South Station Place
Appendices A

PATRICK PROPERTIES

A New Net Carbon Zero Public Transport-Led Community and Employment Hub

Appendices A

1. Transport Appraisal Report
2. Warrington Draft Local Plan & Local Transport Plan 4 Consultation
3. Ecology Technical Note: South Station Place, Birchwood
4. Landscape & Visual Greenbelt Review
5. Landscape & Visual Technical Note
6. Flood Risk Associated with the Birchwood Mixed-Use Development Site
7. Hydrological and Hydrogeological Risk Assessment
8. Preliminary Site Investigation to Identify the extent of Peat with the Underlying soils Birchwood Station South, Warrington
9. Noise Screening Assessment
10. Air Quality Assessment
11. South Station Place, Birchwood Socio-Economic Assessment

8. Preliminary Site Investigation to Identify the extent of Peat with the Underlying soils Birchwood Station South, Warrington

[redacted]

[redacted]

Date: 12th November 2021

Patrick Properties

[redacted]

Dear Sir/ Madam,

PRELIMINARY SITE INVESTIGATION TO IDENTIFY THE EXTENT OF PEAT WITHIN THE UNDERLYING SOILS BIRCHWOOD STATION SOUTH, WARRINGTON

1. INTRODUCTION

1.1. BACKGROUND

It is understood that Patrick Properties are currently in the preliminary stages of appraising a parcel of land known as Birchwood Station South, Warrington for a mixed use development.

E3P has previously completed a desk study on the site known as Birchwood Station South. The findings of the initial desk study are presented within the E3P report entitled Phase I Geo-environmental Site Assessment (report ref: 14-671-R1).

The desk study the presence of peat as the upper superficial drift deposition (near surface soils) across the proposed development site. in due consideration of the desk based geological appraisal and the subsequent preliminary intrusive investigation, E3P has prepared this geotechnical summary letter to outline out findings and provide a synopsis for the likely development solutions. These findings are summarised herein.

- The presence of peat across the majority of the development site to variable depths represents is identified as a pertinent geotechnical hazard that requires due consideration as part of the proposed site development.

- Where peat is present, ground engineering works are required to construct a suitable development platform for commercial, industrial and residential end uses.

- A highly detailed Ground Investigation is required to ascertain the spatial distribution and thickness of peat, at this juncture proposals can be obtained from specialist contractors to assess viable ground engineering solutions to determine the most sustainable engineering solution to facilitate the future development at this site.

- Peat is also classified as a carbon capture commodity, therefore as part of the design of the ground engineering works, the maximisation and retention of this material is a key consideration when selecting the appropriate development solution;

To assess the extent and depth of peat, preliminary investigations in the form of mechanically excavated trial pits were conducted in attempt to determine the spatial distribution of peat within the context of the proposed development and the anticipated depth of the material where identified.

1.1. SCOPE OF WORKS

The preliminary investigation ground investigation was designed within the constraints of site access and time with exploratory positions targeted to identify the extent of shallow peat across the development area, the scope of works comprised the following:

- 31 mechanically excavated trial pits to a maximum depth of 2.90 m bgl.;

- Supervision of all works and subsequent logging of the lithology by E3P engineering geologists; and,

- Preparation of scaled logs recording identified ground conditions and engineering geology observations pertaining to the identified superficial drift deposits.

2. GROUND CONDITIONS

Mechanically excavated trial pits were advanced to investigate ground condition, including peat, and provide spatially distributed to offer the maximum site coverage.

The ground investigation generally confirms the published geology and identifies the strata set out in Table 2.1; however peat was not located across the northern and southern areas of the site and instead was identified within the central and north western areas.

TABLE 2.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (m bgl)						
	MADE GROUND	TOPSOIL	SAND	CLAY	MADE GROUND: PEAT	PEAT	SILT
TP101	0.00–0.50	–	0.50–2.10	–	–	–	–
TP102	0.00–0.60	–	0.60–2.15	–	–	–	–
TP103	0.00–0.20	–	0.20–2.40	–	–	–	–
TP104	–	0.00–0.30	0.80–2.30	0.30–0.80	–	–	–
TP105	0.00–0.25	–	0.25–2.50	–	–	–	–
TP106	0.00–0.15	–	0.15–2.50	–	–	–	–
TP107	0.00–0.50	–	0.50–1.10	1.10–2.60	–	–	–
TP108	–	–	0.60–1.00	1.00–2.90	0.00–0.60	–	–
TP109	0.00–0.20	–	0.70–1.20	0.20–0.70 1.20–2.00	–	–	–
TP110	–	–	0.80–0.90 1.80–2.20	0.90–1.8	0.00–0.80	–	–
TP111	0.00–0.10	–	1.40–2.50	–	–	0.10–1.40	–
TP112	–	–	1.80–2.40	–	0.00–0.40	0.40–1.80	–
TP113	0.00–0.10	–	0.10–2.00	–	–	–	–
TP114	0.00–0.20	–	0.20–1.40	–	–	–	–
TP115	0.00–0.40	–	0.40–1.50	1.50–2.20	–	–	–
TP116	0.00–0.40	–	0.75–1.85	1.85–2.20	–	0.40–0.75	–
TP117	–	0.00–0.15	0.70–1.70	1.70–2.40	–	0.15–0.70	–
TP118	–	–	1.80–2.05	2.05–2.30	0.00–0.30	0.30–1.80	–
TP119	0.00–0.30	–	0.30–1.15	1.15–2.00	–	–	–
TP120	–	0.00–0.40	0.40–1.90	–	–	–	1.90–2.45
TP121	0.00–0.40	–	0.40–0.90	0.90–2.30	–	–	–
TP122	0.00–0.30	–	0.50–0.60	0.60–2.30	–	0.30–0.50	–
TP123	0.00–0.35	–	0.35–0.80 0.90–1.10	0.80–0.90 1.10–2.00	–	–	–
TP124	0.00–0.55	–	0.55–1.90	1.90–2.50	–	–	–
TP125	0.00–0.50	–	0.50–2.30	2.30–2.40	–	–	–

HOLE	DEPTH TO STRATUM (m bgl)						
	MADE GROUND	TOPSOIL	SAND	CLAY	MADE GROUND: PEAT	PEAT	SILT
TP126	0.00–0.35	–	–	–	–	0.35–2.70 depth not proven	–
TP127	0.00–0.40	–	2.60–2.80	–	–	0.40–2.60	–
TP128	0.00–0.40	–	1.75–2.40	–	–	0.40–1.75	–
TP129	0.00–0.40	–	1.40–2.40	2.40–2.60	–	0.40–1.40	–
TP130	0.00–0.20	–	–	–	–	0.20–1.75 depth not proven	–
TP131	–	0.00–0.30	0.30–1.90	1.90–2.00	–	–	–

2.1. MADE GROUND

Made ground was encountered across site between 0.10 m and 0.60 m bgl. Made ground comprises black silty clay with frequent rootlets and gravel of brick sandstone, mudstone and slate with fragments of glass and ceramics. A field drain was encountered at 0.30 m bgl within TP102.

2.2. TOPSOIL

Topsoil was encountered within four locations across site (TP104, TP117, TP120 and TP131). Topsoil comprised a black slightly silty sandy CLAY with frequent rootlets and occasional roots with some areas encountering gravel of sandstone and mudstone.

2.3. DRIFT DEPOSITS

Drift deposits comprise grey/brown fine to medium silty clayey SAND with occasional areas encountering gravel of mudstone. These were generally underlain by a brown mottled grey CLAY with occasional gravel of sandstone and mudstone.

Black silty CLAY with rootlets was encountered within TP109 between 0.20 m and 0.70 m bgl.

Grey mottled yellow slightly clayey sandy SILT was encountered within TP120 between 1.90 m and a maximum proven depth of 2.45 m bgl.

2.4. PEAT

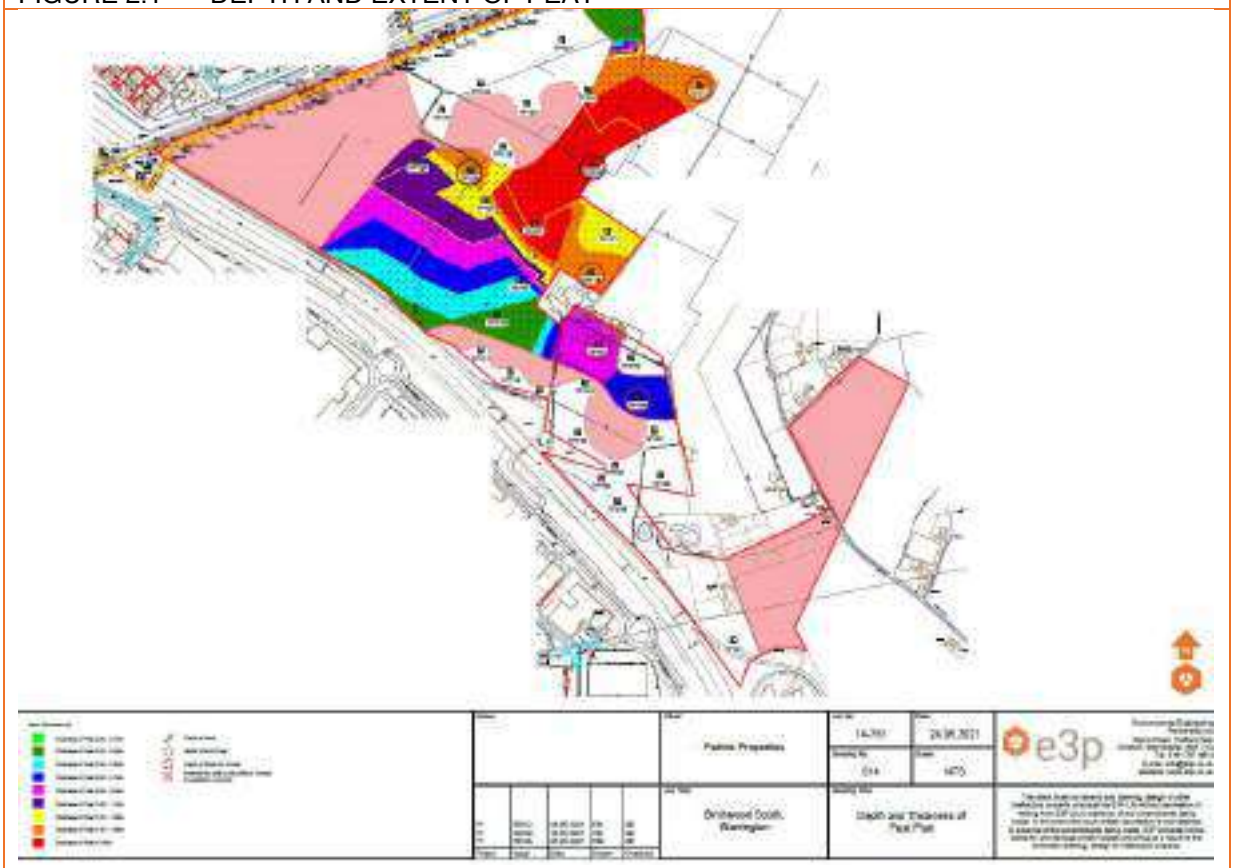
Made Ground peat was identified within four locations across site (TP108,TP110, TP112 and TP118) between ground level and 0.80 m bgl. This comprised black clayey peat with gravel of brick, sandstone and mudstone with areas encountering tiles, glass, timber, plastic bags.

Natural peat was encountered within eleven locations across site between 0.10 m and maximum proven depth of 2.70 m bgl. The full extent of PEAT could not be proven within TP126 (2.70 m bgl) and TP130 (1.75 m bgl) was not proven due to limitations of the excavator reach and unsafe conditions requiring the trial pit to be terminated. The natural deposits comprised Brown fibrous silty PEAT with a strong organic odour with frequent plant matter, branches and trees encountered within TP112. The peat was very saturated in TP118 and TP126.

Peat was encountered in the central and northern areas of site with the deepest areas located in the centre. Peat was not identified to the south or northwest of site.

A conjectured Depth and Thickness of Peat Plan is presented as Drawing 14-671-014 attached to this letter and Figure 2.1. It must be noted that it is highly probably that further ground investigation would further inform and refine the areas of peat in areas not yet investigated.

FIGURE 2.1 DEPTH AND EXTENT OF PEAT



2.5. SOLID GEOLOGY

Solid geology was not encountered during site investigation; however, BGS boreholes within close proximity to the site encountered bedrock between 4.00 m and 12.50 m bgl.

