10.3.6 The wire used in the manufacture of the gabion shall have a tensile strength between 350 and 500 N/mm2 in accordance with BSEN 10223-3.Corrosion Protection: Zinc/Galfan galvanised 245g/m2 to BSEN 10244-2 Table 3; CLASS A.

10.3.7 Size of mesh opening will be 80mm and shall be hexagonal in shape. Joints points shall be flexible and consist of one and a half turns of wire.

10.3.8 Gabion Fill (Class 6G) shall not exceed a maximum size of 200mm, and the minimum size of fill shall not be less than the size of the mesh opening.

10.3.9 All joints and connections shall be formed with continuous 2.2mm Zinc or Galfan coated lacing wire and / or high tensile 3mm diameter Galfan coated ‘C’ rings.

10.3.10 Plastic geo-mesh is not permitted.

10.3.11 Gabion wall shall be founded on compacted Class 6N material as shown in the contract drawings

10.3.12 Gabion wall foundations shall be constructed on a formation layer comprising weather Mercia Mudstone strata and the suitability of the foundations shall be agreed under the supervision of a qualified geotechnical engineer on site.

10.3.13 Fill placed directly behind the gabion wall shall be well compacted Class 6N granular material and shall be benched into the existing earthwork material as shown in the contract drawings.

10.3.14 A geotextile layer shall be placed along the base and side of the gabion facing the Class 6N fill to prevent any fines entering the gabions as per clause 5.1.1 in Appendix 6/5.

10.4 Plastic Sheet pile Walls

10.4.1 Plastic sheet pile retaining walls may be used for low height retention in cuttings as shown on the Contract Drawings. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

10.4.2 The plastic sheet pile retaining wall is to be a composite PVC sheet pile with steel tubular inserts.

10.4.3 PVC sheet piles shall be 'MultiLock' Plastic Pile sections or equivalent.

10.4.4 The PVC sheet pile sections shall have a minimum section modulus of 175cm^3/m with a minimum modulus of elasticity at serviceability limit state of 2300MN/m^2.

10.4.5 The PVC sheet piles to be embedded not less than 0.5m below the finished ground level.

10.4.6 The product shall incorporate measures to resist degradation caused by UV light, de-icing materials, hydrocarbon spills and installation damage for a design life of 120years.

10.4.7 The grade of the steel tubular inserts shall be FeE235.

10.4.8 The minimum section modulus of the steel tube, number of posts per metre run, diameter, thickness, retained height, total and embedded length of steel posts shall be as shown on the Contract Drawings. In addition to the Contract Drawings, the Major Structures and ERAs Earthworks Schedule and the Mainline Widening Earthworks Schedules should be consulted.

10.4.9 The following piling details shall be recorded:-

10.4.9.1 Pile reference number;

10.4.9.2 Pile length;

10.4.9.3 Method of driving / type of hammer;

10.4.9.4 Date of driving;

10.4.9.5 Commencing surface level;

10.4.9.6 Depth driven;

10.4.9.7 Length of off-cuts;

10.4.9.8 Length of pile extensions; and

10.4.9.9 All information regarding interruptions, unexpected changes in driving characteristics, obstructions and times taken in overcoming them.

10.4.10 Where hard driving conditions exist, plastic sheet piles can be installed in a trench and backfilled with concrete.

10.4.11 Signed copies of the above records shall be supplied to the Designer on completion of the sheet piling at each site as detailed in the Works Information.

10.4.12 Where pre-augering is required as a method to facilitate sheet pile installation, the Contractor shall supply details of the proposed pre-augering plant and method and agree the method with the Designer prior to commencing.

11. Appendix 6/12: Instrumentation and monitoring

11.1 General

11.1.1 Monitoring instrumentation is not required for general earthwork widening.

11.1.2 All cutting excavations and foundations for embankments and structures shall be inspected by the Contractor and the Designer's geotechnical engineer or engineering geologist to confirm that ground conditions comply with those assumed in the design.

11.2 'Just in Time' Validation Ground Investigation

11.2.1 Ground investigations at selected infrastructure locations have been specified and can be found as an Addendum to Table 1/5/1 in Series 100 and in the Appendices of the Geotechnical Design Report.

11.2.1.1 Full time supervision from a geotechnical engineer or engineering geologist from the Designer on site shall be required to allow validation of the design following the 'Just in Time' validation ground investigation.

11.2.1.2 The Contractor shall employ the ground investigation Contractor as per Clause 9.2.1.1, and this shall be agreed with the Designer.

11.2.2 'Just in Time' validation ground investigation shall be completed a minimum four weeks before the construction of the foundations or retaining solution at each location.

11.2.3 The Contractor shall employ a full time ground investigation supervisor as part of the ground investigation works.

11.2.4 The Geotechnical Design Report and Appendix 1/5 provide more details relating to the 'Just in Time' validation GI.

12. Appendix 6/14: (11/04) Limiting Values for Pollution of Controlled Waters

12.1 General

12.1.1 The Contractor shall comply with all Local, National and European statutory guidelines and levels, and conform to all special requirements of the Environment Agency and DEFRA. This typically requires the use of environmental quality standards (EQS) and/or UK or EU drinking water standards (DWS).

12.1.2 Based upon the assessment criteria given in this Appendix, a soil can be classified as environmentally acceptable where the criteria for individual chemicals are not exceeded, or unacceptable (Class U1B), where criteria are exceeded.

12.1.3 Any material which exhibits gross visual evidence of contamination (e.g. visible evidence of hydrocarbons such as free product) is unacceptable.

12.1.4 Any soil that is deemed, by visual and olfactory observations and confirmed by the Designer and Environmental Specialist to be impacted by contaminants, should be sampled and submitted for leachate analysis to UKAS/MCERT accredited laboratories. The relevant chemicals of concern to be included in laboratory testing suites and Limiting Values for Class U1B soils are discussed in Appendix 6/2 and below within Table 6/14/1.

12.1.5 General testing requirements are as in Appendix 1/5 and Table 1/5/1.

12.1.6 The following limits apply to materials subjected to leaching tests:

Table 6/14/1 – SOIL LEACHATE: CLASS U1B LIMITING VALUES (µg/l)

Contaminant	Class U1B Limit Value (µg/l)	Criteria Source
pH	6 - 9	UK EQS All freshwater Annual Average
Arsenic	50	
Cadmium	5	
Mercury	1	
Boron	2000	
Iron	1000	
Naphthalene	10	
Benzene	30	
Toluene	50	
Xylene	30	
Cyanide	50	UK Surface Water (Abstraction for Drinking) DW2
Sulphate (SO4)	250,000	
Phenols	5	
Dissolved/Emulsified Hydrocarbons *	200	
Selenium	10	

Contaminant	Class U1B Limit Value (µg/l)	Criteria Source
Anthracene	0.4	EU EQS Maximum Allowable Concentration – Inland surface water
Benzo(a)pyrene	0.1	
Indeno(1,2,3-cd)pyrene	0.002	
Benzo(ghi)fluoranthene		
Benzo(k)fluoranthene	0.03	
Benzo(b)fluoranthene		

* TPH/EPH C10-C40

12.1.7 Table 6/14/1 is in accordance with:

12.1.7.1 UK Environmental Quality Standards. Available on Environment Agency Website;

12.1.7.2 The Surface Waters (Abstraction for Drinking) (Classification) Regulations 1996; and

12.1.7.3 EU Environmental Quality Standards. COM(2006) 397 Final: on environmental quality standards in the field of water policy and amending Directive 2000/60/EC.

13. Appendix 6/15: (11/04) Limiting Values for Harm to Human Health and the Environment

13.1 General

13.1.1 Chemical acceptance criteria will determine whether a material is environmentally acceptable for use in the scheme or, if it is to be classed as U1B / U2 unacceptable.

13.1.2 Based upon the assessment criteria given in this Appendix, a soil can be classified as environmentally acceptable where the criteria for individual chemicals are not exceeded, or unacceptable (Class U1B), where criteria are exceeded.

13.1.3 Imported materials will be chemically tested to demonstrate suitability for use at the intended location at a frequency of one test per 500m^3 subject to a minimum of three for each material from a distinct source. These tests will not exceed either leachate standard or soil standards in Tables 6/15/1 and 6/15/2 respectively.

13.1.4 The limits on the concentration of contaminants in a material which, if exceeded, may lead to a significant possibility of significant harm to human health or the environment are presented in Table 6/15/2.

13.1.5 If concentrations of chemicals within materials exceed the limits shown in the table given in Tables 6/15/1 and 6/15/2 then Quantitative Risk Assessment modelling shall be undertaken by the Contractor to determine whether or not it is appropriate to classify the material as contaminated as defined in the Environmental Protection Act 1990 Part IIA. The risk assessment shall be focused upon the materials being positioned at their final location in the permanent works, but shall also consider temporary conditions. This approach may restrict the locations where the material can be placed. Materials which exceed the limits shown and are subsequently classified as contaminated shall be classified as Class U1B (unless they are hazardous in which case they will be classified as U2).

13.1.6 Class U1B should be sent off-site to a licensed treatment facility prior to disposal.

13.1.7 It should be noted that these criteria do not affect the chemical acceptance criteria or testing for Topsoil. The Appendix 6/8 criteria are primarily based on the phytotoxicity of the Topsoil and are not designed to reduce the risk to controlled waters, human health or the environment.

13.1.8 The criteria presented in Tables 6/15/1 and 6/15/2 have been developed taking into account the concept of risk assessment and the definition of contamination, in accordance with Part 2A of the Environmental Protection Act (1990).

13.1.9 The criteria for the protection of human health are based on published Generic Assessment Criteria values (GACs) and Soil Guideline Values (SGV's), comprising of Category 4 Screening Levels and LQM/CIEH Suitable 4 Use Levels.

13.1.10 SGV's are published by DEFRA for a number of different contaminants for use with such risk assessment modelling procedures, such as CLEA. However, SGVs have not yet been issued for many contaminants, and in the absence of these LQM-GAC and LQM-GAC/CIEH values are used. For the majority of the determinants this is for assessment of long term risk however for cyanide, an acute risk limit is indicated.

13.1.11 LQM-GAC and LQM-GAC/CIEH values are used for the majority of the determinants this is for assessment of long term risk.

13.1.12 The above criteria have been selected due to Series NG 600 Earthworks Guidance stating: For general fills, the limiting values for harm to human health should normally be based on the 'commercial/industrial' end use category of guideline values, as there is a very low risk of exposure to the public from any contaminants in the fill. The appropriate category should be decided for each section or sub-section of the scheme.

