Teddington Direct River Abstraction

Preliminary Environmental Information Report

Appendix 14.3 – Construction Noise and Vibration Calculations

Volume: 3

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Appendix 14.3 – Construction Noise and Vibration Calculations

A.1 Introduction

A.1.1 This appendix presents the information used to inform the construction noise and vibration calculations for the Teddington Direct River Abstraction Project.

A.1.2 The works are spread across a number of work sites. The information is presented in separate sections for each work site, and finally for vibration.

A.1.3 Calculations have been undertaken using the method contained in BS 5228-1:2009 +A1:2014 (British Standards Institution (BSI), 2014a). Where no reference is provided in the tables, the information is from a source other than BS 5228-1:2009 +A1:2014 (e.g. manufacturers data, measured levels).

A.1.4 The plant shown in the tables does not show the full complement of equipment that would be used during the construction process. This is a list of the main items that generate noise. The plant lists do not preclude other items being used and are subject to change.

A.2 Mogden Western Work Area

A.2.1 At the Mogden Western Work Area, a construction compound would be set up, and within this area the drive shaft for the Tunnel Boring Machine (TBM) would be constructed before the TBM is launched from this location. The following tables list the construction plant that has been assumed for each activity during compound creation and operation (Table A.1 to Table A.7), during shaft works (Table A.8 to Table A.15) and finally during site restoration (Table A.16).

Table A.1 Western Work Area compound – top soil removal

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.14	Tracked excavator	1	79
C.8.16	Articulated dump truck	1	81
C.2.37	Roller	1	79
C.5.15	Bulldozer	1	83

Table A.2 Western Work Area compound – hardstanding

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
C.5.15	Bulldozer	1	83
C.2.39	Vibratory roller	1	74

Table A.3 Western Work Area compound – paving

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
C.5.31	Asphalt paver + tipper lorry	1	77
C.2.37	Roller	1	79

Table A.4 Western Work Area compound – establish buildings, groundworks

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.8	Wheeled backhoe loader	1	68
C.4.1	Articulated dump truck	1	81
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76

Table A.5 Western Work Area compound – establish buildings, lifting in

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.39	Mobile telescopic crane	1	77
C.2.34	Lorry	1	80

Table A.6 Western Work Area compound – establish buildings, roofing and cladding

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76
C.2.35	Telescopic handler	1	71

Table A.7 Western Work Area compound – compound daily operations

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.2.34	Lorry	2	80

Table A.8 Western Work Area drive shaft – site preparation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.5	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81
C.2.11	Dozer	1	79

Table A.9 Western Work Area drive shaft – shaft caisson jacking

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.6	Tubular steel hydraulic jack	2	68
C.3.7	Power pack for hydraulic jack	2	70
C.2.15	Tracked excavator	1	76
C.4.41	Mobile telescopic crane	1	71

Table A.10 Western Work Area drive shaft – shaft excavation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.2.15	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81

Table A.11 Western Work Area drive shaft – shaft spray concrete lining

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
Manufacturer data	Concrete batching plant	1	55
Manufacturer data	Shotcrete pump	1	74
Manufacturer data	Shotcrete spray	1	60

Table A.12 Western Work Area drive shaft – shaft dewatering

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.88	Water pump		68

Table A.13 Western Work Area drive shaft – TBM assembly

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.34	Lorry	1	80
C.2.35	Telescopic handler	1	71
Measured data	Hand tools	1	59

Table A.14 Western Work Area drive shaft – TBM operation daytime

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.50	Tracked mobile crane	1	71
C.4.55	Telescopic handler	1	70
C.10.20	Conveyor drive unit	1	77
C.10.23	Field conveyor	1	53
C.2.34	Lorry	2	80
C.2.5	Tracked excavator	1	76

Table A.15 Western Work Area drive shaft – TBM operation night-time

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.50	Tracked mobile crane	1	71
C.10.20	Conveyor drive unit	1	77
C.10.23	Field conveyor	1	53

Table A.16 Western Work Area drive shaft – site restoration

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.11	Dozer	1	79
C.2.37	Roller	1	79

A.3 Mogden Eastern Work Area

A.3.1 At the Mogden Eastern Work Area, a small construction compound would be set up and an interception shaft for the TBM would be constructed. The following tables list the construction plant that has been assumed for each activity during compound creation and operation (Table A.17 to Table A.23), and during shaft works (0 to Table A.31). The construction plant assumed for the construction of the TTP is given in Table A.32 to Table A.37.