2.6. GROUNDWATER

Groundwater was encountered as perched water within the majority of wells between 1.30 m and 2.30 m bgl.

3. PRELIMINARY GEOTECHNICAL FEASIBILITY ASSESSMENT

The underlying compressible peat deposits represent a geotechnical hazard in terms of the risk associated with consolidation to varying degrees which will induce potentially unacceptable differential settlement however there are various well proven engineering solutions in order to construct commercial properties over peat deposits and thus retain the peat on-site. Furthermore, from the investigation completed thus far, it appears that the thicker and deeper layers of peat are within areas to not be developed.

The risk to the proposed structures can be significantly reduced if foundations go beyond the peat through the use of piled foundation for example and found in competent founding strata where the peat will no longer pose a significant risk. Extensive further ground investigation is required before proposed foundation solution can be assessed.

For external areas and hardstanding areas, specialist ground engineering methods will be required due to potential for differential settlement within the compressible peat deposits. The potential methods are discussed herein.

It may be possible to install band drains within the peat and surcharge the proposed building floor slab and areas of external hardstanding to induce primary and secondary settlement and thus mitigate the risk of differential settlement. However, the potential of this is currently being assessed.

The incorporation of Geo-grids as a mechanism of mechanical stabilisation can be utilised to ensure uniform and acceptable settlement within the development platform.

It may also be possible to install Controlled Modulus Columns to mitigate the settlement risk within the peat and soft alluvial soils to ensure the required design ABP for the floor slab UDL.

The use of soil mixing to retain the peat with solidification of the organic matrix to bind the materials and remove the potential for long term consolidation and unacceptable differential settlement provides a viable engineering solution for lightly loaded roads and infrastructure.

Drainage and infrastructure will require specialist design subject to loading and design. It may be that drainage in parts required pilling or reinforcement of the soil to provide a stiffened platform for the infrastructure.

4. CONCLUSION AND RECOMMENDATIONS

- Peat was identified within 13 trial pits to a maximum proven depth of 2.70 m bgl. Four locations (TP108,TP110, TP112 and TP118) identified Made Ground peat at the surface between 0.00 m and 0.80 m bgl. These areas were all identified adjacent to the eastern boundary. Peat was successfully delineated and identified only within the central and north-eastern areas of site which is a smaller area than suggested by the BGS. The depth of the peat was not proven within TP126 and TP130.

- Local farmers have suggested that areas of peat have historically been removed to provide a fuel source for the military during the war. This could be one reason as to why the extent of the peat may not be completely widespread. It could also explain the presence of made ground peat identified at the surface adjacent to the eastern boundary.

- Further detailed Ground Investigation is required to confirm the extent of peat as the initial trial pits provide only limited information and peat may be more prevalent It is recommended boreholes are advanced across the site to prove the depth of the peat and to ensure no deeper underlying peat and to further delineate it's extent ;

- It must be noted that peat is classified as a carbon capture commodity, therefore the ground engineering solution should consider the potential for retention of this material where practicable.

- The risk to the proposed structures can be significantly reduced if foundations go beyond the peat through the use of piled foundation for example and found in competent founding strata where the peat will no longer pose a significant risk. Extensive further ground investigation is required before proposed foundation solution can be assessed.

- The peat and soft alluvial soils identified on the site are highly compressible and are likely to undergo long term settlement when loaded by new ground during cut and fill works, along with structures and infrastructure as part of the development and this needs to be carefully managed.

- The underlying compressible peat deposits represent a geotechnical hazard in terms of the risk associated with consolidation to varying degrees which will induce potentially unacceptable differential settlement however there are various well proven engineering solutions in order to construct commercial properties over peat deposits and thus retain the peat on-site. Furthermore, from the investigation completed thus far, it appears that the thicker and deeper layers of peat are within areas to not be developed.

  Therefore, specialist ground engineering is required to areas in order to mitigate differential settlement. There are a number of options that may be suitable, including:

  - Transferal of structural loading to competent stratum by means of a pile foundation solution;

  - Geo-Grid designed mechanical stabilization to form a stiffened platform to roads and infrastructure;

  - Surcharge the area and utilise appropriate band drains to induce primary and secondary consolidation prior to the construction of the development platform;

  - Controlled Modulus Columns (CMC) to transfer building, floor slab and external hardstanding loading to competent stratum while inducing improvement to the settlement potential for the compressible material;

- In-situ solidification by soil mixing to negate the potential for unacceptable long term consolidation to areas of lightly loaded infrastructure;

- Limited excavation of compressible material within areas of high risk infrastructure.

I trust this information is satisfactory to your requirements, and should I be able to be of any further assistance, please do not hesitate to contact me.

Yours sincerely,

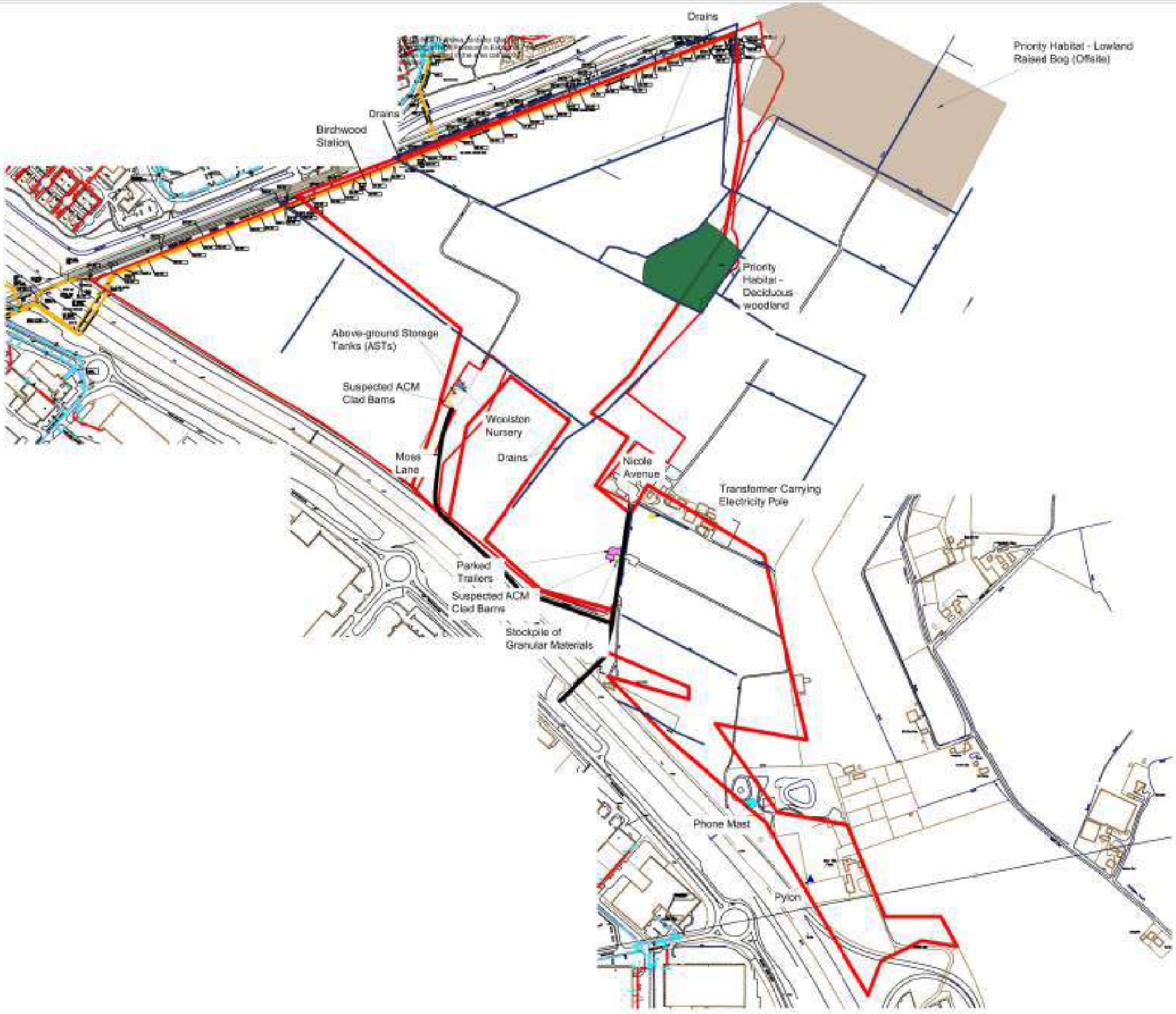
[redacted]

Martin Dyer
Director

e3p

Enclosed:

Exploratory Borehole Logs; and,
Depth of Peat Plan



Site Features
- Site Boundary
- Drains
- Roads
- Priority Habitat - Deciduous Woodland
- Woolston Nursery
- Suspected ACM Clad Barns
- Parked Trailers
- Priority Habitat - Lowland Raised Bog (Offsite)
- Phone Mast
- Pylon
- Transformer Carrying Electricity Pole
- Stockpile Of Granular Material
- Above-ground Storage Tanks (ASTs)

Notes:

Client: WHR Propertys

Job No: 14-761

Date: 17.02.2021

Drawing No: 004

Scale: NTS

Phase	Issue	Date	Drawn	Checked
P1	REVA	17.02.2021	EB	SE

Job Title: Birchwood South, Warrington

Drawing Title: Site Features Plan

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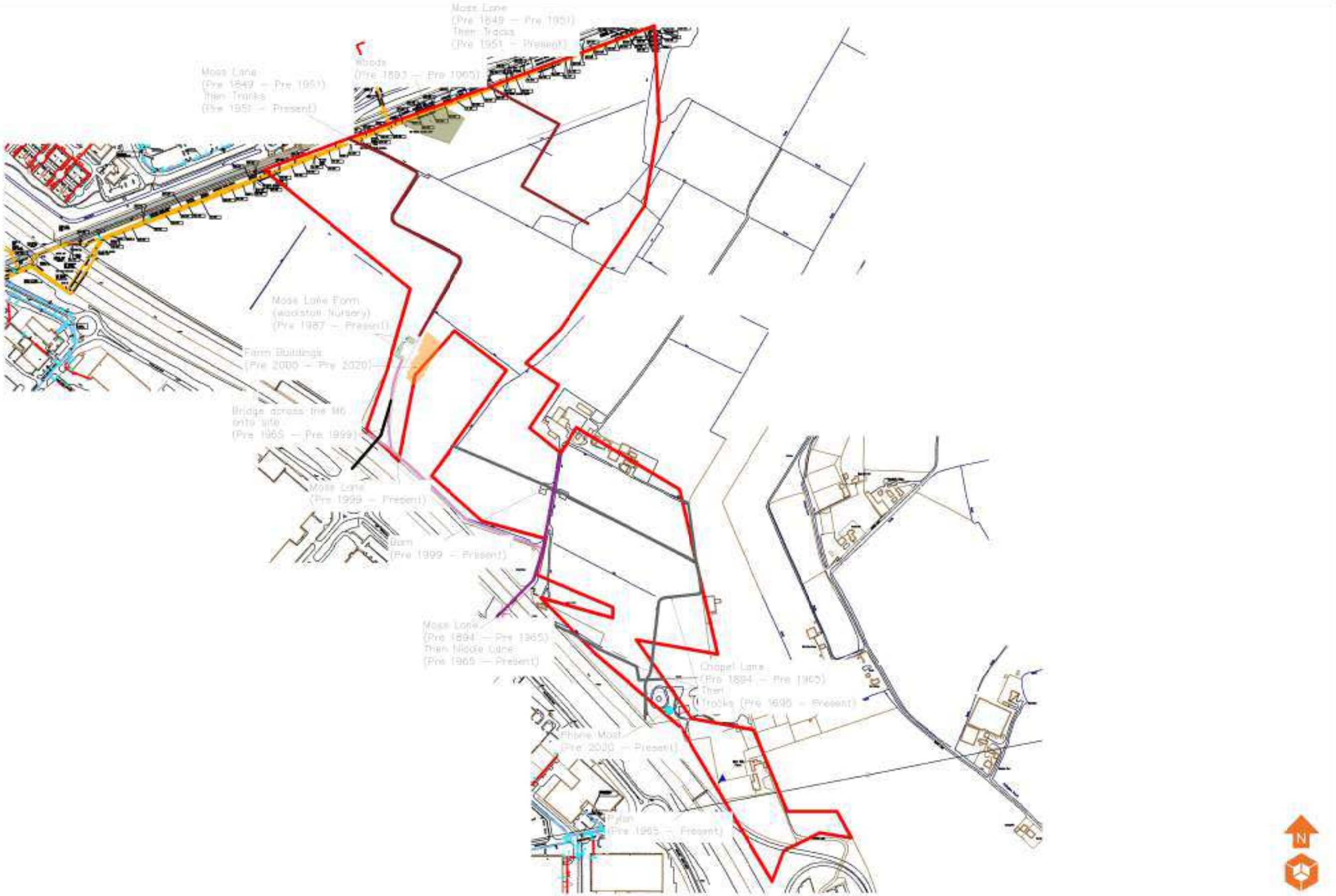