Table 6/15/1 – CLASS U1B SOIL LEACHATE ACCEPTANCE CRITERIA

Determinant Criteria	Concentration (µg/l)	Source
pH	6 - 9	EQS for fresh water
Ammonia (as N)	0.5	UK drinking water standard 1989
Arsenic	10	UK drinking water standard 2000
Cadmium	5	UK drinking water standard 2000
Chromium (dissolved)	0.01	UK drinking water standard 2000
Cobalt	3	EQS for fresh water
Conductivity (µs/cm)	1000	EA Leachate Quality threshold value 2001
Lead (total)	25	UK drinking water standard 2000
Mercury	1	UK drinking water standard 2000
Selenium	10	UK drinking water standard 2000
Boron (total)	1000	UK drinking water standard 2000
Copper	2000	UK drinking water standard 2000
Nickel	20	UK drinking water standard 2000
Zinc	5000	UK drinking water standard 1989
Cyanide (free)	50	UK drinking water standard 2000
Sulphate (SO4)	250	UK drinking water standard 1989
Sulphide	0.25	EQS for fresh water
Phenol (total)	0.5	UK drinking water standard 1989
Iron	0.2	UK drinking water standard 1989
Chloride	250	UK drinking water standard 2000
PAHs (total)*	0.1	UK drinking water standard 2000
Methylbenzene	50	EQS for fresh water
Naphthalene	10	EQS for fresh water
Anthracene	0.02	EQS for freshwater
Benzo(a)pyrene	0.01	UK drinking water standard 2000
Benzene	1	UK drinking water standard 2000
Toluene extract	50	EQS for fresh water
Ethylbenzene	20	EQS for fresh water
Xylene	30	EQS for freshwater

* Sum of 4 PAHs (benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1/2/3-cd)pyrene and benzo(g/h/i)perylene.

Table 6/15/2 – CLASS U1B SOIL ACCEPTANCE CRITERIA

Determinant Criteria	Concentration (mg/kg)*	Criteria Source
pH	Within range - above 6 and below 9	Commercial SSV
Phenols (total)	760	S4UL's
Naphthalene	190 (76.4) [sol]	S4UL's
Acenaphthene	84000 (57) [sol]	S4UL's
Anthracene	520000	S4UL's
Benzene	27	S4UL's
Benzo(a)anthracene	170	S4UL's
Benzo(a)pyrene	35	S4UL's
Benzo(bk)fluoranthene	44	S4UL's
Benzo(g,h,i)perylene	3900	S4UL's
Benzo(k)fluoranthene	1200	S4UL's
Chrysene	350	S4UL's
Dibenzo(a,h)anthracene	3.5	S4UL's
Ethylbenzene	5700 (518)	S4UL's
Fluoranthene	23000	S4UL's
Fluorene	63000 (30.9) [sol]	S4UL's
Indeno(1,2,3,cd) pyrene	500	S4UL's
Pyrene	54,000	S4UL's
TPH Aromatic (C5 – C7) (benzene)	26,000 (1220) [sol]	S4UL's
TPH Aromatic (C7 – C8) (toluene)	56000 (869) [vap]	S4UL's
TPH Aromatic (C8 – C10)	3500 (613) [vap]	S4UL's
TPH Aromatic (C10 – C12)	16000 (364) [sol]	S4UL's
TPH Aromatic (C12 – C16)	36000 (169) [sol]	S4UL's
TPH Aromatic (C16 – C21)	28000	S4UL's
TPH Aromatic (C21 – C35)	28000	S4UL's
TPH Aliphatic (C5 – C6)	3,400 (304) [sol]	S4UL's
TPH Aliphatic (C6 – C8)	7800 (144) [sol]	S4UL's
TPH Aliphatic (C8 – C10)	2000 (78) [sol]	S4UL's
TPH Aliphatic (C10 – C12)	9700 (48) [sol]	S4UL's
TPH Aliphatic (C12 – C16)	59000 (24)) [sol]	S4UL's
TPH Aliphatic (C16 – C35)	1600000	S4UL's
Toluene	56000	S4UL's
Xylene	5900	S4UL's
Free Cyanide	13,900	SGV
Arsenic	640.00	S4UL's
Cadmium	410	S4UL's
Chromium(III) (Chromium VI)	8600 (49)	S4UL's (C4SL)

Lead	1330.00	C4SL
Mercury	120.00	S4UL's
Nickel	980.00	S4UL's
Copper	68000.00	S4UL's
Zinc	730000.00	S4UL's
Selenium	12000.00	S4UL's
Asbestos Screening	Absence of material, discernible by laboratory methods	

Key

[sol] GAC presented exceeds the solubility saturation limit, which is presented in brackets

[vap] GAC presented exceed the vapour saturation limit, which is presented in brackets

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Notes

GACs are rounded to 2 significant figures

GACs assume that free phase contamination is not present

GACs based on a sub-surface soil to indoor air correction factor of 10 for TPH and 1 for PAH

GACs above assume 1% Soil Organic Matter Content

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Appendix M. Series 1600 Specification

highways england

amey ARUP

06 Product Development & Production

Preconstruction and Construction services

Smart Motorways Programme

M1 Junction 23a to 25

Volume 2 Works Information

Specification Appendices Series 1600 PILING AND EMBEDDED RETAINING WALLS

April 2017

Notice

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Amey Arup assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

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1. Appendix 16/1: General Requirements for Piling and Embedded Retaining Walls

1.1. General requirements for piling and embedded retaining walls

1.1.1 The foundation for the proposed gantries will be constructed using bored cast in place piling techniques in accordance with the Works Information. List of the location, number, length and diameter of the proposed piles are detailed in the Contract Drawings and Major Structures and ERAs Earthworks Schedule and Mainline Widening Earthworks Schedules included in the Geotechnical Design Report.

1.1.2 Piling shall be undertaken in accordance with the Series 1600 Appendices, Manual of Contract Documents for Highway Works, Volume 1 Specification for Highway Works, Series 1600 (SHW) and relevant notes for guidance series NG 1600 and BS EN 1536:2010 Execution of Special Geotechnical Works – Bored Piles. For any items note covered by these documents, the Contractor shall comply with the current edition of the 'Specification for Piling and Embedded Retaining Walls' produced by the Institution of Civil Engineers (SPREW, 2007) unless specified otherwise in this section.

1.1.3 Prior to the commencement of work, records of drains, cables, mains and other services shall be obtained by the Contractor to ensure that the works will not cause damage to these services.

1.1.4 Notify the Designer and service authority or owner of any damage.

1.1.5 Make all arrangements for repair to the satisfaction of the Designer and service authority or owner and bear any associated costs.

1.1.6 Make good any damage arising from piling works and leave clean and in working order at completion.

1.1.7 The piling Contractor shall submit a comprehensive method statement for the approval of the Designer. It shall include details of the Method of piling, details of the plant and monitoring equipment to be used, any testing pre- and post-installation of pile, Quality Assurance and Health and Safety procedures.

1.1.8 The piling Contractor shall keep records for the installation of each pile and shall submit two signed copies of these records to the Designer not later than 1200hours of the next working day after the pile was installed. The signed records will form a record of the work.

1.1.9 The piling Contractor should undertake the removal of redundant foundation and/or other obstructions where they will clash with pile locations and replace with imported granular fill before construction of the piles.

1.1.10 Any unexpected conditions will be noted in these records, data to be recorded as follows:

1.1.10.1 Contract;

1.1.10.2 Pile reference number (location);

1.1.10.3 Pile type;

1.1.10.4 Nominal cross-sectional dimensions of pile;

1.1.10.5 Standing groundwater level from direct observation or given ground investigation data;

1.1.10.6 Date and time of pile installation;

1.1.10.7 Ground level at pile position at commencement of installation of pile (commencing surface);

1.1.10.8 Working level on which piling base machine stands;

1.1.10.9 Depth from ground level at the pile position to toe;

1.1.10.10 Toe level;

1.1.10.11 Pile head level as constructed;

1.1.10.12 Pile cut-off level;

1.1.10.13 All information regarding obstruction delays and other interruptions to the sequence of work;

1.1.10.14 The co-ordinates of pile alignment installed;

1.1.10.15 Details of plant used to form pile including plant reference number; and

1.1.10.16 Verticality of piles;

1.1.11 The piling Contractor shall report to the Designer details of any piles that are installed out of tolerance not later than noon of the next working day and shall obtain the Designer's approval for any remedial work that is required.

1.1.12 Construction tolerances are provided in appendix 16/3.

1.1.13 The piling Contractor shall inform the Designer each day of the intended programme of piling for the following day and shall give adequate notice of any intention to work outside normal hours and public holidays.

1.1.14 Supervision of the construction works and certification will be the responsibility of the Main Contractor.

1.1.15 Setting out of the piles shall be the responsibility of the Main Contractor. Immediately prior to construction of the piles the positions shall be checked by the Main Contractor.

1.1.16 All works shall be carried out in accordance with the Construction Design & Management (CDM) Regulations 2015. All plant and equipment must be maintained and operated in a safe manner. It will be the Contractors responsibility to implement and ensure all works are with accordance CDM Regulations 2015.

1.1.17 The Contractor shall be responsible for the design, construction and maintenance for the duration of the piling and testing works, a working platform of sufficient strength and thickness for all plant proposed for use on the site.

1.1.18 The piling Contractor shall provide a full-time supervisor on the site to be responsible for the construction aspects of the works. The supervisor shall be experienced in this type of construction necessitated by the Contract. A CV of the Supervisor shall be submitted to the Designer prior to the commencement of the works. The Supervisor shall not be removed from the works without the Designer being notified in advance with at least one week notice.

1.1.19 The piling Contractor shall submit one week prior to the commencement of the works the Quality Plan for the works. Subsequent revisions, additions or amendments shall be submitted prior to their implementation. Quality Assurance and Quality Control documentation shall be made available on request.

1.1.20 The piling Contractor shall construct the piles of the types and dimensions, having the qualities of materials and workmanship, and in the locations specified. Before commencement of the installation of the piles, the Main Contractor will provide the piling Contractor with a numbered schedule of pile elements. The piling Contractor shall confirm in the tender that the method of working, equipment and programme are compatible with the installation of the piles elements to the required penetrations in the ground conditions indicated by the results of ground investigation data. The reliance being placed on the piling Contractor shall be deemed to be in respect of the piling Contractor's skill, care and diligence as an experienced piling Contractor executing workmanship and not in respect of any design expertise the piling Contractor may possess.

1.1.21 The stock piling and disposal of the pile arisings is the responsibility of the Main Contractor. Any disposal of material should be undertaken in accordance with the methodology set out in Appendix 6/2 in the Series 600 Earthworks Specification.

2. Appendix 16/3: Bored Cast-In-Place Piles

2.1 General

2.1.1 All works shall be with accordance of BS EN 1536:2010+A1:2015 Execution of Special Geotechnical Works – Bored Piles.

2.1.2 Full details of the pile requirements are shown in the Contract Drawings and Major Structures and ERAs Earthworks Schedule and Mainline Widening Earthworks Schedules included in the Geotechnical Design Report.

2.1.3 The use of a support fluid is permitted to maintain the stability of the pile bores, details of which can be found in Appendix 16/18.