Table A.17 Eastern Work Area compound – top soil removal

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.14	Tracked excavator	1	79
C.8.16	Articulated dump truck	1	81
C.2.37	Roller	1	79
C.5.15	Bulldozer	1	83

Table A.18 Eastern Work Area compound – hardstanding

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated Dump Truck	1	81
C.5.15	Bulldozer	1	83
C.2.39	Vibratory Roller	1	74

Table A.19 Eastern Work Area compound – establish buildings, groundworks

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.8	Wheeled backhoe loader	1	68
C.4.1	Articulated dump truck	1	81
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76

Table A.20 Eastern Work Area compound – establish buildings, lifting in

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.39	Mobile telescopic crane	1	77
C.2.34	Lorry	1	80

Table A.21 Eastern Work Area compound – establish buildings, fitting out

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76
C.2.35	Telescopic handler	1	71

Table A.22 Eastern Work Area compound – compound operation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.2.34	Lorry	2	80

Table A.23 Eastern Work Area compound – site restoration

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.11	Dozer	1	79
C.2.37	Roller	1	79

Table A.24 Eastern Work Area interception shaft – vegetation clearance

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
Manufacturer data	Chainsaw	1	84
Manufacturer data	Brushcutter	1	77
Manufacturer data	Large wood chipper	1	86
C.2.5	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81

Table A.25 Eastern Work Area interception shaft – cutting into embankment

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.5	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81

Table A.26 Eastern Work Area interception shaft – embankment piling

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.28	Tracked mobile crane	1	67
Manufacturer data	SL30 Hammer rig for sheet piling	1	101
C.3.34	Gas cutter	1	68

Table A.27 Eastern Work Area interception shaft – ground preparation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.5	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81
C.2.11	Dozer	1	79

Table A.28 Eastern Work Area interception shaft – shaft caisson jacking

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.6	Tubular steel hydraulic jack	2	68
C.3.7	Power pack for hydraulic jack	2	70
C.2.15	Tracked excavator	1	76
C.4.41	Mobile telescopic crane	1	71

Table A.29 Eastern Work Area interception shaft – shaft excavation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.2.15	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81

Table A.30 Eastern Work Area interception shaft – shaft spray concrete lining

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
Manufacturer data	Concrete batching plant	1	55
Manufacturer data	Shotcrete pump	1	74
Manufacturer data	Shotcrete spray	1	60

Table A.31 Eastern Work Area interception shaft – shaft dewatering

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.88	Water pump	1	68

Table A.32 Eastern Work Area TTP – ground level buildings

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.8.16	Articulated dump truck	1	81
C.4.55	Telescopic handler	1	70
C.4.20	Concrete mixer truck	1	80

Table A.33 Eastern Work Area TTP – foundation piling

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.28	Tracked mobile crane	1	67
Manufacturer data	SL30 Hammer rig for sheet piling	1	101
C.3.34	Gas cutter	1	68

Table A.34 Eastern Work Area TTP – platform construction

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.34	Lorry	1	80
C.2.28	Wheeled loader	1	76
C.4.48	Tower crane	1	76
C.4.62	Site lift for workers	1	66
C.3.31	Hand-held welder	1	73
C.3.32	Generator for welding	1	73
Manufacturer data	Impact wrench	1	84

Table A.35 Eastern Work Area TTP – lifting in of TTP components

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.34	Lorry	1	80
C.2.28	Wheeled loader	1	76
C.4.48	Tower crane	2	76
C.4.62	Site lift for workers	2	66
C.3.31	Hand-held welder	1	73

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.32	Generator for welding	1	73
Manufacturer data	Impact wrench	1	84

Table A.36 Eastern Work Area TTP – concreting

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.29	Truck mounted concrete pump and boom	2	80
C.4.62	Site lift for workers	1	66

Table A.37 Eastern Work Area TTP – fitting out and testing

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
Manufacturer data	Impact wrench	1	84
C.4.62	Site lift for workers	1	66
C.3.19	Compressor	1	75

A.4 Ham Playing Fields site

A.4.1 At the intermediate shaft a compound would be set up around the shaft on the Playing Fields. The following tables list the construction plant that has been assumed for each activity during compound creation and operation (Table A.38 to Table A.46), during shaft works (Table A.47 to Table A.52) and during the creation of the Riverside Drive parking area (0 to Table A.56).