Historical Features

- Moss Lane (Pre 1849- Pre 1951) Then Tracks (Pre 1951-Present)
- Bridge across the M6 once site (Pre 1965- Pre 1999)
- Moss Lane (Pre 1999- Present)
- Moss Lane (Pre 1894- Pre 1965) Then Nicole Lane (Pre 1965- Present)
- Chapel Lane (Pre 1894- Pre 1965) Then Tracks (Pre 1936- Present)
- Woods (Pre 1893- Pre 1965)
- Moss Lane Farm (Woolston Nursery) (Pre 1987- Present)
- Farm Buildings (Pre 2000- Pre 2020)
- Barn (Pre 1999- Present)
- Pylon
- Phone Mast

Notes:

Client: WHR Propertys

Job No: 14-761

Date: 17.02.2021

Drawing No: 003

Scale: NTS

P1	REVA	17.02.2021	EB	SE
Phase	Issue	Date	Drawn	Checked

Job Title: Birchwood South, Warrington

Drawing Title: Historical Features Plan

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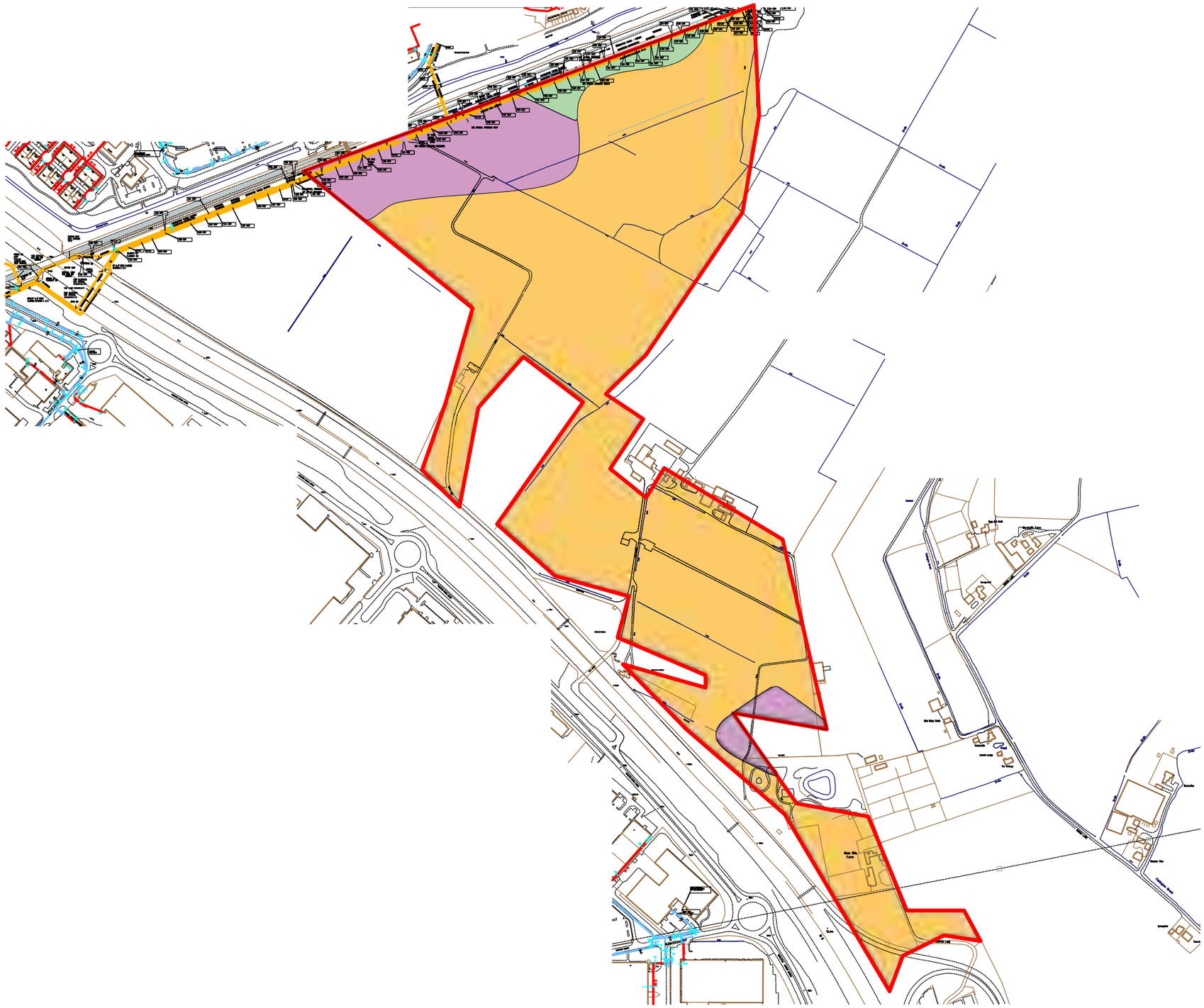

Underlying Geology

- Peat
- Glaciofluvial Sheet Deposits
- Glacial Till

Notes:

P1	REVA	17.02.2021	EB	SE
Phase	Issue	Date	Drawn	Checked

Client: WHR Propertys

Job No: 14-761

Date: 17.02.2021

Drawing No: 023

Scale: NTS

Job Title: Birchwood South, Warrington

Drawing Title: Underlying Geology Plan

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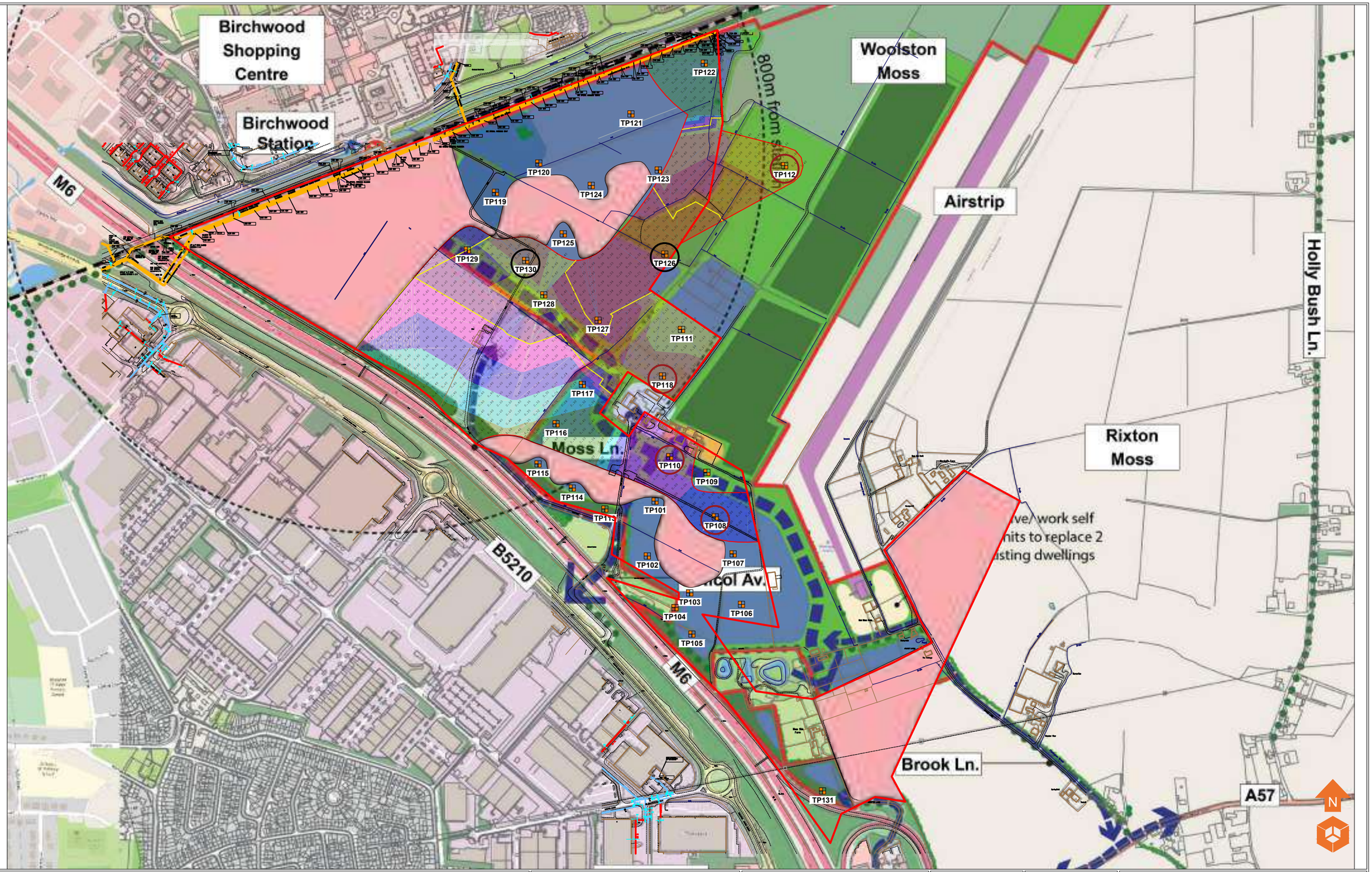

Location Symbols

- Approximate Trial Pit Location

Peat Thickness (m)

- Thickness of Peat 0.00 - 0.19m
- Thickness of Peat 0.20 - 0.39m
- Thickness of Peat 0.40 - 0.59m
- Thickness of Peat 0.60 - 0.79m
- Thickness of Peat 0.80 - 0.99m
- Thickness of Peat 1.00 - 1.19m
- Thickness of Peat 1.20 - 1.39m
- Thickness of Peat 1.40 - 1.59m
- Thickness of Peat >1.60m

- 0.00 Depth to Peat
- Made Ground Peat
- Depth of Peat not Proven
- Potential for peat to be present. Further Investigation required.

Notes:

Phase	Issue	Date	Drawn	Checked
P1	REVD	12.11.2021	EB	SE
P1	REVC	24.05.2021	EB	SE
P1	REVB	19.05.2021	CB	SE
P1	REVA	26.03.2021	HM	SE

Client: Patrick Properties

Job No: 14-761

Date: 12.11.2021

Drawing No: 014

Scale: NTS

Job Title: Birchwood South, Warrington

Drawing Title: Depth and Thickness of Peat Plan

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Trial Pit Log

TrialPit No: TP101
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365704.00 - 390044.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): Depth 2.10 — 2.00 × 0.70	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				0.50			Yellow brown fine to medium SAND.
▼ 1.50				1.30			Firm grey slightly gravelly CLAY with pockets of medium sand. Gravel is fine to coarse sub-angular to rounded of sandstone and mudstone.
				2.10			End of Pit at 2.10m

Trial Pit Photographs

Trial Pit 101

Trial Pit 101 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.50m bgl.

Stability: Stable.

Trial Pit Log

			TrialPit No TP102 Sheet 1 of 1
Project Name: Birchwood South	Project No. 14761	Co-ords: 365676.00 - 389966.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): Depth 2.15 — 2.00 × 0.70	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				0.60			Firm grey mottled yellow slightly gravelly CLAY with pockets of medium sand. Gravel is fine to coarse sub-angular to rounded of sandstone and mudstone.
▼ 1.80							
				2.15			End of Pit at 2.15m

1 2 3 4

Trial Pit Photographs

Trial Pit 102

Trial Pit 102 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.80m bgl.

Stability: Stable.