2.1.4 Cover to pile reinforcement shall be 75mm unless shown otherwise on the design drawings or otherwise specified in Appendix 17/1.

2.1.5 All piles shall be constructed to the toe levels indicated on the Contract Drawings and Major Structures and ERAs Earthworks Schedule and Mainline Widening Earthworks Schedules included in the Geotechnical Design Report.

2.1.6 Piles to be tested as follows:-

2.1.6.1 Integrity Test: All piles to be tested for integrity in accordance with Appendix 16/8.

2.1.6.2 Working pile tests: Maintained Load Tests shall be carried out in accordance with Appendix 16/9.

2.1.7 Details of the grade of concrete for the piles are presented in Appendix 17/1.

2.1.8 Reinforcement: Details of the grades and cover to reinforcement shall be as identified on the Contract Drawings and shall be as specified in Appendix 17/1.

2.1.9 Copies of grouting records will be provided.

2.1.10 All testing of concrete shall be carried out as specified in Appendix 1/5 and Table 1/5/1.

2.1.11 Lateral Pile tolerance to be accepted is ± 5mm.

3. Appendix 16/8: Non-Destructive Methods for Testing Piles

3.1 Integrity Testing

3.1.1 Integrity tests are to confirm that the required length of pile has been obtained, that the pile is monolithic, and that the required density and the full cross-sectional area of concrete as shown on the Contract Drawings and Major Structures and ERAs Earthworks Schedule and Mainline Widening Earthworks Schedules and Minor Structures Schedule included in the Geotechnical Design Report has been maintained throughout its length.

3.2 The method of the test to be carried out

3.2.1 All piles shall be tested by using the sonic echo or transient response method.

3.2.2 The tests shall provide the following information:

3.2.2.1 Depth measurement to pile toe/defect

3.2.2.2 Pile head stiffness

3.2.2.3 Pile mobility (i.e. section & concrete properties)

3.2.2.4 Pile impedance profiles

3.3 Number, type and location of piles to be tested

3.3.1 Integrity testing shall be undertaken on every bored cast-in-place pile.

3.4 Stages in programme of works

3.4.1 Testing shall be carried out in the period between pile installation and pile cap casting.

3.4.2 Pile integrity testing shall be undertaken when the cement has been allowed to cure for a minimum of seven days.

3.4.3 The pile head shall be prepared in accordance with 3.5.

3.5 Preparation of pile head for testing using dynamic impulse shock method

3.5.1 The pile head of vertical piles shall be prepared by removing all loose material and debris to expose sound concrete over an approximately horizontal top surface, and be kept free of standing water.

3.6 Test results and findings

3.6.1 Testing shall only be undertaken by an experienced testing organisation, independent of the piling Contractor and approved by the Designer.

3.6.2 Preliminary results of the tests shall be submitted to the Designer within 24 hours of carrying out the tests. The Contractor shall within seven days of the completion of integrity testing of piles at each gantry site submit to the Designer a report on the integrity of each pile.

3.7 Sonic coring

3.7.1 Not used.

3.8 Dynamic Testing of Piles

3.8.1 Not used.

4. Appendix 16/9: Static Load Testing of Piles

4.1 General

4.1.1 The Contractor shall prepare a methodology for the static load testing, which shall be agreed with the Designer 30 days prior the pile testing.

4.1.2 Testing shall comply with the current edition of SPREW unless otherwise specified.

4.2 Particular requirements for static load testing of piles:

4.2.1 Piles to be tested are bored cast-in-place piles and steel driven piles. Where sacrificial pile testing is undertaken the piles shall also be of the same type and design for the specific ground conditions. Loads shall be equivalent to those imposed by the site specific structures.

4.2.2 Piles shall be tested by vertical extended proof load test to ensure the structural and geotechnical soundness of the pile, to predict likely deflections of working piles and for possible re-design.

4.3 Preliminary Pile Tests

4.3.1 Preliminary pile tests shall be undertaken on the following number of piles:

4.3.1.1 4 No. preliminary pile tests (on non-working piles) at 4 locations throughout the scheme in varying ground conditions.

4.3.2 Preparation of pile heads for working load compression tests shall be in accordance with Clause 1609.6.

4.3.3 All tests for preliminary piles shall be carried out in three cycles for loading and unloading. The first cycle shall lad test piles to DVL, the second cycle shall load the test pile to DVL+(0.5xSWL) and the third cycle shall load the pile to DVL+SWL.

4.3.4 Construction detail and plant shall be the same proposed for the main works.

4.3.5 Contractor shall report any unexpected ground conditions observed during drilling.

4.3.6 The Contractor shall allow at least 2 weeks between pile installation and testing allowing for cement curing.

4.3.7 Temporary works shall be removed following preliminary pile testing.

4.4 Working Pile Tests

4.4.1 Working pile tests shall be carried out on the following number of piles:

4.4.1.1 At gantry locations – 1 No. working pile per gantry location.

4.4.1.2 Noise barrier piling – Minimum 1 No. per barrier location or 1 per 100m length whichever is greater.

4.4.1.3 Minor structures – 1% of total pile numbers.

4.4.2 The working pile will be tested to 1.5 times of the representative load (Design Load). The maximum test load, together with the test and reaction pile lengths are summarised in Table 16/9/1 below. Also shown in the table is the estimated permitted settlement at 150% of the representative load.

Table 16/9/1 – Working Pile Test Details - Gantries

Gantry Ref	Test Pile Location	Representative Load (kN)	Maximum Test Load (kN)	Test Pile Length (m)	Permitted Settlement at 150% Representative Load (mm)
101	TBC	606	909	11	15
112	TBC	1475	2213	28	18
202	TBC	501	752	14	15
203	TBC	1137	1706	25	20
204	TBC	1475	2213	19	17
301	TBC	770	1155	13	15
302	TBC	1264	1896	20	18
303	TBC	1146	1719	20	20
304	TBC	1517	2276	12.5	15
305	TBC	625	938	9	15
307	TBC	646	969	15	15
308	TBC	1214	1821	26	20
309	TBC	396	594	12	15
310	TBC	539	809	6	15
311	TBC	433	650	15.5	15
312	TBC	529	794	16	15
313	TBC	273	410	8	15
314	TBC	638	957	11	15
315	TBC	1222	1833	25	20
316	TBC	678	1017	10.5	15
318	TBC	487	731	13	17
319	TBC	1133	1700	25	20
320	TBC	1778	2667	12.5	15
321	TBC	510	765	15	17
322	TBC	1009	1514	15	15
323	TBC	398	597	6	15
324	TBC	434	651	6	15
326	TBC	741	1112	9	18

4.4.3 The maximum load applied shall be 150% of the representative load. The loading and unloading cycle are summarised in Table 16/9/2:

Table 16/9/2 – Loading Cycle

Load	Minimum Time of Holding Load
25% of Representative Load – 25% DVL	30 minutes
50% of Representative Load – 50% DVL	30 minutes
75% of Representative Load – 75% DVL	30 minutes
100% of Representative Load – 100% DVL	6 hours
75% of Representative Load - 75% DVL	10 minutes
50% of Representative Load – 50% DVL	10 minutes
25% of Representative Load – 25% DVL	10 minutes
0	1 hour
100% of Representative Load – 100% DVL	1 hour
100% of Representative Load – 100% DVL + 25%SWL	1 hour
100% of Representative Load – 100% DVL + 50%SWL	6 hours
100% of Representative Load – 100% DVL + 25%SWL	10 minutes
100% of Representative Load – 100% DVL	10 minutes
75% of Representative Load - 75% DVL	10 minutes
50% of Representative Load – 50% DVL	10 minutes
25% of Representative Load – 25% DVL	10 minutes
0	1 hour

Notes:

The Design Verification Load (DVL) is equal to the representative load.

The ICE Specification for Piling and Embedded Retaining Walls 2nd Edition indicates that Specified Working Load (SWL) is the unfactored load, which is similar to the Representative Action defined in BS EN 1990.

4.4.4 Following each application of an increment of load, the load shall be maintained at the specified value for not less than the hold periods indicated above until the measured rate of settlement in a period of 30minutes is less than 0.5% of the current cumulative settlement which has occurred, subject to a minimum settlement rate of 0.05mm in 30minutes. The rate of settlement shall be calculated from the slope of the line obtained by plotting values of settlement versus time and drawing a smooth curve through the points.

4.4.5 Load Test Report:

4.4.5.1 In addition, the load test report shall include the information listed below in accordance with BS EN 1997-1:2004.

- Description of the site:
  - The ground conditions with reference to ground investigations;
  - The pile type including details of the working piles used as reaction piles, as defined on the Contract Drawings and Major Structures and ERAs Earthworks Schedule and Mainline Widening Earthworks Schedules included in the Geotechnical Design Report;
  - Description of the loading and measuring apparatus and the reaction system;
  - Calibration documents for the load cells, jacks and gauges;
  - The installation records of the test piles;
  - Photographic records of the pile and the test site;
  - Test results in numerical form;
  - Time-displacement plots for each applied load when a step loading procedure is used; and
  - Reasons for any departures from the above requirements.

4.4.6 Special requirement for pile installation and testing

4.4.6.1 The work shall be carried out in accordance with a method statement which should be approved by the Designer. The method statement shall detail the pile testing equipment, arrangement, form of the test records and any temporary works required. The Contractor shall submit the document at least five days prior to testing.

4.4.6.2 Any working piles used as reaction piles shall be monitored during static load testing. Working reaction piles shall not uplift by more than half specified permissible settlement at working load. Where working piles are used as reaction piles the movement shall be measured and recorded to within an accuracy of 0.5mm.

4.4.7 The pile tests shall comply with the following:

4.4.7.1 Testing shall only be undertaken by an experienced testing organisation and approved by the Designer.

4.4.7.2 All the main items of the testing equipment shall be approved by the Designer.

4.4.7.3 The equipment shall be robust for use on this scheme.

4.4.7.4 If a test pile is deemed to have failed the test load then the Designer shall be notified and the pile shall be re-designed based on the results of the pile tests.

4.4.7.5 Where the working pile test requires reaction piles, the temporary reaction piles will be designed by the Contractor.

4.4.7.6 The pile shall be tested when the concrete strength of pile has developed at least twice the stress at maximum test load and the pile concrete is at least seven days old. The compressive strength of the concrete at seven days shall be verified by laboratory testing of cube samples.

4.4.7.7 Temporary works shall be designed by the Contractor and detailed in the method statement which should be approved by the Designer.

4.4.7.8 Any temporary reaction piles shall be cut off below ground level and all debris shall be removed. The ground shall be made good to the original commencing.

4.4.8 Special requirements for the application of lateral load to piles surface.

4.4.8.1 Not Used.

4.4.9 Details of work to be carried out to the test pile cap or head at the completion of a test

4.4.9.1 On the completion a working pile test, the test pile head shall be prepared as required by the Specification and left in a state ready for incorporation into the structure.