Table A.38 Ham Playing Fields site compound – top soil removal

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.14	Tracked excavator	1	79
C.8.16	Articulated dump truck	1	81
C.2.37	Roller	1	79
C.5.15	Bulldozer	1	83

Table A.39 Ham Playing Fields site compound – hardstanding

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
C.5.15	Bulldozer	1	83
C.2.39	Vibratory roller	1	74

Table A.40 Ham Playing Fields site compound – paving

BS5228-1 reference	Plant description	Quantity	Sound pressure level LAeq,T dB at 10m
C.4.1	Articulated dump truck	1	81
C.5.31	Asphalt paver	1	77
C.2.37	Roller	1	79

Table A.41 Ham Playing Fields site compound – fencing

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.53	Lorry with lifting boom	1	77
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76

Table A.42 Ham Playing Fields site compound – establish buildings, groundworks

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.8	Wheeled backhoe loader	1	68
C.4.1	Articulated dump truck	1	81
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76

Table A.43 Ham Playing Fields site compound – establish buildings, lifting in

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.39	Mobile telescopic crane	1	77
C.2.34	Lorry	1	80

Table A.44 Ham Playing Fields site compound – establish buildings, fitting out

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76
C.2.35	Telescopic handler	1	71

Table A.45 Ham Playing Fields site compound – compound operation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.35	Telescopic handler	1	71
C.2.34	Lorry	1	80
C.4.77	Diesel generator	1	60

Table A.46 Ham Playing Fields site compound – site restoration

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.11	Dozer	1	79
C.2.37	Roller	1	79

Table A.47 Ham Playing Fields site shaft works – ground preparation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.5	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81
C.2.11	Dozer	1	79

Table A.48 Ham Playing Fields site shaft works – shaft caisson jacking

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.6	Tubular steel hydraulic jack	2	68
C.3.7	Power pack for hydraulic jack	2	70
C.2.15	Tracked excavator	1	76
C.4.41	Mobile telescopic crane	1	71

Table A.49 Ham Playing Fields site shaft works – shaft excavation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.2.15	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81

Table A.50 Ham Playing Fields site shaft works – spray concrete lining

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
Manufacturer data	Concrete batching plant	1	55
Manufacturer data	Shotcrete pump	1	74
Manufacturer data	Shotcrete spray	1	60

Table A.51 Ham Playing Fields site shaft works – dewatering

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.88	Water pump	1	68

Table A.52 Ham Playing Fields site shaft works – shaft operation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.4.88	Water pump	1	68
C.4.77	Diesel generator	1	60

Table A.53 Riverside Drive parking area – top soil strip

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.21	Tracked excavator	1	71
C.4.4	Dumper	1	76

Table A.54 Riverside Drive parking area – kerb removal

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.21	Tracked excavator	1	71
C.4.4	Dumper	1	76
C.4.72	Hand-held circular saw	1	79

Table A.55 Riverside Drive parking area – vacuum excavation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
Manufacturers data	Vacuum pump extractor	1	79

Table A.56 Riverside Drive parking area – laying of new material

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.38	Roller	1	73
C.4.4	Dumper	1	76

A.5 Burnell Avenue site

A.5.1 At the Burnell Avenue site, a compound would be set up and the TBM reception shaft, Thames Lee Tunnel (TLT) connection and outfall would be constructed. The following tables list the construction plant assumed for utility diversions (Table A.57), during compound creation and operation (Table A.58 to Table A.66), for reception shaft works (Table A.67 to Table A.72), for intake construction (Table A.73 to Table A.78), for the connection shaft (Table A.79 to Table A.82), for the Motor Control Centre (MCC) building (Table A.83 and Table A.84), and for outfall construction (Table A.85 to Table A.90).

Table A.57 Burnell Avenue advance works – utility diversions

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.14	Tracked excavator	1	79
C.4.1	Articulated dump truck	1	81
C.2.35	Telescopic handler	1	71

Table A.58 Burnell Avenue site compound – top soil removal

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.14	Tracked excavator	1	79
C.8.16	Articulated dump truck	1	81
C.2.37	Roller	1	79
C.5.15	Bulldozer	1	83

Table A.59 Burnell Avenue site compound – hardstanding

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
C.5.15	Bulldozer	1	83
C.2.39	Vibratory roller	1	74

Table A.60 Burnell Avenue site compound – paving

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
C.5.31	Asphalt paver	1	77
C.2.37	Roller	1	79