Trial Pit Log

TrialPit No: TP103
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365802.00 - 389860.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 2.50 × 0.75 Depth 2.40	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
							Orange silty fine to medium SAND.
				2.40			End of Pit at 2.40m

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Trial Pit Photographs

Trial Pit 103

Trial Pit 103 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP104
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365789.00 - 389821.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 2.50 x 0.70 Depth 2.30	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Black slightly silty sandy CLAY (TOPSOIL) with roots and rootlets.
				0.80			Firm grey very sandy CLAY.
				1.50			Orange silty fine to medium SAND.
				2.30			Light brown yellow fine to medium SAND.
							End of Pit at 2.30m

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Trial Pit Photographs

Trial Pit 104

Trial Pit 104 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP105
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365873.00 - 389770.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): Depth 2.50 — 2.00 × 0.70	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25			MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
							Light brown yellow fine to medium SAND.
				2.50			End of Pit at 2.50m

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Trial Pit Photographs

Trial Pit 105

Trial Pit 105 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP106
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365982.00 - 389886.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 2.50 x 0.70 Depth 2.50	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				1.30			Yellow grey brown silty fine SAND.
▼ 1.50							Grey brown gravelly medium to coarse SAND. Gravel is fine sub-rounded to rounded of mudstone and sandstone.
				2.50			End of Pit at 2.50m

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Trial Pit Photographs

Trial Pit 106

Trial Pit 106 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.50m bgl.

Stability: Stable.

Trial Pit Log

			TrialPit No TP107 Sheet 1 of 1
Project Name: Birchwood South	Project No. 14761	Co-ords: 365974.00 - 389970.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 2.50 x 0.70 Depth 2.60	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				0.50			Yellow grey brown silty fine SAND.
				1.00			Grey brown gravelly medium to coarse SAND. Gravel is fine sub-rounded to rounded of mudstone and sandstone.
▼ 1.40	1.40	HVP	72	1.40			Firm medium strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium rounded of sandstone and mudstone. (Becoming stiff high strength at 1.70m bgl, becoming very stiff very high strength at circa 2.60m bgl).
	1.70	HVP	110				
	2.00	HVP	127				
	2.30	HVP	131				
	2.60	HVP	155	2.60			End of Pit at 2.60m

1 2 3 4

Trial Pit Photographs

Trial Pit 107

Trial Pit 107 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.40m bgl.

Stability: Stable.

Trial Pit Log

TrialPit No: TP108
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365965.00 - 390039.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 2.50 × 0.70 Depth 2.90	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black gravelly clayey peat. Gravel is fine to medium angular to sub-rounded of brick, sandstone and mudstone with fragments of tile, glass and timber.
				0.60			Brown slightly gravelly fine SAND. Gravel is fine sub-rounded of sandstone and mudstone.
	1.00	HVP	62	1.00			Firm medium strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium rounded of sandstone and mudstone. (Becoming stiff high strength at circa 1.50m bgl).
	1.50	HVP	102				
	2.00	HVP	167	1.80			Very stiff very high strength brown mottled grey gravelly CLAY with occasional cobbles. Gravel is fine to medium rounded of sandstone and mudstone. Cobbles are sub-rounded of sandstone.
	2.50	HVP	161				
				2.90			End of Pit at 2.90m

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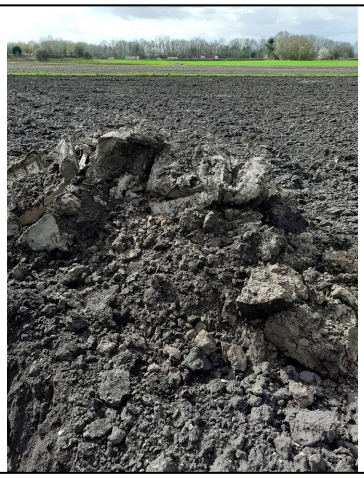
Trial Pit Photographs

Trial Pit 108



Trial Pit 108 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP109
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365933.00 - 390111.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 1.50 x 0.70 Depth 2.00	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				0.70			Firm black silty sandy CLAY with occasional rootlets.
							Yellow grey brown silty fine SAND.
	1.50	HVP	145	1.20			Stiff high strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium rounded of sandstone and mudstone.
				2.00			End of Pit at 2.00m

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Trial Pit Photographs

Trial Pit 109

Trial Pit 109 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP110
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365795.00 - 390163.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m):	Scale 1:30
Client: Patrick Properties Group		Depth 2.20	Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black gravelly clayey peat. Gravel is fine to medium angular to sub-rounded of brick, sandstone and mudstone with fragments of tile, glass and timber.
				0.80			
				0.90			Yellow grey brown silty fine SAND.
	1.00	HVP	54				Firm medium strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium rounded of sandstone and mudstone. (Becoming stiff high strength at circa 1.50m bgl).
	1.50	HVP	102				
				1.80			Light brown mottled grey very clayey fine SAND.
				2.20			End of Pit at 2.20m

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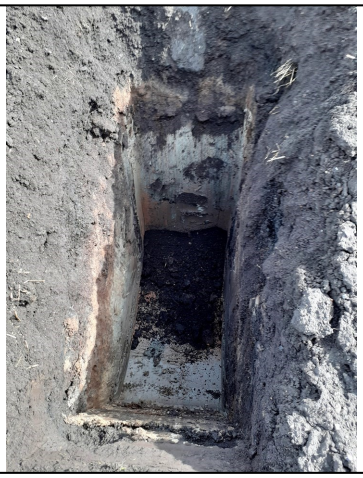
Trial Pit Photographs



Trial Pit 110

Trial Pit 110 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP111
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365829.00 - 390382.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 2.00 × 0.70 Depth 2.50	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Black gravelly clayey peat. Gravel is fine to medium angular to sub-rounded of brick, sandstone and mudstone with fragments of tile, glass and timber.
	0.80	B		0.70			Black silty fibrous PEAT.
▼ 1.30							Brown fibrous PEAT (Strong organic odour).
				1.40			Yellow mottled grey fine to medium SAND.
				2.50			End of Pit at 2.50m

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Trial Pit Photographs

Trial Pit 111

Trial Pit 111 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.30m bgl.

Stability: Stable.

Trial Pit Log

TrialPit No: TP112
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 366045.00 - 390716.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 2.00 x 0.70 Depth 2.40	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black gravelly clayey peat. Gravel is fine to medium angular to sub-rounded of brick, sandstone and mudstone with fragments of tile, glass and timber.
				0.40			Brown fibrous PEAT (Strong organic odour).
▼ 1.50							
				1.80			Yellow mottled grey fine to medium SAND.
				2.40			End of Pit at 2.40m

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Trial Pit Photographs

Trial Pit 112

Trial Pit 112 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.50m bgl.

Stability: Unstable.

Trial Pit Log

TrialPit No: TP113
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365661.00 - 390035.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m):	Scale 1:30
Client: Patrick Properties Group		Depth 2.00	Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				2.00			Yellow mottled grey fine to medium SAND. End of Pit at 2.00m

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Trial Pit Photographs

Trial Pit 113

Trial Pit 113 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP114
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365544.00 - 390060.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m):	Scale 1:30
Client: Patrick Properties Group		Depth 1.40	Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				0.40			Yellow mottled grey fine to medium SAND.
				1.40			End of Pit at 1.40m

Trial Pit Photographs

Trial Pit 114

Trial Pit 114 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP115
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365467.00 - 390129.00 Level:	Date 24/03/2021
Location: Warrington		Dimensions (m): 2.00 x 0.80 Depth 2.20	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				1.50			Yellow brown mottled grey slightly clayey fine to medium SAND. Gravel is fine to medium sub-angular to sub-rounded of mudstone and sandstone.
	2.00	HVP	94	2.20			Stiff high strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium rounded of sandstone and mudstone.
							End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 115

Trial Pit 115 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP116
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365546.00 - 390258.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m):	Scale 1:30
Client: Patrick Properties Group		Depth 2.20	Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			Black slightly gravelly silty CLAY (Topsoil). Gravel is fine sub-angular to sub-rounded of mudstone and sandstone.
				0.75			Black slightly fibrous PEAT with wood debris.
▼ 1.80	2.00	HVP	76	1.85			Yellow brown mottled grey fine to medium SAND with occasional gravel. Gravel is fine to medium sub-rounded of mudstone and sandstone.
				2.20			Stiff high strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium sub-rounded of sandstone and mudstone.
							End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 116

Trial Pit 116 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.80m bgl.

Stability: Stable.

Trial Pit Log

TrialPit No: TP117
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365603.00 - 390326.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): 3.00 x 0.70 Depth 2.40	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			Black slightly gravelly silty CLAY (Topsoil). Gravel is fine sub-angular to sub-rounded of mudstone and sandstone.
				0.70			Black slightly fibrous PEAT with wood debris.
1.70							Yellow brown mottled grey fine to medium SAND.
	1.80	HVP	101	1.70			Stiff high strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium rounded of sandstone and mudstone. (Becoming very stiff very high strength at circa 2.10m bgl).
	2.10	HVP	157				
				2.40			End of Pit at 2.40m

Trial Pit Photographs

Trial Pit 117

Trial Pit 117 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.70m bgl.

Stability: Stable.

Trial Pit Log

TrialPit No: TP118
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365733.00 - 390337.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m):	Scale 1:30
Client: Patrick Properties Group		Depth 2.30	Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Black gravelly clayey peat. Gravel is fine to medium angular to sub-rounded of brick, sandstone and mudstone with fragments of tile, glass and timber.
				0.75			Black fibrous PEAT.
				1.80			Brown fibrous PEAT (Strong organic odour).
	2.20	HVP	17	2.05			Yellow brown black slightly gravelly medium to coarse SAND. Gravel is fine sub-angular to sub-rounded of mudstone and sandstone.
				2.30			Very soft very low strength grey mottled brown CLAY.
							End of Pit at 2.30m

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Trial Pit Photographs

Trial Pit 118

Trial Pit 118 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No TP119
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365401.00 - 390655.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): Depth 2.00	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			MADE GROUND: Black silty gravelly clay. Gravel is fine to medium sub-angular to rounded of brick, sandstone and mudstone with fragments of glass, slate and pottery.
				1.00			Orange brown silty fine SAND.
				1.15			Yellow brown gravelly medium SAND. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
	1.50	HVP	124				Stiff high strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium sub-angular to sub-rounded of mudstone.
	2.00	HVP	127	2.00			End of Pit at 2.00m

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Trial Pit Photographs

Trial Pit 119

Trial Pit 119 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP120
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365426.00 - 390759.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): 2.50 × 0.70 Depth 2.45	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			Black slightly sandy slightly gravelly CLAY (TOPSOIL). Gravel is fine to medium sub-angular to sub-rounded of mudstone and sandstone.
				1.90			Yellow brown slightly gravelly fine SAND. Gravel is fine to medium sub-angular to sub-rounded of mudstone and sandstone.
				2.45			Grey mottled yellow slightly clayey sandy SILT.
							End of Pit at 2.45m

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Trial Pit Photographs

Trial Pit 120

Trial Pit 120 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP121
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365640.00 - 390851.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): 1.50 × 0.70 Depth 2.30	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				0.90			Orange slightly silty fine to medium SAND.
	1.00	HVP	108				Stiff high strength brown mottled grey CLAY with occasional gravel. Gravel is fine to medium sub-rounded of mudstone and sandstone.
	1.50	HVP	125				
	2.00	HVP	147				
				2.30			End of Pit at 2.30m

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Trial Pit Photographs

Trial Pit 121

Trial Pit 121 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP122
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365894.00 - 390987.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): 2.50 × 0.70 Depth 2.30	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				0.50			Brown orange fibrous PEAT.
				0.60			Grey gravelly fine to medium SAND. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
	1.00	HVP	74				Stiff high strength brown mottled grey slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
	1.50	HVP	103				
	2.00	HVP	99				
				2.30			End of Pit at 2.30m

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Trial Pit Photographs

Trial Pit 122

Trial Pit 122 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP123
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365844.00 - 390753.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): 2.00 × 0.70 Depth 2.00	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				0.80			Light brown silty fine SAND.
				0.90			Grey slightly silty sandy CLAY.
				1.10			Grey gravelly fine to medium SAND. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
	1.50	HVP	117				Stiff high strength brown mottled grey slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone. (Becoming very stiff very high strength at circa 2.00m bgl).
	2.00	HVP	156	2.00			End of Pit at 2.00m

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Trial Pit Photographs

Trial Pit 123

Trial Pit 123 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP124
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365615.00 - 390662.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): Depth 2.50 — 2.50 × 0.70	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.55			MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				1.00			Orange brown slightly silty fine SAND.
				1.50			Light brown fine SAND.
▼ 1.80	2.00	HVP	124	1.90			Light brown gravelly fine to medium SAND. Gravel is fine to medium sub-angular to sub-rounded of mudstone and sandstone.
				2.50			Stiff high strength brown mottled grey slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
							End of Pit at 2.50m

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Trial Pit Photographs

Trial Pit 124

Trial Pit 124 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 1.80m bgl.