5. Appendix 16/15: Steel Sheet Piles

5.1 General

5.1.1 Steel sheet piles shall be 'U Pile Sections' or equivalent as shown on the Contract Drawings.

5.1.2 The grade of steel shall be: EN 10248 (1996) as shown on the Contract Drawings.

5.1.3 The minimum section modulus, toe level and pile length required at each site shall be as detailed in the Contract Drawings and Major Structures and ERAs Earthworks Schedule and Mainline Widening Earthworks Schedules included in the Geotechnical Design Report.

5.1.4 The following piling details shall be recorded:

5.1.4.1 Gantry site and pile reference number;

5.1.4.2 Pile length;

5.1.4.3 Type of hammer;

5.1.4.4 Date of driving;

5.1.4.5 Commencing surface level;

5.1.4.6 Depth driven;

5.1.4.7 Length of off-cuts;

5.1.4.8 Length of pile extensions; and

5.1.4.9 All information regarding interruptions, unexpected changes in driving characteristics, obstructions and times taken in overcoming them.

5.1.5 Signed copies of the above records shall be supplied to the Designer on completion of the sheet piling at each site as detailed in the Works Information.

5.1.6 Where pre-augering is required as a method to facilitate sheet pile installation, the Contractor shall supply details of the proposed pre-augering plant and method.

5.1.7 Sheet pile capping beams shall be constructed of steel as outlined on the Contract drawings.

5.1.8 A Kee Klamp (or similar) pedestrian rail shall be installed on capping beam as outlined on the Contract drawings.

5.1.9 The sheet pile interlocks are to receive a layer of hot applied bituminous product.

5.1.10 Composition:

5.1.10.1 Bituminous polymer filler;

5.1.10.2 Density at 25°C: 1.38 – 1.48 (ASTM D70);

5.1.10.3 Softening point: ~ 90°C (ASTM D36); and

5.1.10.4 Colour: Black brown.

5.1.11 Conditions of application of the bituminous product:

5.1.11.1 Application on a surface covered with standing water is to be avoided;

5.1.11.2 Application on damp metal (dew point) is to be avoided as far as possible;

5.1.11.3 Application on metal is to be between 10°C and +70°C;

5.1.11.4 Hardening in rain; and

5.1.11.5 Drying under UV light.

5.1.12 The bituminous product shall have the following durability:

5.1.12.1 Water with pH 3.5 to 11.5: excellent;

5.1.12.2 Sea water: excellent;

5.1.12.3 Mineral oil: low;

5.1.12.4 Petrol: very low; and

5.1.12.5 Crude oil: very low.

6. Appendix 16/18: Support Fluid

6.1 General

6.1.1 Requirements for details of support fluid, including any minimum material testing requirements or environmental restrictions on use.

6.1.1.1 The use of bentonite or an alternative support fluid is permitted to maintain the stability of the pile bores.

6.1.1.2 The use of support fluid may be limited where sites are considered to be environmentally sensitive (source protection zones, watercourses etc.)

6.1.2 Requirements for and frequency of testing water not available from a public supply, if required.

6.1.2.1 Not Envisaged.

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See Bookmarks for contents of this report.

Appendix 5 : Geotechnical Risk Register

Risk Classification and Required Action

Likelihood		Severity				
		1	2	3	4	5
		Minor	Moderate	Serious	Major	Catastrophic
1	Extremely unlikely	1	2	3	4	5
2	Unlikely	2	4	6	8	10
3	Likely	3	6	9	12	15
4	Extremely likely	4	8	12	16	20
5	Almost certain	5	10	15	20	25

Risk Classification	
Low (1-8)	Ensure assumed control measures are maintained and reviewed as necessary.
Medium (9-19)	Additional control measures are needed to reduce the risk rating to a level that is equivalent to a test of "reasonably required" for.
High (20-25)	Activity not permitted. Hazard to be avoided or risk to be reduced to tolerable level.

The risk classification is the product of the likelihood and the severity

Potential Severity of Harm Occurring		
1	Minor	Minor damage or loss - (no human injury)
2	Moderate	Moderate damage or loss - (slight injury or illness)
3	Serious	Substantial damage or loss - (Serious injury or illness)
4	Major	Major damage or loss - (Fatal injury)
5	Catastrophic	Catastrophic loss or damage - (Multiple fatalities)

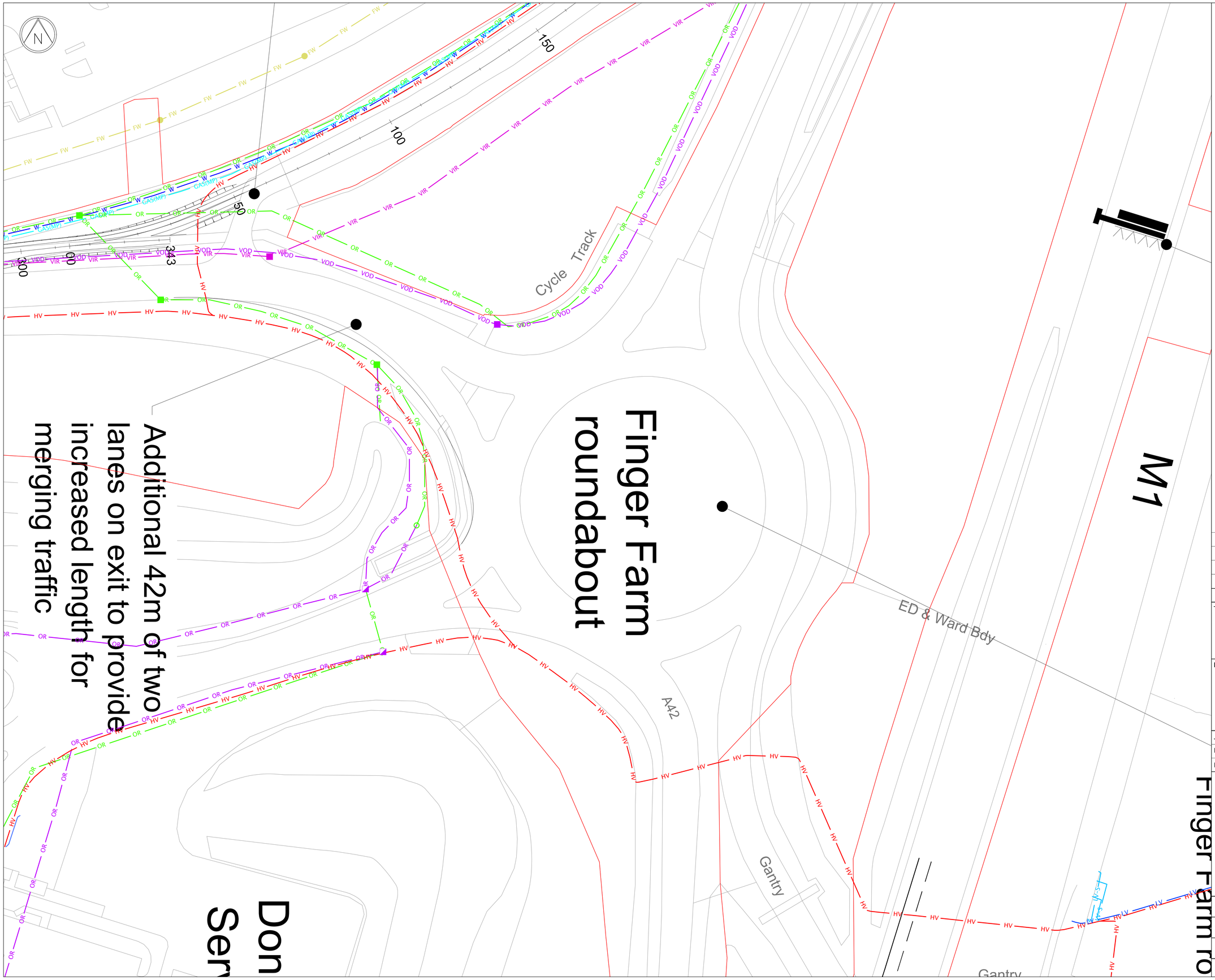
The purpose of the register is to provide an assessment of the risk to the project posed by common ground related problems and identify suitable mitigation measures to control the risk to an acceptable level. The risk register will be developed and refined as the geotechnical design and assessment progresses such that the register will allow the management of the geotechnical risks.

The list of hazards identified in this Geotechnical Risk Register is non-exhaustive and has been selected on specific critical hazards that are relevant to this scheme having regard to health and safety, environmental, works program and cost considerations. The degree of risk is determined by combining the likelihood of the hazard occurring and the severity of its Impact: Risk = Likelihood x Severity that the hazard and associated mitigation will cause if it occurs. The scale against which the likelihood and severity are measured, and the resulting degree of risk determined, are presented below. The register is a live document that will be updated as the project develops to reflect additional data and experience.

No	Hazard	Consequence	Risk Owner	Likelihood	Severity	Risk	Mitigation	Likelihood	Severity	Risk
1	Ground conditions on site vary from those considered in the design.	Foundation depth may be over cautious and difficult to install or under-cautious leading to potential instability.	Designer	3	3	9	PSSR to determine scope of ground investigation required.	1	3	4
2	Working near live highway / footway / cycleway	Potential danger to traffic	Contractor	2	4	8	Adopt a safe system of work.	1	4	4
3	Underground services / utilities	Damage to utilities could pose a potential danger to operatives. Inconvenience to utility customers. Delays to programme and reputational damage.	Contractor	3	4	12	Service plans to be consulted and services to be drawn on location-specific plans and section drawings. Services to be traced on site. Standard good site practice to be adopted.	1	4	4
4	Quality of fill for new earthworks	Could lead to slope instability or other problems. Additional cost Delays to construction	Designer, Contractor	4	3	12	Fill is to be site-won from the development area where possible. Existing ground investigation to be reviewed and more undertaken. Assessment required to include suitability for re-use as fill. If ground conditions in areas of cut are expected to be soft and waterlogged, modification of this material may be required to make it suitable for re use as fill.	2	3	6
5	Variable existing fill	Variability of existing M69 embankment fill (1970s) leading to localised variation in slope stability and settlement relating to new buildouts or cuttings.	Designer, Contractor	2	2	4	Geotechnical focussed ground investigation to assess conditions at locations of key proposals. Design to consider potential variation in existing fill. Contractor to identify unexpected ground conditions if encountered on site.	1	2	2