Table A.61 Burnell Avenue site compound – establish buildings, groundworks

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.8	Wheeled backhoe loader	1	68
C.4.1	Articulated dump truck	1	81
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76

Table A.62 Burnell Avenue site compound – establish buildings, lifting in

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.39	Mobile telescopic crane	1	77
C.2.34	Lorry	1	80

Table A.63 Burnell Avenue site compound – establish buildings, fitting out

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.1	Articulated dump truck	1	81
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76
C.2.35	Telescopic handler	1	71

Table A.64 Burnell Avenue site compound – compound fencing

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.53	Lorry with lifting boom	1	77
Manufacturer data	Nail gun	1	69
Manufacturer data	Circular saw	1	76

Table A.65 Burnell Avenue site compound – compound operation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.35	Telescopic handler	1	71
C.2.34	Lorry	1	80
C.4.77	Diesel generator	1	60

Table A.66 Burnell Avenue site compound – site restoration

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.11	Dozer	1	79
C.2.37	Roller	1	79

Table A.67 Burnell Avenue site reception shaft – ground preparation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.5	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81
C.2.11	Dozer	1	79

Table A.68 Burnell Avenue site reception shaft – shaft caisson jacking

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.6	Tubular steel hydraulic jack	2	68

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.7	Power pack for hydraulic jack	2	70
C.2.15	Tracked excavator	1	76
C.4.41	Mobile telescopic crane	1	71

Table A.69 Burnell Avenue site reception shaft – shaft excavation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.2.15	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81

Table A.70 Burnell Avenue site reception shaft – shaft spray concrete lining

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
Manufacturer data	Concrete batching plant	1	55
Manufacturer data	Shotcrete pump	1	74
Manufacturer data	Shotcrete spray	1	60

Table A.71 Burnell Avenue site reception shaft – dewatering

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.88	Water pump	12	68

Table A.72 Burnell Avenue site reception shaft – shaft operation and TBM removal

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.4.88	Water pump	1	68
C.4.77	Diesel generator	1	60

Table A.73 Burnell Avenue site TLT connection, intake – vegetation clearance

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.8.16	Articulated dump truck	1	81
Manufacturer data	Brushcutter	1	77
Manufacturer data	Large wood chipper	1	86

Table A.74 Burnell Avenue site TLT connection, intake – embankment earthworks

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.14	Wheeled backhoe loader	1	67
C.8.16	Articulated dump truck	1	81

Table A.75 Burnell Avenue site TLT connection, intake – cofferdam construction

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
Manufacturer data	SL30 Hammer rig for sheet piling	1	101
C.3.29	Tracked mobile crane	1	70
C.4.88	Water pump	1	68
C.4.77	Diesel generator	1	60

Table A.76 Burnell Avenue site TLT connection, intake – pipework connection

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.14	Wheeled backhoe loader	1	67
C.8.16	Articulated dump truck	1	81
C.4.55	Telescopic handler	1	70

Table A.77 Burnell Avenue site TLT connection, intake – brickwork to intake structure

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.8.16	Articulated dump truck	1	81
C.4.55	Telescopic handler	1	70
C.4.20	Concrete mixer truck	1	80

Table A.78 Burnell Avenue site TLT connection, intake – removal of cofferdam

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.29	Tracked mobile crane	1	70

Table A.79 Burnell Avenue site connection shaft – shaft caisson jacking

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.6	Tubular steel hydraulic jack	2	68
C.3.7	Power pack for hydraulic jack	2	70
C.2.15	Tracked excavator	1	76
C.4.41	Mobile telescopic crane	1	71

Table A.80 Burnell Avenue site connection shaft – shaft excavation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.2.15	Tracked excavator	1	76
C.2.33	Articulated dump truck	1	81

Table A.81 Burnell Avenue site connection shaft – spray concrete lining

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
Manufacturer data	Concrete batching plant	1	55
Manufacturer data	Shotcrete pump	1	74
Manufacturer data	Shotcrete spray	1	60

Table A.82 Burnell Avenue site connection shaft – dewatering

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.88	Water pump	1	68

Table A.83 MCC building construction – ground clearance

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.68	Mini tracked excavator	1	65

Table A.84 MCC building construction – foundations and structure

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.23	Small cement mixer	1	61
C.4.55	Telescopic handler	1	70

Table A.85 Burnell Avenue site outfall – vegetation clearance

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.8.16	Articulated dump truck	1	81
Manufacturer data	Brushcutter	1	77
Manufacturer data	Large wood chipper	1	86