Stability: Stable.

Trial Pit Log

TrialPit No: TP125
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365618.00 - 390647.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): Depth 2.40	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.50			MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				2.10			Light brown slightly gravelly fine SAND. Gravel is fine to medium sub-rounded of sandstone.
	2.30	HVP	168	2.30			Grey gravelly fine to medium SAND. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
				2.40			Very stiff very high strength brown mottled grey slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
							End of Pit at 2.40m

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Trial Pit Photographs

Trial Pit 125

Trial Pit 125 Spoil

Remarks: Complete.

Stability: Unstable side walls.

Trial Pit Log

TrialPit No: TP126
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365746.00 - 390517.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): 3.00 x 0.70 Depth 2.70	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone, brick and pottery.
	0.40	B		0.35			Black PEAT.
				0.60			Brown fibrous PEAT (Strong organic odour).
	1.00	B					
				2.70			End of Pit at 2.70m

Trial Pit Photographs

Trial Pit 126

Trial Pit 126 Spoil

Remarks: 1. Complete. 2. Depth of peat could not be identified due to limit of the excavator reach.

Stability: Stable.

Trial Pit Log

			TrialPit No TP127 Sheet 1 of 1
Project Name: Birchwood South	Project No. 14761	Co-ords: 365685.00 - 390395.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): 3.00 × 0.70 Depth 2.80	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				0.40			Brown fibrous PEAT (Strong organic odour).
				2.60			Grey light brown silty gravelly fine to medium SAND. Gravel is fine to medium sub-rounded of sandstone and mudstone.
				2.75			Light brown slightly gravelly fine to medium SAND. Gravel is fine to medium sub-rounded of sandstone and mudstone.
				2.80			End of Pit at 2.80m

Trial Pit Photographs

Trial Pit 127

Trial Pit 127 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP128
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365472.00 - 390471.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m):	Scale 1:30
Client: Patrick Properties Group		Depth 2.40	Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				1.75			Brown fibrous PEAT (Strong organic odour).
2.30 ▼				2.00			Grey light brown silty gravelly fine to medium SAND. Gravel is fine to medium sub-rounded of sandstone and mudstone.
				2.40			Light brown slightly gravelly fine to medium SAND. Gravel is fine to medium sub-rounded of sandstone and mudstone.
							End of Pit at 2.40m

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Trial Pit Photographs

Trial Pit 128

Trial Pit 128 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 2.30m bgl.

Stability: Stable.

Trial Pit Log

			TrialPit No TP129 Sheet 1 of 1
Project Name: Birchwood South	Project No. 14761	Co-ords: 365391.00 - 390526.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m): Depth 2.60	Scale 1:30
Client: Patrick Properties Group			Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				1.40			Brown fibrous PEAT (Strong organic odour).
				2.00			Grey light brown silty gravelly fine to medium SAND. Gravel is fine to medium sub-rounded of sandstone and mudstone.
				2.30			Light brown slightly gravelly fine to medium SAND. Gravel is fine to medium sub-rounded of sandstone and mudstone.
				2.40			Grey gravelly fine to medium SAND. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
				2.60			Firm brown mottled grey slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
							End of Pit at 2.60m

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Trial Pit Photographs

Trial Pit 129

Trial Pit 129 Spoil

Remarks: Complete.

Stability: Stable.

Trial Pit Log

TrialPit No: TP130
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 365524.00 - 390579.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m):	Scale 1:30
Client: Patrick Properties Group		Depth 1.75	Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Black slightly sandy slightly silty clay (Topsoil). Gravel is fine to medium sub-angular to sub-rounded of sandstone and brick with fragments of pottery.
				0.65			Black fibrous PEAT.
				1.75			Brown fibrous PEAT (Strong organic odour).
							End of Pit at 1.75m

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Trial Pit Photographs

Trial Pit 130

Trial Pit 130 Spoil

Remarks: 1. Complete. 2. Terminated due to unsafe conditions.

Stability: Stable.

Trial Pit Log

TrialPit No: TP131
Sheet 1 of 1

Project Name: Birchwood South	Project No. 14761	Co-ords: 366106.00 - 389477.00 Level:	Date 25/03/2021
Location: Warrington		Dimensions (m):	Scale 1:30
Client: Patrick Properties Group		Depth 2.00	Logged M. Jackson

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Black silty CLAY (TOPSOIL) with rootlets.
				0.70			Firm black slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone.
				1.00			Orange brown slightly silty fine SAND.
				1.90			Light brown slightly gravelly fine SAND with occasional cobbles. Gravel is fine to medium sub-rounded of sandstone. Cobbles are sub-rounded of sandstone.
				2.00			Firm brown mottled grey slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone and mudstone. End of Pit at 2.00m

1
2
3
4

Trial Pit Photographs

Trial Pit 131

Trial Pit 131 Spoil

Remarks: Complete.

Stability: Stable.

9. Noise Screening Assessment

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

NOISE SCREENING ASSESSMENT

on behalf of

PATRICK PROPERTIES WARRINGTON LTD.

for the site at

LAND SOUTH OF BIRCHWOOD, WARRINGTON

REPORT DATE: 26TH JULY 2021

REPORT NUMBER: 102615

Summary

Miller Goodall Ltd (MG) has, on behalf of Patrick Properties Warrington Limited, undertaken a feasibility study for the proposed mixed-use development at Land South of Birchwood, Warrington.

The study has considered the existing noise sources that are likely to impact on the proposed development to assess the feasibility of the site for both residential and commercial development. Noise and vibration measurements have been undertaken at the site to ascertain the likely existing noise levels. These measurements will be supported with available online data. The information within this report is to be used to inform the likely mitigation measures required for the proposed residential development at the site. Any proposed development would require a full noise impact assessment to include further noise monitoring and modelling at the site to ensure suitable noise standards are achieved.

In relation to the impact of the development on the noise environment, information is limited and significance will need to be assessed via detailed noise modelling and noise monitoring as part of a full noise impact assessment for the planning application. This assessment would include details in relation to noise mitigation measures considered necessary for the development. These may include:

- Consideration given to the location of specific noisy activities such as loading bays at the proposed employment/logistics and Commercial sites;
- Detailed consideration given to the design of the Business Parks in relation to the use of buildings for the screening and mitigation of the noise;
- Use of natural and formed bunds and barriers as mitigation for noise;
- The implementation of a Noise Management Plan; and
- The implementation of a Construction and Environmental Management Plan (CEMP).

The study concludes that noise should not be a barrier to the currently proposed development, however noise and vibration assessments are required to ensure good acoustic design in relation to the proposed development.

Record of changes

Prepared By	Jo Miller MIOA	Reviewed By	David Sproston MIOA MCIEH
Signed	[redacted]	Signed	[redacted]
Date	26/07/2021	Date	26/07/2021

Version	Date	Change	Initials
1	26/07/2021	First Issue	JM

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Contents

1 Introduction

1.1 This noise assessment report is submitted in support of the promotion of land through the local plan for a proposed development of land south of Birchwood.

1.2 The report provides a review of the potential for noise impact from existing sources in proximity to the proposed development site and assesses the potential impact of the proposed development on the local noise environment.

1.3 The noise assessment shall consider the impact of the development on the surrounding noise-sensitive properties. The assessment is considered as a strategic screening assessment, rather than a full detailed noise assessment. The assessment shall consider likely noise impacts of the developments and provide guidance in relation to future detailed noise assessments and the likely areas of mitigation which may be necessary.

1.4 The assessment shall also consider the existing noise levels on the proposed future development. Again, the assessment is considered as a strategic screening assessment to identify whether the land is suitable for the proposed uses. The assessment shall consider likely noise impacts of the existing area and provide guidance in relation to future detailed noise assessments and the likely areas of mitigation which may be necessary.

1.5 Noise impacts need to be considered as part of the planning process to ensure the new development does not create adverse noise impacts on existing receptors.

2 Site Description

2.1 The site sits within the administrative boundary of Warrington Borough Council (WBC).

2.2 The site is located approximately 4.7 km to the east of Warrington city centre and 2.9 km to the south-east of the M6/M62 interchange.

2.3 The land in review has been sub-divided into several land areas, termed ‘Sites’. These Sites, broadly, extend from Junction 21, up the M6 boundary and cut into the land into a northerly direction to meet the northern boundary in the centre of the land. Each site currently comprises arable land.

2.4 The northern boundary of the land is bound by the Liverpool to Manchester railway line. Open land borders the development land to the east. Junction 21 of the M6 is to the south with open land and a canal beyond. The M6 traverses on a southeasterly to northwesterly direction and bounds Site’s 6, 7 and 13 to the west. To the west of the M6 are commercial uses along Woolston Grange Avenue, with residential housing and the Warrington urban area beyond. Both the M6 and M62 are heavily trafficked, and consequently road traffic from these roads is likely to be the dominant source of existing environmental noise in the area.

3 Proposed Development

3.1 The proposed development would be a mixed-use development and may include residential use, logistics, warehousing and an upgrade of the existing Birchwood Rail Station. The purpose of this assessment is to assess the feasibility of the development land for any of the above uses. Residential use is the most noise-sensitive use proposed.

3.2 The development includes the following:

- 3 parcels of land for Employment/logistics/commercial
- 1 parcel of land for Employment/logistics/commercial/studio
- 1 parcel of land for Employment
- 1 parcel of land for Residential Care and
- Public open space and woodland areas.

3.3 An early design for the site has been prepared, shown in Appendix 1 which shows that the development is split into several development parcels. This initial design places the commercial uses along the western and southern boundaries of the site. The residential uses are located approximately 600 m to the east of the M6.

3.4 At this stage, no detailed assessment has been undertaken to understand what the potential vehicle generation and routing may be from the development proposals. However, given the development size, an assumption can be made that the total vehicle generation will likely be well above that required for a detailed noise assessment, and that an Environmental Impact Assessment would be required.

4 Policy Context

4.1 Noise Policy Statement for England

4.1.1 The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse effects on health and quality of life;*
- *mitigate and minimise adverse effects on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

4.1.2 The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and the quality of life occur.

4.1.3 The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the Statement). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case:

[1] Noise Policy Statement for England, Defra, March 2010

"…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development".

4.1.4 Importantly, the NPSE goes on to state:

"This does not mean that such adverse effects cannot occur".

4.1.5 The Statement does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that:

"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available"

4.1.6 It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

4.2 National Planning Policy Framework

4.2.1 The National Planning Policy Framework (NPPF[2]) initially published in March 2012, was updated in July 2021. One of the documents that the NPPF replaces is Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise"[3].

4.2.2 The revised NPPF advises that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives). One of these is an environmental objective which is described in par. 8 (c):

"To protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

4.2.3 At par. 174 we are advised that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."

4.2.4 Par. 185 goes on to state:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions

[2] National Planning Policy Framework, Ministry of Housing, Communities and Local Government, July 2021

[3] Planning Policy Guidance 24: Planning and Noise, DCLG, September 1994

and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

4.3 Planning Practice Guidance – Noise

4.3.1 As of March 2014, a Planning Practice Guidance[4] for noise was issued which provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

4.3.2 In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

"…the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation".

4.3.3 Examples of these factors include:

- The source and absolute noise level of the source along with the time of day that it occurs;
- Where the noise is non-continuous, the number of noise events and pattern of occurrence;
- The frequency content and acoustic characteristics of the noise;
- The effect of noise on wildlife;
- The acoustic environment of external amenity areas provided as an intrinsic part of the overall design;
- The impact of noise from certain commercial developments such as night clubs and pubs where activities are often at their peak during the evening and night.

4.3.4 The PPG also provides general advice on the typical options available for mitigating noise. It goes on to suggest that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

"Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed".

[4] Planning Practice Guidance – Noise, http://planningguidance.planningportal.gov.uk/blog/guidance/noise/, 06 March 2014

4.3.5 The PPG was amended in December 2014 to clarify guidance on the potential effect of noise from existing businesses on proposed new residential accommodation. Even if existing noise levels are intermittent (for example, from a live music venue), noise will need to be carefully considered and appropriate mitigation measures employed to control noise at the proposed accommodation.