No	Hazard	Consequence	Risk Owner	Likelihood	Severity	Risk	Mitigation	Likelihood	Severity	Risk
6	Groundwater impacting geotechnical performance of new works over the anticipated design life of 120 years	Potential for fluctuating / increasing groundwater levels due to climate change or other variables to impact on long term performance of structures / earthworks.	Designer, Contractor	2	3	6	Geotechnical design to include sensitivity analysis on groundwater levels/conditions. Contractor to consider drainage performance during construction sequencing.	1	3	3
7	Flood Risk	Potential for surface water and groundwater flooding in cuttings and at the toe of new and existing embankments.	Designer, Contractor, Asset Owner	4	3	12	Design to consider risk from flooding and localised mitigation measures to improve or maintain resilience of the asset.	2	3	6
8	Temporary Works or Retaining walls	Collapse of parts of the proposed works or existing infrastructure if not done correctly.	Contractor	3	4	12	To be considered further at design and construction stages. Temporary Works designs and implementation to be undertaken by suitably qualified engineers / contractor	1	4	4
9	Foundations for overbridge	Inadequate depth of GI requiring additional GI	Designer, Contractor	4	4	16	To be considered further at design. Design solutions to be confirmed prior to GI being undertaken	1	4	4

Appendix 6: Service Drawings



LEGEND

CADENT GAS

- Existing U/G MP Mains — GAS(MP)

NATIONAL GRID ELECTRICITY DISTRIBUTION

- Existing U/G LV Cable — LV
- Existing U/G Service Cable — LV-S
- Existing U/G HV Cable — HV

OPENREACH

- U/G Plant — OR
- Joint Box
- U/G Plant - Inferred — OR
- Joint Box - Inferred

SEVERN TRENT WATER - CLEAN

- Water Main — W

SEVERN TRENT WATER - SEWER

- Public Foul Gravity/ Lateral Drain — FW

VIRGIN MEDIA

- Duct — VIR
- Chamber

VODAFONE

- Existing Duct (Owned) — VOD
- Chamber

ISSUE	DATE	REVISION DETAILS	DRN	CHK'D
C	20/08/25	Background Updated	JLR	-
B	19/12/24	Background Updated	JLR	-
A	30/09/24	Background Updated	JLR	-
Ist	06/08/24	1st Issue	JLR	-

Title

EAST MIDLANDS GATEWAY
(PHASE 2)
FINGER FARM ROUNDABOUT

Drawing

EXISTING UTILITY
COMPOSITE DRAWING

Job No.	UC24010	Date	AUGUST 2024
Drawn	JLR	Checked	-
Design	-	Appd	-

utilityconnections

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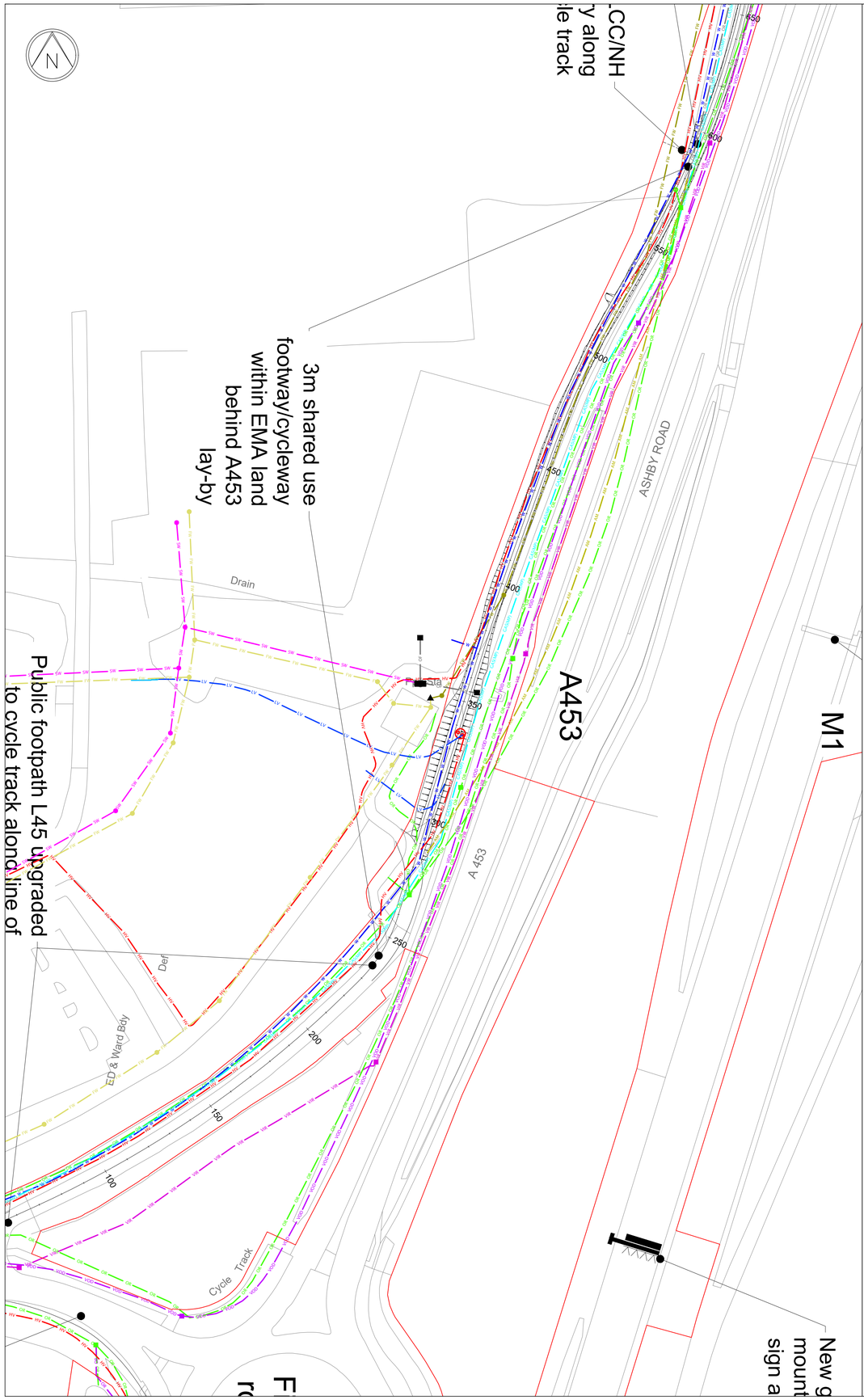
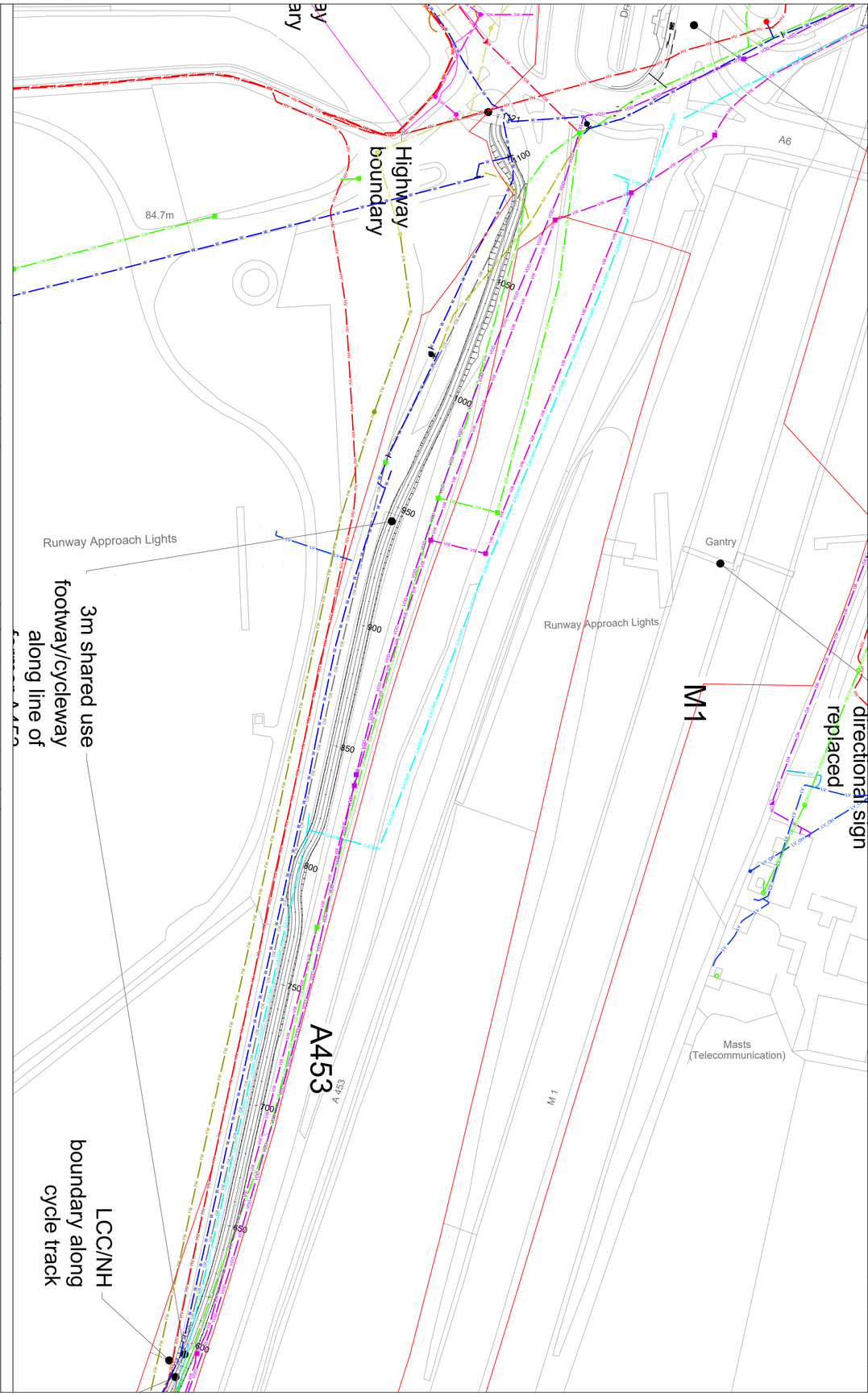
DRAWING No.	4069-UCL-DR-MU-FEA-001
STATUS	FOR APPROVAL





LEGEND

CADENT GAS

- Existing U/G MP Mains

NATIONAL GRID ELECTRICITY DISTRIBUTION

- Existing U/G LV Cable
- Existing U/G Service Cable
- Existing U/G HV Cable
- Existing Overhead LV Cable
- Existing Overhead HV Cable

OPENREACH

- U/G Plant
- Joint Box
- Pole
- U/G Plant – Planned
- Joint Box – Planned
- U/G Plant – Inferred
- Joint Box – Inferred
- U/G Plant – Duct
- Overhead Plant

SEVERN TRENT WATER – CLEAN

- Water Main
- Abandoned Main
- Hydrant
- Wash Out
- Valve

SEVERN TRENT WATER – SEWER

- Public Foul Gravity/ Lateral Drain
- Private Surface Gravity/ Lateral Drain
- Pressure Public Foul
- Overflow Pipe