Table A.86 Burnell Avenue site outfall – embankment earthworks

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.14	Wheeled backhoe loader	1	67
C.8.16	Articulated dump truck	1	81

Table A.87 Burnell Avenue site outfall – cofferdam construction

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
Manufacturer data	SL30 Hammer rig for sheet piling	1	101
C.3.29	Tracked mobile crane	1	70
C.4.88	Water pump	1	68
C.4.77	Diesel generator	1	60

Table A.88 Burnell Avenue site outfall – pipework connection

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.14	Wheeled backhoe loader	1	67
C.8.16	Articulated dump truck	1	81
C.4.55	Telescopic handler	1	70

Table A.89 Burnell Avenue site outfall – brickwork to intake structure

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.8.16	Articulated dump truck	1	81
C.4.55	Telescopic handler	1	70
C.4.20	Concrete mixer truck	1	80
C.4.43	Wheeled mobile crane	1	70

Table A.90 Burnell Avenue site outfall – removal of cofferdam

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.29	Tracked mobile crane	1	70

A.6 TLT connection

A.6.1 A connection to the TLT would be made by either adit connection or by a conveyance pipeline. The following tables list the construction plant that has been assumed for adit connection (Table A.91 and 0) and for a conveyance pipeline (Table A.93 and Table A.94).

Table A.91 Adit TLT connection daytime works

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.21	Tracked excavator	1	71
C.4.41	Mobile telescopic crane	1	71
Manufacturer data	Concrete batching plant	1	55
Manufacturer data	Shotcrete spray	1	60
Manufacturer data	Shotcrete pump	1	74
C.2.34	Lorry	1	80

Table A.92 Adit TLT connection night-time works

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.2.21	Tracked excavator	1	71
C.4.41	Mobile telescopic crane	1	71
Manufacturer data	Concrete batching plant	1	55
Manufacturer data	Shotcrete spray	1	60
Manufacturer data	Shotcrete pump	1	74

Table A.93 Conveyance pipeline daytime works

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.6	Tubular steel hydraulic jack	1	68
Manufacturer Data	Sound attenuated power pack for hydraulic jack	1	68
C.2.34	Lorry	1	80
C.4.41	Mobile telescopic crane	1	71

Table A.94 Conveyance pipeline night-time works

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.6	Tubular steel hydraulic jack	1	68
Manufacturer Data	Sound attenuated power pack for hydraulic jack	1	68
C.4.41	Mobile telescopic crane	1	71

A.7 Tudor Drive site

A.7.1 There are two options for the connection to the TLT at this location. One is for a direct connection to the existing shaft, and the second would require construction of a new connection shaft. The following tables list the construction plant that has been assumed for the construction of a new shaft (Table A.95 to Table A.98), and the plant assumed for the connection to either shaft option (Table A.99).

Table A.95 Tudor Drive site – shaft caisson jacking

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.3.6	Tubular steel hydraulic jack	2	68
C.3.7	Power pack for hydraulic jack	2	70
C.2.15	Tracked excavator	1	76
C.4.41	Mobile telescopic crane	1	71

Table A.96 Tudor Drive site – shaft caisson excavation

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
C.2.15	Tracked excavator	1	76
C.2.34	Lorry	1	80

Table A.97 Tudor Drive site – spray concrete lining

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71
Manufacturer data	Concrete batching plant	1	55
Manufacturer data	Shotcrete pump	1	74
Manufacturer data	Shotcrete spray	1	60

Table A.98 Tudor Drive site – dewatering

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.88	Water pump	1	68

Table A.99 Tudor Drive site – connection

BS5228-1 reference	Plant description	Quantity	Sound pressure level $L_{Aeq,T}$ dB at 10m
C.4.41	Mobile telescopic crane	1	71

A.8 Vibration

A.8.1 Calculations for vibration from piling have been based on percussive piling, using the empirical prediction method from Table E.1 of BS 5228-2:2009 +A1:2014 (BSI, 2014b). The parameters used in the equations are summarised in Table A.100.

Table A.100 Percussive piling parameters

Parameter	Value
Energy of hammer	30,000 joules
Soil factor	3 (very stiff cohesive soil / dense granular soil)

A.9 References

BSI (2014a). BS 5228-1:2009 +A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise, London: BSI.

BSI (2014b). BS 5228-2:2009 +A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration, London: BSI.