4.4 Local Planning Policy

Warrington Local Plan Core Strategy

4.4.1 The expansion of Port Warrington has been a long standing strategic priority for WBC and the adopted Warrington Local Plan Core Strategy (WLPCS) has established the principal of expansion of the Port Warrington into the Green Belt. The WLPCS states within Policy CS2 - 277ha of land for business, general industrial and storage/distribution should be made available in Warrington to 2027 in order to support growth of the local and sub-regional economy. The strategy notes that major warehousing and distribution developments should ideally be located away from areas sensitive to heavy vehicle movement.

Warrington Preferred Options Local Plan

4.4.2 The Preferred Options Local Plan for Warrington has identified that it will, alongside the land allocated at M56 Junction 9, meet the majority of Warrington's employment land requirement of 381ha over the next 20 years (Policy W1) and open up Port Warrington to "*become one of the most important employment areas in the North West region*." It notes that the Port will provide a key distribution centre of c. 200,000 sqm and has the potential to become a multi-modal Port.

5 Acoustic Standards and Guidance

5.1 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

5.1.1 This standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999)[5]. These guideline noise levels are shown in Table 1, below.

[5] World Health Organisation Guidelines for Community Noise, 1999

Table 1: BS 8233: 2014 guideline indoor ambient noise levels for dwellings

Location	Activity	Daytime 07:00 to 23:00	Night-time 23:00 to 07:00
Living Room	Resting	35 dB $L_{Aeq,16hr}$	-
Dining room/area	Dining	40 dB $L_{Aeq,16hr}$	-
Bedroom	Sleeping (daytime resting)	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

5.1.2 BS 8233:2014 advises that:

> *"regular individual noise events…can cause sleep disturbance. A guideline value may be set in terms of SEL[6] or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values".*

5.1.3 BS 8233:2014 adopts guideline external noise values provided in WHO for external amenity areas such as gardens and patios. The standard states that it is "*desirable*" that the external noise does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ whilst recognising that development in higher noise areas such as urban areas or those close to the transport network may require a compromise between elevated noise levels and other factors that determine if development in such areas is warranted. In such circumstances, the development should be designed to achieve the lowest practicable noise levels in external amenity areas.

5.2 World Health Organisation (WHO) Guidelines for Community Noise 1999

5.2.1 The WHO Guidelines 1999 recommends that to avoid sleep disturbance, indoor night-time guideline noise values of 30 dB L_{Aeq} for continuous noise and 45 dB L_{AFmax} for individual noise events should be applicable. It is to be noted that the WHO Night Noise Guidelines for Europe 2009[7] makes reference to research that indicates sleep disturbance from noise events at indoor levels as low as 42 dB L_{AFmax}. The number of individual noise events should also be taken into account and the WHO guidelines suggest that indoor noise levels from such events should not exceed approximately 45 dB L_{AFmax} more than 10 – 15 times per night.

5.2.2 The WHO document recommends that steady, continuous noise levels should not exceed 55 dB L_{Aeq} on balconies, terraces and outdoor living areas. It goes on to state that to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB L_{Aeq}.

[6] Sound exposure level or L_{AE}

[7] WHO Night Noise Guidelines for Europe 2009

5.3 BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'

5.3.1 BS 4142: 2014[8] provides guidance on the assessment of the likelihood of complaints relating to noise from industrial sources. It replaced the 1997 edition of the Standard in October 2014. The key aspects of the Standard are summarised below.

5.3.2 The standard presents a method of assessing potential noise impact by comparing the noise level due to industrial sources (the Rating Level) with that of the existing background noise level at the nearest noise sensitive receiver in the absence of the source (the Background Sound Level).

5.3.3 The Specific Noise Level - the noise level produced by the source in question at the assessment location - is determined and a correction applied for certain undesirable acoustic features such as tonality, impulsivity or intermittency. The corrected Specific Noise Level is referred to as the Rating Level.

5.3.4 In order to assess the noise impact, the Background Sound Level is arithmetically subtracted from the Rating Level. The standard states the following:

- *Typically, the greater this difference, the greater the magnitude of the impact,*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context,*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context,*
- *The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.*

5.3.5 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

> *"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*

5.3.6 The 2014 edition of BS 4142 also introduces a requirement to consider and report the uncertainty in the data and associated calculations and to take reasonably practicable steps to reduce the level of uncertainty.

5.4 BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings (Part 1: Vibration sources other than blasting)

5.4.1 BS 6472-1: 2008 *Guide to evaluation of human exposure to vibration in buildings – Part 1 Vibration sources other than blasting*, provides general guidance on human exposure to building vibration in the range of 0.5 Hz

[8] BS 4142:2014 Methods for rating and assessing industrial and commercial sound

to 80 Hz. The standard sets out the measurement methodology procedure to be used, including suggested measurement positions, the evaluation methods and the reporting and information to be included in a report.

5.4.2 The standard presents the concepts of vibration dose value (VDV) and estimated vibration dose value (eVDV) as the appropriate measurement parameters. Where the vibration is continuous and does not vary in its magnitude over time, the eVDV may be used to approximate the VDV value. Where the vibration is time varying such as is the case with trains passing by a given location, this approach is not recommended.

5.4.3 The human response to vibration exposure varies depending upon the displacement, the frequency, how it varies over time, and the duration of exposure. The calculation of VDV incorporates these factors and includes a frequency weighting to give a better correlation with human response than say root mean squared (RMS) methods, where the vibration is of short duration and of high amplitude.

5.4.4 The units of measurement of VDV are metres per second raised to the power of minus 1.75 (or $ms^{-1.75}$).

5.4.5 The standard provides a table of recommended vibration dose values with which the estimated daytime 16 hour and night-time 8 hour dose values are to be assessed to establish the likelihood of adverse comment. These values are reproduced in Table 2 below.

Table 2: Likelihood of adverse comment to vibration in residential buildings

Location	Low Probability of Adverse Comment*	Adverse Comment Possible	Averse Comment Probable**
Residential Buildings (07:00 to 23:00hrs)	0.2 to 0.4 $ms^{-1.75}$	0.4 to 0.8 $ms^{-1.75}$	0.8 to 1.6 $ms^{-1.75}$
Residential Buildings (23:00 to 07:00hrs)	0.1 to 0.2 $ms^{-1.75}$	0.2 to 0.4 $ms^{-1.75}$	0.4 to 0.8 $ms^{-1.75}$
* Below these ranges adverse comment is not expected ** Above these ranges adverse comment is very likely The above values apply to both vertical and horizontal vibration using appropriate frequency weightings.			

5.5 Consultation

5.5.1 No consultation with the local planning authority has been undertaken for this feasibility study. Should the proposed development proceed to a planning application, the proposed noise assessment methodology should be discussed with the relevant environmental health practitioners at WBC to ensure all matters are suitably addressed for any subsequent noise assessment submitted to WBC Planning.

6 Existing Noise Environment

6.1 The properties identified are likely to be impacted by existing noise sources in the area to varying extents, including ;

- Noise from the Manchester to Liverpool railway line, which includes existing freight and passenger traffic;
- Noise from existing industrial and commercial premises to the north and west of the site, including; warehouse activities, fork lift trucks, loading and unloading and HGV movements which is permitted to operate 24 hours;
- Noise from the existing road network, including mainly the M6 motorway to the west of the site;
- Aircraft noise from both Liverpool and Manchester Airport; and

6.2 Noise Mapping

6.2.1 Environmental noise mainly consists of noise from transport sources, such as road, rail and aviation. Department for Environment, Food and Rural Affairs (DEFRA) is responsible for creating noise maps and drawing up Action Plans under the Environmental Noise (England) Regulations 2006 (as amended), which requires Defra to:

- adopt noise maps which show people's exposure to environmental noise;
- adopt action plans based on the results of noise mapping
- aims to preserve environmental noise quality where it is good; and
- provides information to the public on environmental noise and its effects.

6.2.2 Noise mapping has been undertaken by Department of Environment Food and Rural Affairs (DEFRA) in 2017. Maps have been provided for main noise sources including road and rail traffic. The noise map for the area is shown for road traffic noise in Appendix 2. The results show the predicted $L_{Aeq,16hour}$ results around the site, taken at a grid height of 4 m.

6.3 Road Traffic Noise

6.3.1 The main existing road traffic noise source which has the potential to impact on the site is from the M6 (DEFRA Maps in Appendix 2a), along with traffic noise from A57 Manchester Road. Road traffic noise from Moss Lane, Brook Lane and Juniper Lane within the site all have minimal potential to impact on the site. All parcels of land are likely to be impacted by the road traffic noise from the M6. These are areas where the road traffic noise levels are predicted to exceed 55 dB $L_{Aeq,16hour.}$

6.3.2 The road network in this area is a significant noise source for the area and further assessments would be needed to ensure that national noise standards are not exceeded. The assessment would need to include the potential noise from road traffic, and the provision of mitigation measures to protect future residents from noise is likely to be required. The mitigation may be in the form of:

- Suitable buffer zones between noise sources and proposed residential developments;
- The use of noise bunds and barriers to protect future residents from noise; and
- Orientation of properties to provide the most protection to noise sensitive areas, such as bedrooms and private garden areas.

6.4 Railway Noise

6.4.1 Results of the noise mapping produced on behalf of DEFRA for the railway identify that railway noise is only significant at the northern parcel of land close to the railway line (Appendix 2b).

6.5 Measurements of Existing Noise Sources

6.5.1 A full baseline noise survey has not been undertaken at the site, however short term noise and vibration measurements around the site have been undertaken to get a baseline of the likely noise levels.

6.5.2 Daytime noise and vibration measurements have been undertaken at a number of locations (N1-7) and V1 and V2 identified in Appendix 3 in accordance with BS 7445-1: 2003[9] by Paul Bentley and Will Bladon of Miller Goodall Ltd. The calibration of the sound level meter was checked before and after measurements with negligible deviation (<0.1 dB). Details of the equipment used are shown in Table 3, below.

Table 3: Noise and Vibration Monitoring Equipment.

Equipment Description	Type Number	Manufacturer	Serial No.	Date Calibrated	Calibration Certification Number
Class 1[10],[11] Integrating Real Time 1/3 Octave Sound Analyser	NOR 140	Norsonic	1407510	13/12/2019	473910536
Microphone	NOR 1225	Norsonic	384687	15/01/2021	n/a*
Class 1 Calibrator[12]	NOR 1251	Norsonic	34123	20/07/2020	04743/2
Class 1[13],[14] Integrating Real Time 1/3 Octave Sound Analyser	NOR 140	Norsonic	1406017	22/10/2019	U33164
Microphone	NOR 1225	Norsonic	358159	22/10/2019	33163
Class 1 Calibrator[15]	Type 4231	Brüel & Kjær	2478249	20/07/2020	04743/1
Vibration monitoring equipment	V900	Vibrock	2053	04/01/2021	01212053

6.5.3 Specific, background and ambient noise monitoring was undertaken at the times specified in Table 3, below. Weather conditions were determined both at the start and on completion of the survey. There were no abnormal traffic conditions (such as road works, accidents or speeds restrictions) noted on nearby roads on the survey date. It is, therefore, considered that local conditions were appropriate for environmental noise measurements.

[9] BS 7445-1: 2003 Description and measurement of environmental noise - Part 1: Guide to quantities and procedures

[10] IEC 61672-1 (2002) Electroacoustics – Sound level meters Part 1: Specifications

[11] IEC 61260 (1995) Electroacoustics – Octave-band and fractional-octave-band filters

[12] IEC 60942 (2003) Electroacoustics – Sound calibrators

[13] IEC 61672-1 (2002) Electroacoustics – Sound level meters Part 1: Specifications

[14] IEC 61260 (1995) Electroacoustics – Octave-band and fractional-octave-band filters

[15] IEC 60942 (2003) Electroacoustics – Sound calibrators

Table 4: Survey dates, times and weather conditions

Type	Measurement Location	Date	Time	Weather conditions
Vibration Noise	V1 and V2 N1 – N6 and N99	14/07/2021	11:00 – 16:42	Clear Skies, dry, 20 ℃, gentle breeze from north-west 1 – 3 ms^{-1}

6.5.4 Noise measurements were taken to establish an estimate of the existing ambient and background sound levels in the area. More detailed noise monitoring would be required to support a full noise assessment for the site.