VIRGIN MEDIA

- Duct
- Chamber

VODAFONE

- Existing Duct (Owned)
- Chamber

ISSUE	DATE	REVISION DETAILS	DRN	CHK'D
C	20/08/25	Background Updated	JLR	-
B	19/12/24	Background Updated	JLR	-
A	30/09/24	Background Updated	JLR	-
Ist	06/08/24	1st Issue	JLR	-

Title

EAST MIDLANDS GATEWAY
(PHASE 2)
A453 FOOTWAY/CYCLEWAY LINK

Drawing

EXISTING UTILITY
COMPOSITE DRAWING

Job No.	UC24010	Date	AUGUST 2024
Drawn	JLR	Checked	-
Design	-	Appd	-

utilityconnections

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CLIENT	-
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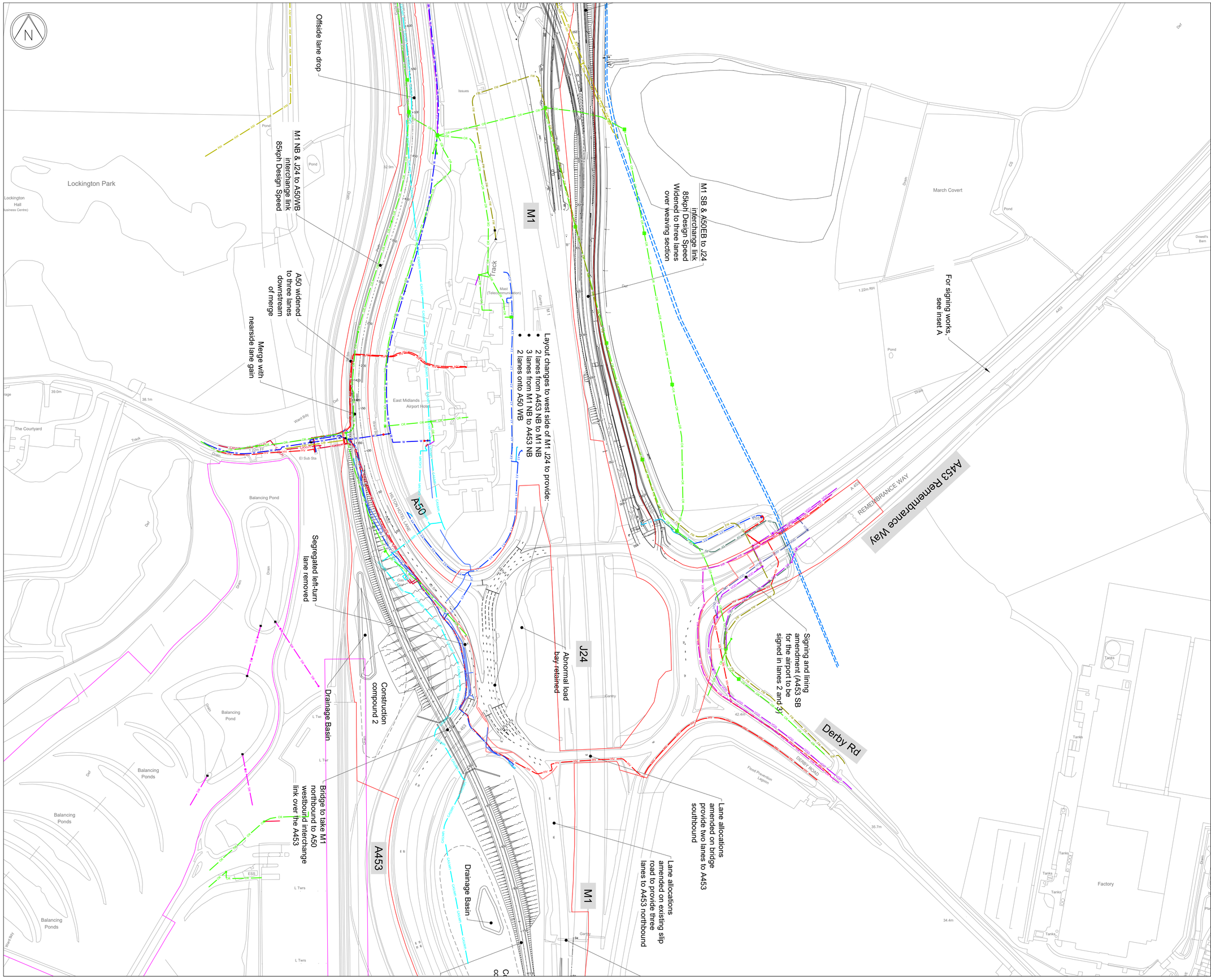
DRAWING No.	4069-UCL-DR-MU-FEA-001
STATUS	FOR APPROVAL



LEGEND

CADENT GAS

Existing U/G LP Mains	GAS(LP)
Existing U/G MP Mains	

NATIONAL GRID ELECTRICITY DISTRIBUTION

Existing U/G LV Cable	LV
Existing U/G Service Cable	LV-S
Existing U/G HV Cable	HV
Existing U/G LV Cable OOU	
Existing U/G HV Cable OOU	

OPENREACH

U/G Plant	OR
Joint Box	
Manhole	
Pole	
Cabinet	
U/G Plant - Inferred	OR
Joint Box - Inferred	

SEVERN TRENT WATER - CLEAN

Water Main	W
Abandoned Main	AM
Hydrant	
Wash Out	
Valve	
Aqueduct	

SEVERN TRENT WATER - SEWER

Public Foul Gravity/ Lateral Drain	FW
Pressure Public Foul	FW
Private Surface Gravity/ Lateral Drain	SW
Abandoned Sewer	AS

VIRGIN MEDIA

Duct	VIR

VODAFONE

Owned Route - (Active)	VOD
Owned Route - (Abandoned)	VOD
Chamber (Active)	
Chamber (Abandoned)	

ISSUE	DATE	REVISION DETAILS	DRN	CHK'D
C	20/08/25	Background Updated	JLR	-
B	16/01/25	Background Updated	JLR	-
A	30/09/24	Background Updated	JLR	-
Ist	22/08/24	1st Issue	JLR	-

Title

EAST MIDLANDS GATEWAY
(PHASE 2)
M1 JUNCTION 24 (OVERVIEW)

Drawing

UTILITY COMPOSITE DRAWING

Job No.	UC24010	Date	AUGUST 2024
Drawn	JLR	Checked	-
Design	-	Appd	-

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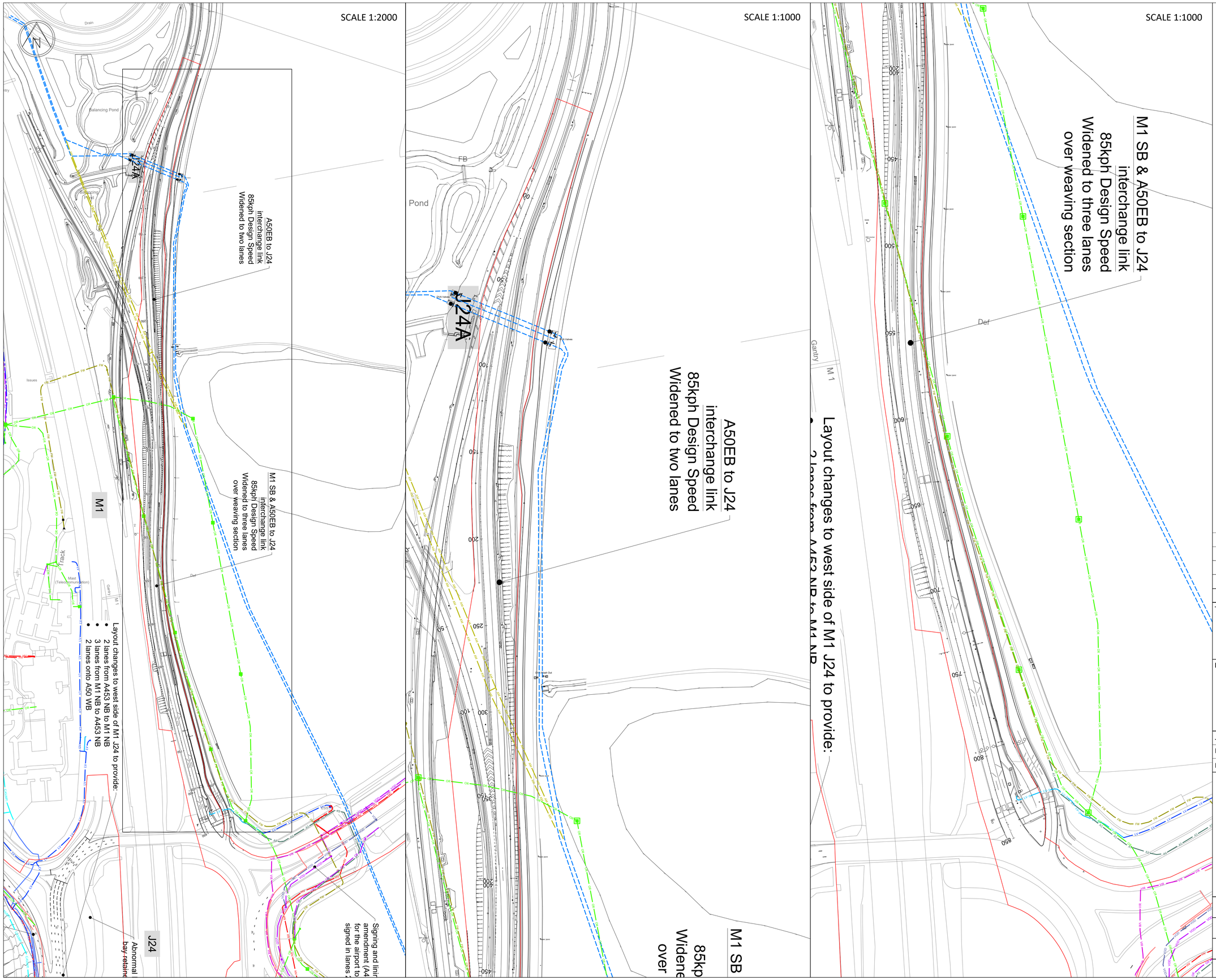

LEGEND

CADENT GAS

- Existing U/G MP Mains (GASMP)

NATIONAL GRID ELECTRICITY DISTRIBUTION

- Existing U/G LV Cable (LV)
- Existing U/G Service Cable (LV-S)
- Existing U/G HV Cable (HV)
- Existing U/G LV Cable OOU
- Existing U/G HV Cable OOU

OPENREACH

- U/G Plant (OR)
- Joint Box
- U/G Plant – Inferred (OR)
- Joint Box – Inferred

SEVERN TRENT WATER – CLEAN

- Water Main (W)
- Abandoned Main (AM)
- Aqueduct
- Hydrant
- Wash Out
- Valve

SEVERN TRENT WATER – SEWER

- Public Foul Gravity/ Lateral Drain (FW)
- Pressure Public Foul (FW)
- Abandoned Sewer (AS)