6.5.5 The noise and vibration measurement locations are detailed below and indicated on Appendix 3.

- V1 and N1 - Approximately 23 m south of the railway line and Birchwood Station
- V2 and N7 - Approximately 23 m south of the railway line
- N2 - approximately 290 m north-east of the motorway at the location of the rear of Woolston nursery
- N3 - approximately 360 m north-east of the motorway at the location of the rear of Hens Haven
- N4 - approximately 40 m north-east of the motorway at the location on Moss Lane
- N5 - approximately 85 m north-east of the motorway
- N6 - approximately 455 m north-east of the motorway at the corner of Brook Lane

6.5.6 The noise sources within the vicinity of the measurement locations are summarised in Table 5, below:

Table 5: Description of noise sources affecting the site

Noise Measurement Location	Noise Sources
N1	Dominant source M6 motorway, tannoy occasionally audible at station. Mainly inaudible against background. Passing trains.
N2	Noise from trains arriving and alarms sound on doors. Very little brake squeak/squeal. Hissing noise from pressure vent possibly. Train departing and pressure release from brakes. Noise from high speed trains and helicopter noise.
N3	Motorway noise dominant, birdsong, farmyard animals, mainly chickens and cockerels.
N4	Motorway noise dominant. Grass cutting on field adjacent from tractor passing by (short duration).
N5	Construction noise audible but not affecting measured noise level which is dominated by the M6
N6	Motorway noise dominant, some birdsong.

6.6 Noise Monitoring Results

6.6.1 A summary of the broadband measurement data is provided in Table 6 below. All data are sound pressure levels in dB re 20 μPa. The noise monitoring was carried out at locations up-wind of the M6 and consequently, a cautious approach should be taken when placing reliance on the results, as, under typical conditions (i.e. a

south-westerly wind) road traffic noise from the M6 can be expected to be higher, and comparable to that predicted in the DEFRA noise mapping exercise.

Table 6: Summary of noise measurements

Measurement Location	Start Time (hh:mm:ss)	Duration (mm:ss)	$L_{Aeq,T,\ 5\ mins}$ (dB)	Overall L_{AFmax} (dB)	$L_{AF10,5\ mins}$ (dB)	$L_{AF90,5\ mins}$ (dB)
N1	11:02:24	9:00	60.5	69.3	47.2	57.2
	11:12:32	2:27	61.4	65.5	43.8	60
	11:15:01	14:58	61.5	68.7	48.9	58.6
	12:30:23	14:36	59.8	69.7	45.1	56.3
	12:45:01	14:58	59.3	74.5	44.0	56
	15:00:01	14:58	57.3	70.3	58.7	55.4
	15:25:22	15:03	63.2	69.8	64.9	61
N2	11:33:36	15:05	60.6	61.9	61.4	59.8
	14:13:10	15:02	66.5	73.1	67.8	64.9
	15:50:01	9:58	58.6	61.2	59.5	57.6
N3	14:23:08	6:51	60.2	63.7	54.2	58.7
	14:30:01	14:23	60	65.3	50.8	58.2
	12:03:14	15:02	62.4	67.4	63.8	60.5
N4	13:45:43	14:16	65.1	76	66.7	63.2
	11:07:31	15:05	67	72.6	68.6	65
N5	15:15:01	2:59	58	62	48.0	56.5
	10:43:30	15:05	65.8	69.9	67.2	64.2
	13:25:02	15:04	57	64.7	58.6	54.7
N6	15:00:01	14:58	57.3	70.3	48.8	55.4
	12:42:38	15:04	61.5	70.1	63	59.2
	16:24:52	15:02	60.9	73	63	57.4
N7	11:45:01	14:58	58.5	82.1	53.1	52.1
	12:00:01	14:58	56.5	73.4	47.9	52.6
	13:15:01	14:58	57.3	79.3	52.8	52.4
	13:30:01	14:58	55.9	72.7	45.1	52.9

6.6.2 A full environmental noise surveys has not been undertaken at this stage of the assessment. It is however recommended as part of the full noise assessment that a background noise survey is agreed with the Local Authority and undertaken as part of the assessment. Given the potential for 24 hour/7 day uses within the proposed commercial developments, long-term day and night surveys are suggested.

6.6.3 It can be seen from Table 6 and Appendix 2 that the noise levels in the area are dominated by noise from the motorway and from the railway line. The M6 at this location lies at grade or higher than the site and hence is the main noise source. The information provides an indication of the most sensitive areas which may be impacted from the future proposed development, however as previously stated additional noise monitoring would be required as part of the full noise impact assessment.

6.7 Vibration Monitoring Results

6.7.1 Short-term measurements of vibration were undertaken on 14th July 2021 using instrumentation calibrated to traceable standards to obtain an indicative vibration level at the closest likely receptors. The vibration monitoring locations are shown in Appendix 3 and were approximately 23 m from the nearside railway tracks.

6.7.2 The tri-axial vibration monitor was placed on solid compacted ground using the sensor's built-in 2 inch metal spikes. The results are considered representative of vibration levels at the ground floor of the building closest to and most exposed to ground-borne vibration from passing trains. Vibration measurements were carried out in three orthogonal axis (V-vertical, L-longitudinal, T-transverse), with the longitudinal axis of the vibration monitor aligned to be perpendicular to the railway tracks.

6.7.3 The full data set is held on file and can be provided on request. It demonstrates that the highest levels of vibration were measured in the vertical (V) axis when a train passed.

6.7.4 Table 7 summarises the results of the vibration monitoring undertaken at V1 and V2

Table 7: Summary of measured Vibration Dose Values V1 and V2

Vibration Monitoring Position	Period	Date	VDV ($ms^{-1.75}$)	
			Max	With x2 transfer function
V1	Daytime	14/07/2021 (12:29-12:59 hrs)	0.009	0.018
V2		14/07/2021 (13:09-13:44 hrs)	0.009	0.018

7 Vibration Assessment

7.1.1 The results of the vibration monitoring summarised in Table 7 show that the measured VDV values are no higher than 0.009$ms^{-1.75}$ in any one axis, which when the transfer function is added is a low probability of adverse comment for ground-borne vibration.

8 Impact of existing noise on the Proposed Development

8.1 The main areas of the development which are likely to be impacted by noise are the proposed Residential or Care areas to the north of the site adjacent to the railway line and any noise sensitive elements of the employment/logistics and commercial areas of the site.

8.2 Residential/Care areas

8.2.1 The noise monitoring results and noise maps have been assessed against the ProPG noise risk levels to determine the potential effect of noise on the proposed site without mitigation measures. The risk level has been determined based on the measured daytime noise levels at the monitoring positions.

8.2.2 The results indicate that at the monitoring positions the noise levels exceed the guideline values for ProPG, and therefore careful design of the site will be required. The monitoring was purely undertaken to obtain a guide of the levels of noise on the site. No night-time noise measurements have been undertaken to date.

8.2.3 Noise from the road traffic and rail traffic around the site are likely to result in an adverse impact in relation to noise and therefore would need to be addressed as part of the noise assessment for the site and mitigation provided for this area.

Table 8: ProPG Noise Risk Level Assessment

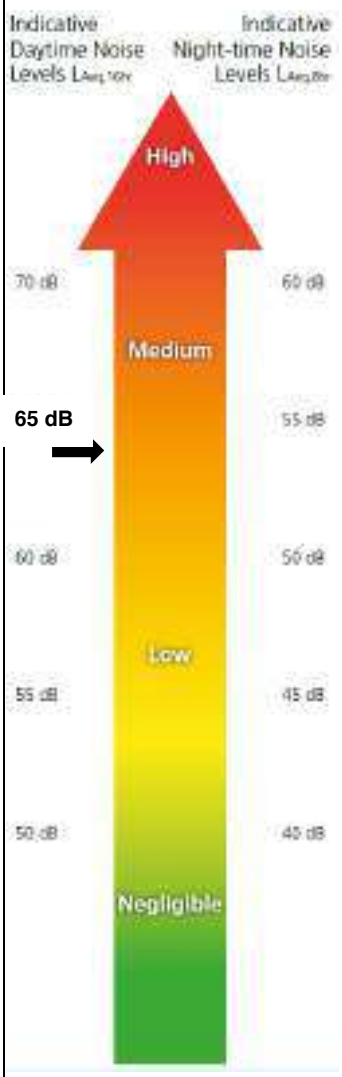
Noise Risk Assessment	Potential Effect Without Noise Mitigation	Pre-Planning Application Advice
	Increasing risk of adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.
		As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.
		At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
	No Adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.

Table Notes:

a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is not dominant.

8.2.4 As can be seen in Table 8 above, the noise levels measured at the site indicate “an increased risk of adverse effect”, however as previously stated these levels are a short-term indication of the noise levels for the site and do not include night-time levels.

8.2.5 Careful design of the site would be required to ensure the target noise levels are achieved. The following acoustic mitigation principals will be followed as part of the full design of the proposed development:

- Provision of suitable buffer zones between the main noise sources and noise sensitive receptors;
- Provision of noise bunds and barriers between noise sources and noise sensitive receptors;
- Location of the main noise sources to ensure maximised benefit from proposed buildings, barriers and bunds;
- Use of best practical means to control noise sources;
- Provision of a Construction Environmental Management Plan (CEMP) to control construction noise; and noise management plan to control unnecessary noise sources.

9 Impact of Noise from the Proposed Development

9.1 Employment/Logistics/Commercial and Studio Developments

9.1.1 The employment/logistics/commercial and studio developments are likely to include a number of noise sources, details of which are not currently available, however they are likely to include:

- Noise during the construction phase;
- Noise from loading/unloading of HGV's at the site;
- Operational noise from road vehicle movements, and activities in and around the warehouses; and
- Off-site road vehicle movements.

9.1.2 The noise sources identified are likely to include the loading/unloading of HGV's and light vehicle movements and noise from plant and machinery. These noise sources have as yet not been fully identified or assessed as a result of the early nature of this application. It is recommended that once details of the application are known the noise sources are included within a noise modelling package to predict the impact to the closest noise sensitive receptors. The modelling will also include topographical information to ensure the model takes account of all the features of the area.

9.2 Road Traffic Noise

9.2.1 Off-site noise associated with the proposed development including; HGV movements and vehicles associated with the use of the site are not know at this stage.

9.2.2 A future noise assessment of the transport infrastructure for sites will consider the impact of increased road traffic from the site and associated industrial/commercial park on the local receptors.

9.3 Construction Noise and Vibration Impacts

9.3.1 It is common for the control of construction noise, vibration and dust emission to be addressed by the application of Best Practicable Means (BPM) and detailed within a Construction and Environmental Management Plan (CEMP). The impact of construction noise from a development of this size is likely to be the main noise impacting on existing noise sensitive receptors, albeit over a relatively short period of time.

9.3.2 Prior to commencement of works, a quantitative noise impact assessment using guidance in BS 5228[16] on site may also be required but in our experience is usually unnecessary, (unless there are nearby high risk or noise sensitive receptors) provided a robust CEMP is in place and agreed upon by the Local Authority.

9.3.3 WBC are likely to have their own recommended wording for planning conditions relating to the control of noise and vibration from construction works.

9.4 Noise Sensitive Receptors around the Proposed Development Site

9.4.1 There are a number of existing noise sensitive receptors located around the proposed Port Warrington development. The closest of these are identified in Appendix 4 and include:

- Residential Property Woolstone Nursery, Moss Lane (NSR 1)
- Residential property off Nicol Avenue, site of Hens Haven (NSR 2)
- Residential property off Nicol Avenue, east of Hens Haven (NSR 3)
- Moss Lane Farm, Off Brook Lane, (NSR 4)
- Residential Property off Juniper Lane (NSR 5)
- Residential property north of Brook Lane (NSR 6)
- Residential property south of Brook Lane (NSR 7)
- Residential property north of Brook Lane (NSR 8)
- Residential property north the railway line, Woodhouse Close (NSR 9)

10 Summary and Conclusions

10.1 A noise screening assessment has been carried out to assess the impact of the expansion of Port Warrington on existing noise sensitive receptors.

10.2 It is recommended that;

- A detailed noise assessment would be required as part of a full planning application for the site.
- Noise from transportation sources around the site would need to be considered as part of the detailed masterplan for the site and considered as part of the planning submission which is likely to require an Environmental Impact Assessment.
- Noise from industrial and commercial sources located around the periphery of the site would need to be assessed in more detail as part of a detailed planning submission for the site.
- The use of best practicable means and the latest technology should be considered at all stages, such that the design and operation of the site reduces the likelihood and level of impact noise to a minimum.
- Any proposed residential areas would need to be carefully considered as part of the design process to ensure they are not impacted by existing and proposed noise sources.