VIRGIN MEDIA

- Duct (VIR)

VODAFONE

- Owned Route – (Active) (VOD)
- Owned Route – (Abandoned) (VOD)
- Chamber (Active)
- Chamber (Abandoned)

ISSUE	DATE	REVISION DETAILS	DRN	CHK'D
C	20/08/25	Background Updated	JLR	-
B	16/01/25	Background Updated	JLR	-
A	30/09/24	Background Updated	JLR	-
Ist	06/08/24	1st Issue	JLR	-

Title

EAST MIDLANDS GATEWAY
(PHASE 2)
M1 JUNCTION 24 (SHEET 1 of 4)

Drawing

EXISTING UTILITY
COMPOSITE DRAWING

Job No.	UC24010	Date	AUGUST 2024
Drawn	JLR	Checked	-
Design	-	Appd	-

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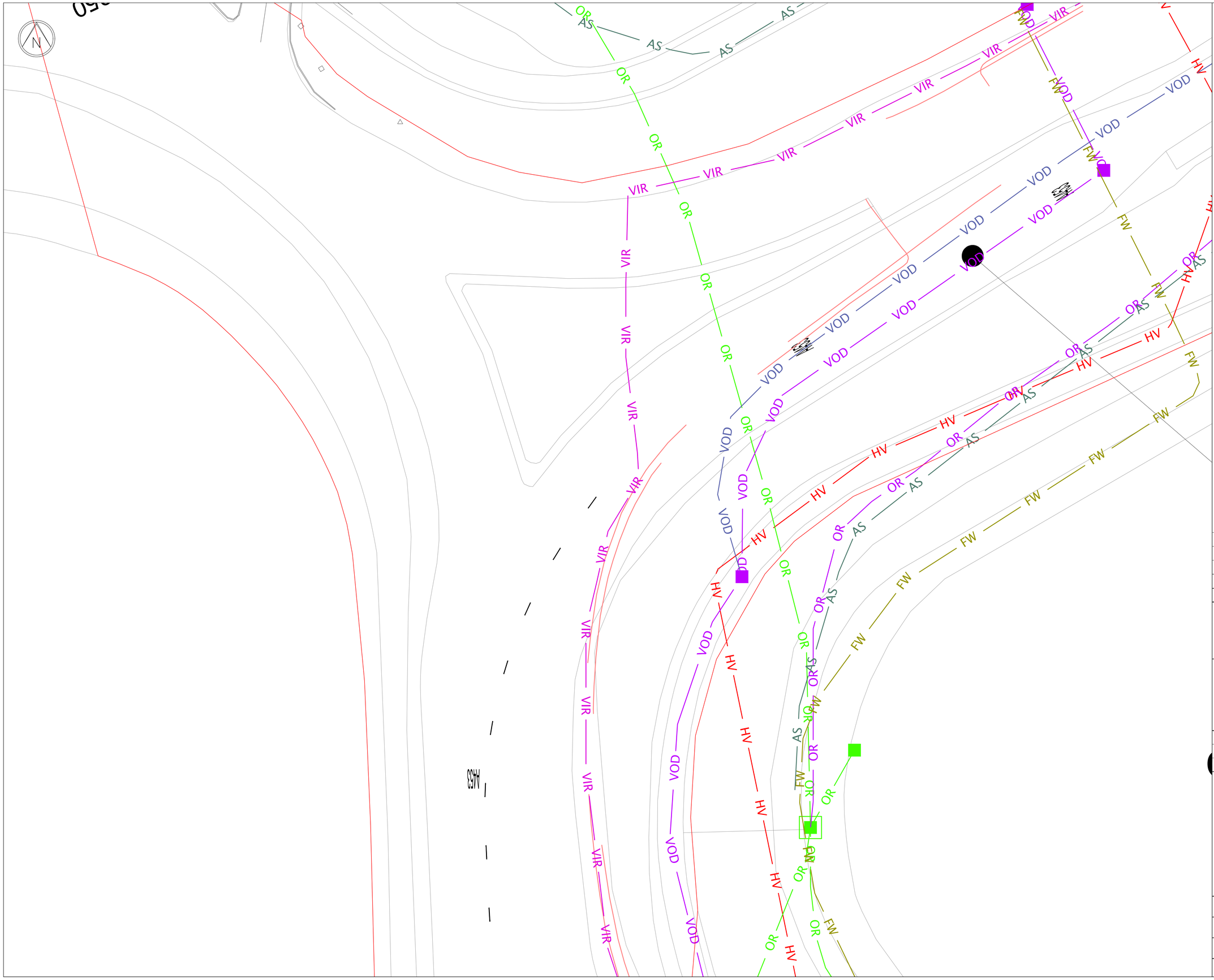

LEGEND

NATIONAL GRID ELECTRICITY DISTRIBUTION

- Existing U/G HV Cable — HV
- Existing U/G HV Cable OOU

OPENREACH

- U/G Plant — OR
- Joint Box
- Manhole
- U/G Plant - Inferred — OR

SEVERN TRENT WATER - SEWER

- Pressure Public Foul — FW
- Abandoned Sewer — AS

VIRGIN MEDIA

- Duct — VIR

VODAFONE

- Owned Route - (Active) — VOD
- Owned Route - (Abandoned) — VOD
- Chamber (Active)
- Chamber (Abandoned)

ISSUE	DATE	REVISION DETAILS	DRN	CHK'D
C	20/08/25	Background Updated	JLR	-
B	16/01/25	Background Updated	JLR	-
A	30/09/24	Background Updated	JLR	-
Ist	06/08/24	1st Issue	JLR	-

Title

EAST MIDLANDS GATEWAY
(PHASE 2)
M1 JUNCTION 24 (SHEET 2 of 4)

Drawing

EXISTING UTILITY
COMPOSITE DRAWING

Job No.	UC24010	Date	AUGUST 2024
Drawn	JLR	Checked	-
Design	-	Appd	-

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STATUS	FOR APPROVAL

LEGEND

NO UTILITIES IN THIS AREA

ISSUE	DATE	REVISION DETAILS	DRN	CHK'D
C	20/08/25	Background Updated	JLR	-
B	16/01/25	Background Updated	JLR	-
A	30/09/24	Background Updated	JLR	-
Ist	06/08/24	1st Issue	JLR	-

Title

EAST MIDLANDS GATEWAY
(PHASE 2)
M1 JUNCTION 24 (SHEET 3 of 4)

Drawing

EXISTING UTILITY
COMPOSITE DRAWING

Job No.	UC24010	Date	AUGUST 2024
Drawn	JLR	Checked	-
Design	-	Appd	-

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SCALE	1:250 @ A1
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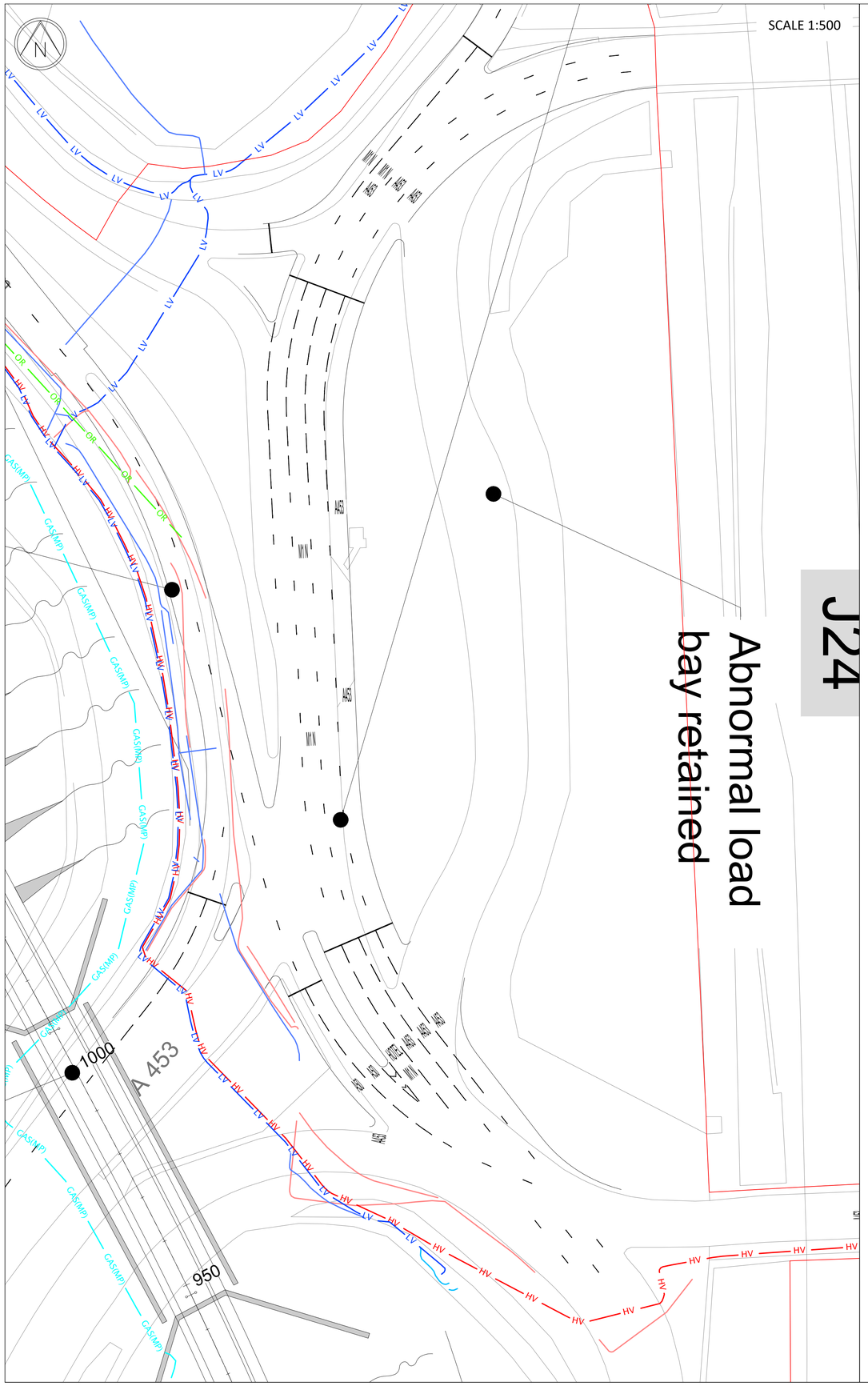

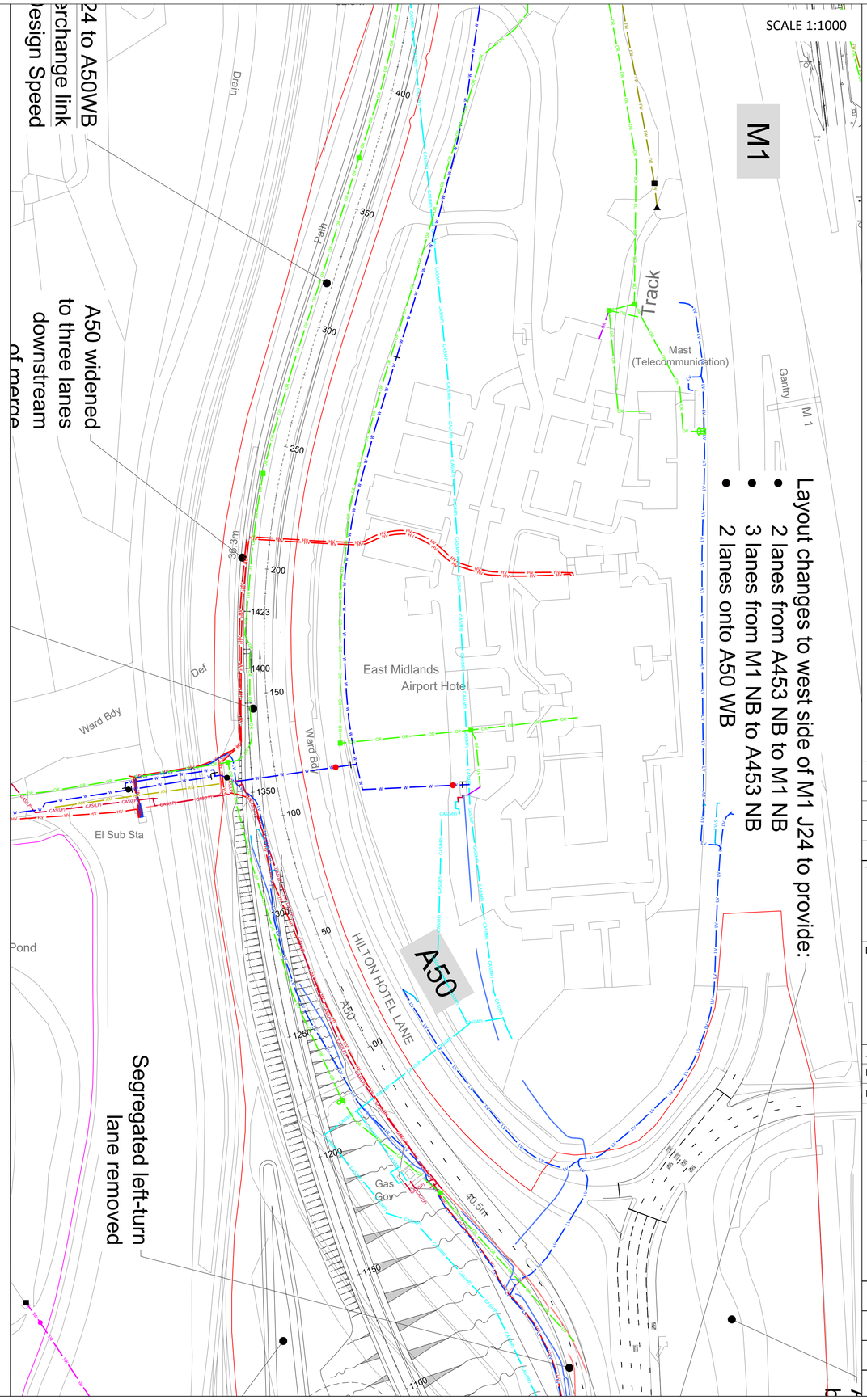

Layout changes to west side of M1 J24 to provide:

- 2 lanes from A453 NB to M1 NB
- 3 lanes from M1 NB to A453 NB
- 2 lanes onto A50 WB

LEGEND

CADENT GAS

Existing U/G LP Mains	GAS(LP)
Existing U/G MP Mains	GAS(MP)

NATIONAL GRID ELECTRICITY DISTRIBUTION

Existing U/G LV Cable	LV
Existing U/G Service Cable	LV-S
Existing U/G HV Cable	HV
Existing U/G LV Cable OOU	
Existing U/G HV Cable OOU	

OPENREACH

U/G Plant	OR
Joint Box	
Manhole	
Pole	
Cabinet	
U/G Plant - Inferred	OR

SEVERN TRENT WATER - CLEAN

Water Main	W
Abandoned Main	AM
Hydrant	
Wash Out	
Valve	

SEVERN TRENT WATER - SEWER

Private Surface Gravity/ Lateral Drain	SW
Pressure Public Foul	FW

ISSUE	DATE	REVISION DETAILS	DRN	CHK'D
C	20/08/25	Background Updated	JLR	-
B	16/01/25	Background Updated	JLR	-
A	30/09/24	Background Updated	JLR	-
Ist	06/08/24	1st Issue	JLR	-

Title

EAST MIDLANDS GATEWAY
(PHASE 2)
M1 JUNCTION 24 (SHEET 4 of 4)

Drawing

UTILITY COMPOSITE DRAWING

Job No.	UC24010	Date	AUGUST 2024
Drawn	JLR	Checked	-
Design	-	Appd	-

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CLIENT	-
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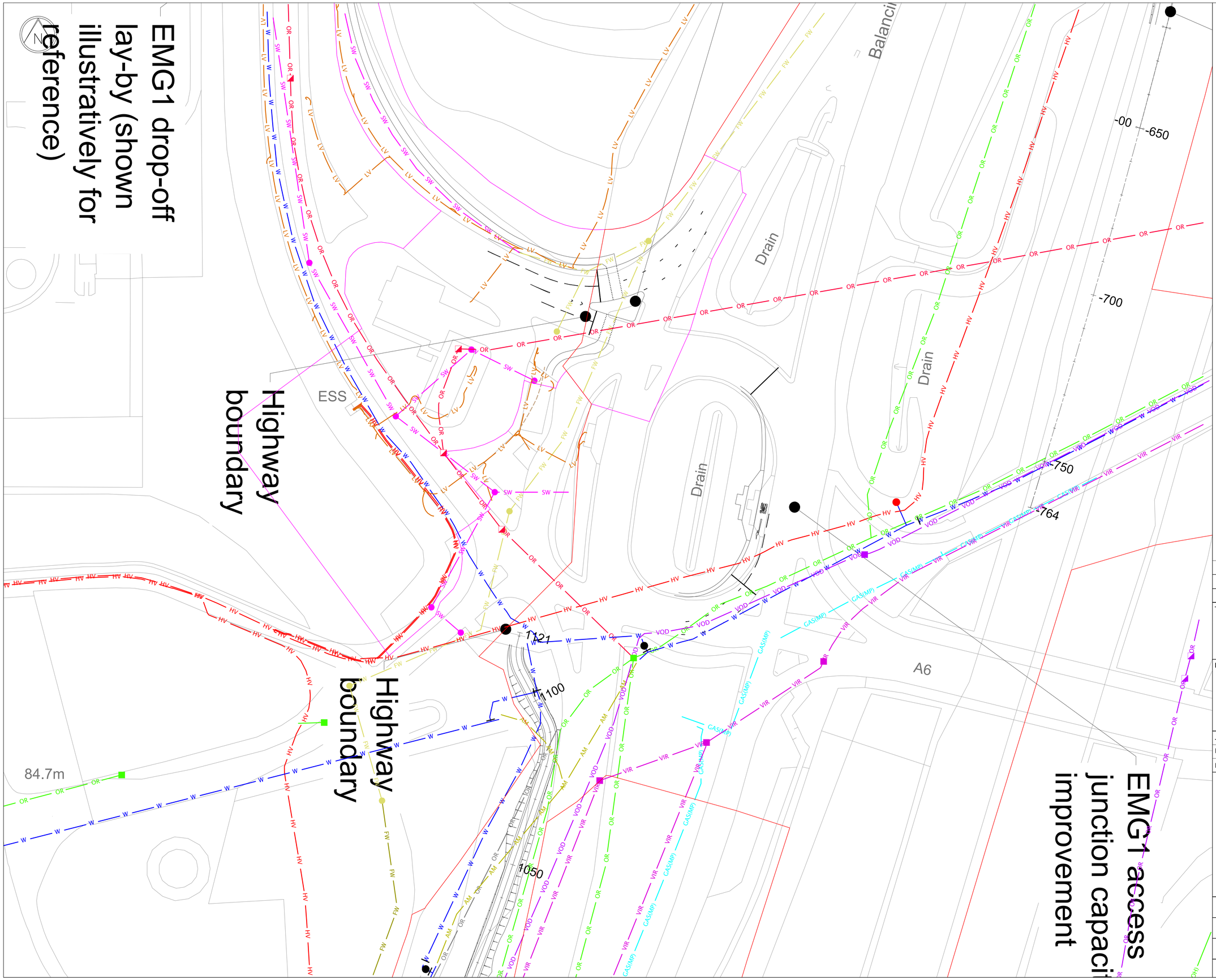
DRAWING No.	4069-UCL-DR-MU-FEA-001
STATUS	FOR APPROVAL



LEGEND

CADENT GAS

- Existing U/G MP Mains — GAS(MP)

NATIONAL GRID ELECTRICITY DISTRIBUTION

- Existing U/G HV Cable — HV

OPENREACH

- U/G Plant — OR
- Joint Box
- U/G Plant - Inferred — OR
- Joint Box - Inferred
- U/G Plant - Planned — OR
- Joint Box - Planned
- U/G Plant - Duct — OR

SEVERN TRENT WATER - CLEAN

- Water Main — W
- Abandoned Main — AM
- Hydrant
- Wash Out
- Valve

SEVERN TRENT WATER - SEWER

- Public Foul Gravity/ Lateral Drain — FW
- Private Surface Gravity/ Lateral Drain — SW

UKPD

- Existing U/G LV Cable — LV
- Out of Use U/G HV Cable

VIRGIN MEDIA

- Duct — VIR
- Chamber

VODAFONE

- Existing Duct (Owned) — VOD
- Chamber

ISSUE	DATE	REVISION DETAILS	DRN	CHK'D
A	20/08/25	Background Updated	JLR	-
Ist	22/01/25	1st Issue	JLR	-

Title

EAST MIDLANDS GATEWAY
(PHASE 1)
A6 KEGWORTH BYPASS / A453 JUNCTION

Drawing

EXISTING UTILITY
COMPOSITE DRAWING

Job No.	UC24010	Date	JANUARY 2025
Drawn	JLR	Checked	-
Design	-	Appd	-

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CLIENT	-
SCALE	1:500 @ A1
DRAWING No.	4069-UCL-DR-MU-FEA-001
STATUS	FOR APPROVAL

Appendix 7: Site Walkover Photographs

Photo – view of A453 towards Diner 51 layby

Photo – view of A453 towards East Midlands Gateway Junction

Photo – view of A543 southbound (public access path)

Photo – view of A543 northbound (public access path)

Photo – view of A50 eastward from M1 Junction 24

Photo - View of A50 eastwards from M1 junction 24