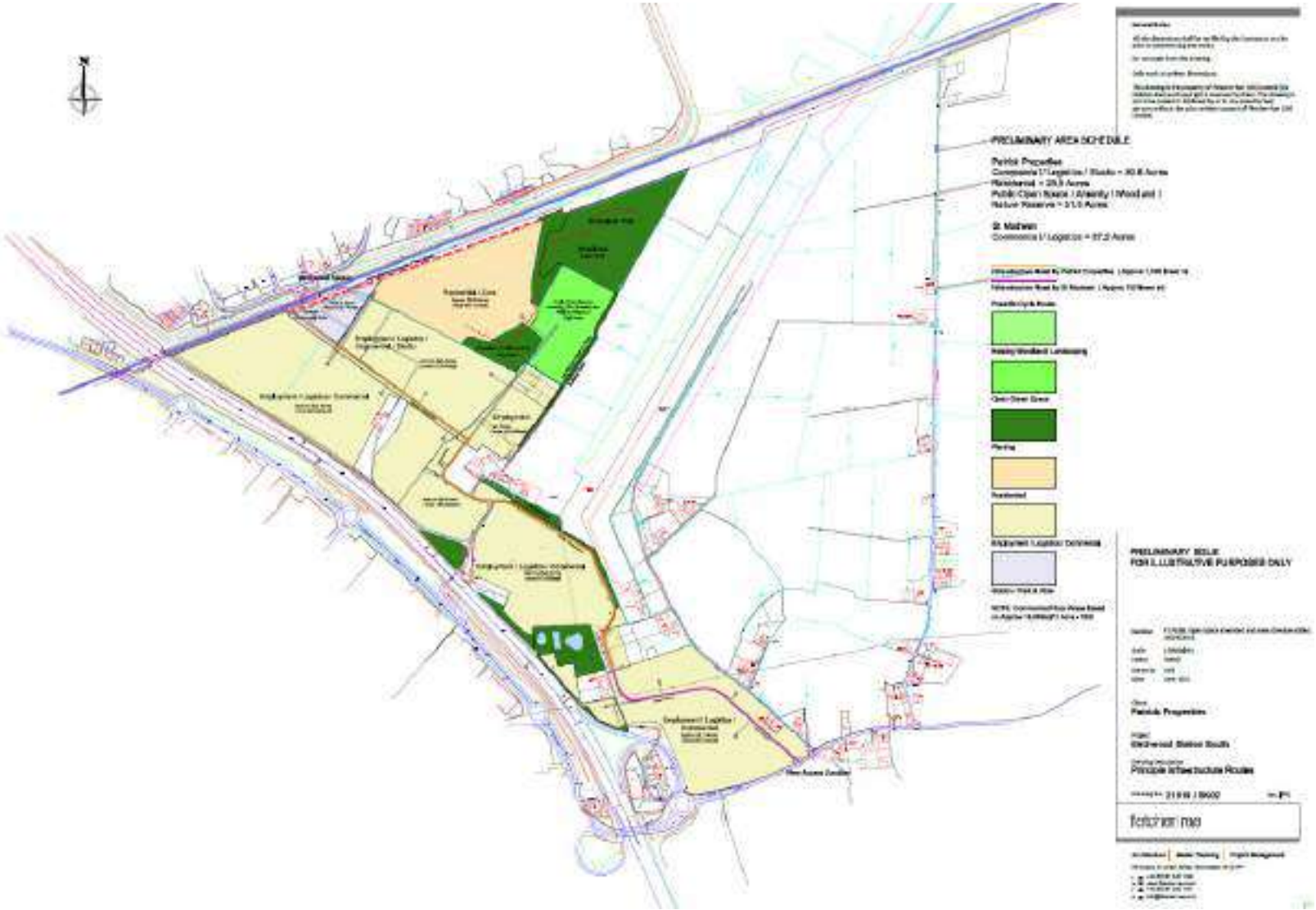
[16] BS 5228 Noise and Vibration Control on Construction and Open Sites - Part 1: Noise: 2009+A1:2014

10.3 A full assessment of the impact of the development in terms of noise from; transport, new infrastructure, construction noise and commercial and retail sources would need to be assessed as part of the planning submission for the application site. Good acoustic design should be considered as part of the development of the masterplan to protect existing noise sensitive receptors.

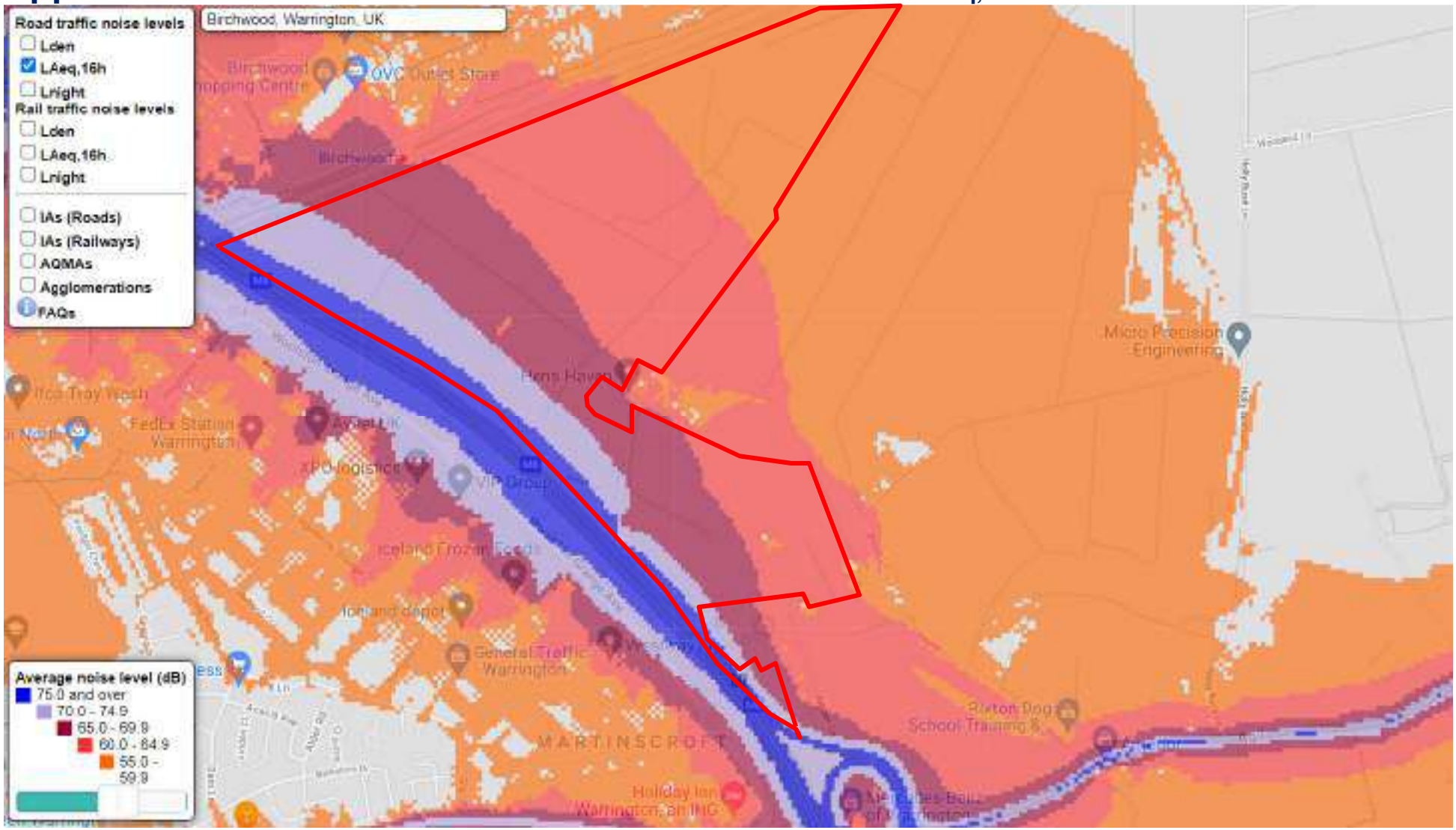
10.4 A vibration assessment has identified that vibration levels do not have the potential to lead to adverse comment at the vibration monitoring locations. We would however suggest that if the location of the care facility is to be within 20m of the railway line a more detailed vibration assessment is undertaken at the design stage of the development.

APPENDICES

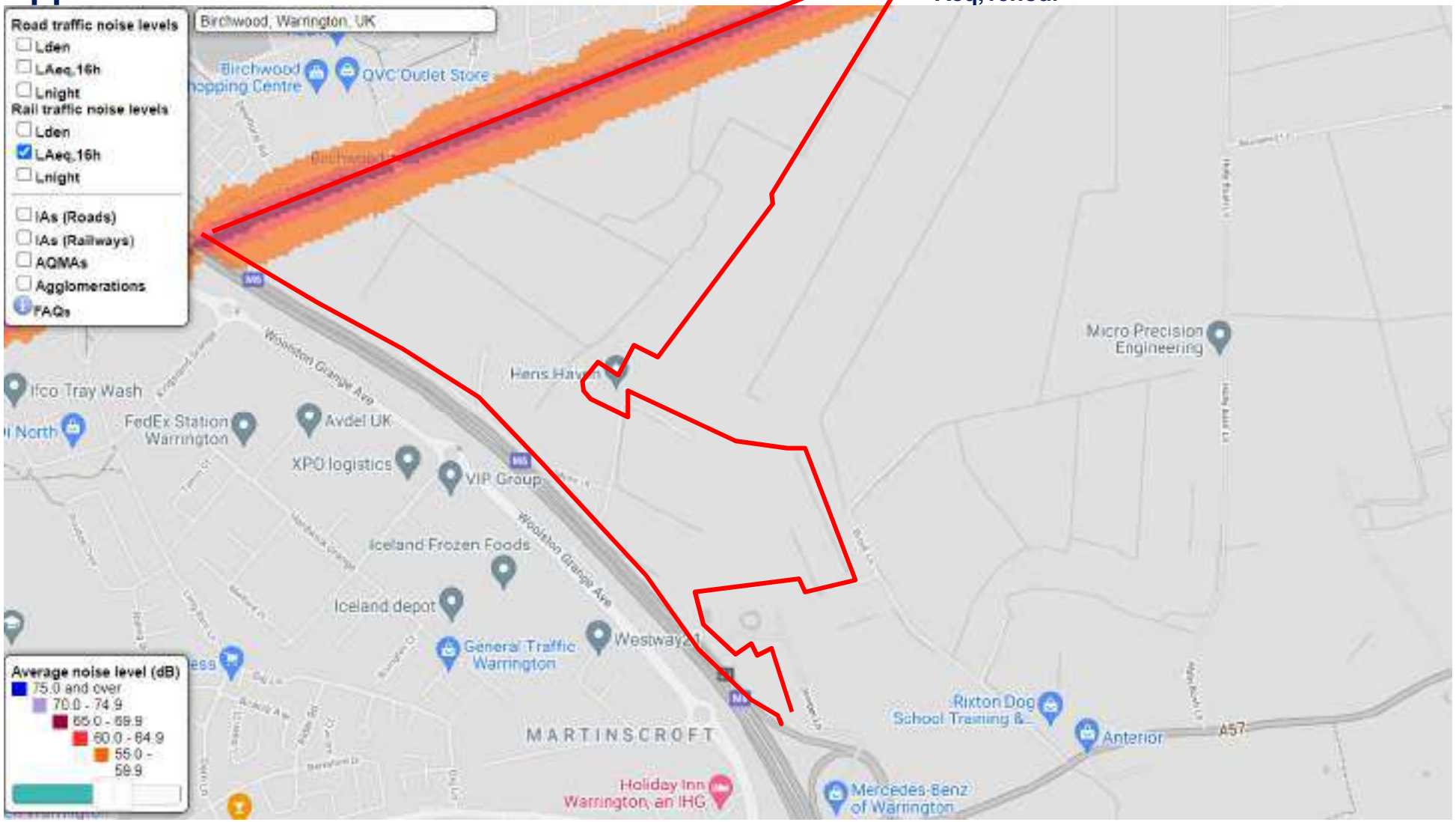
Appendix 1: Site Outline and Illustrative Draft Masterplan



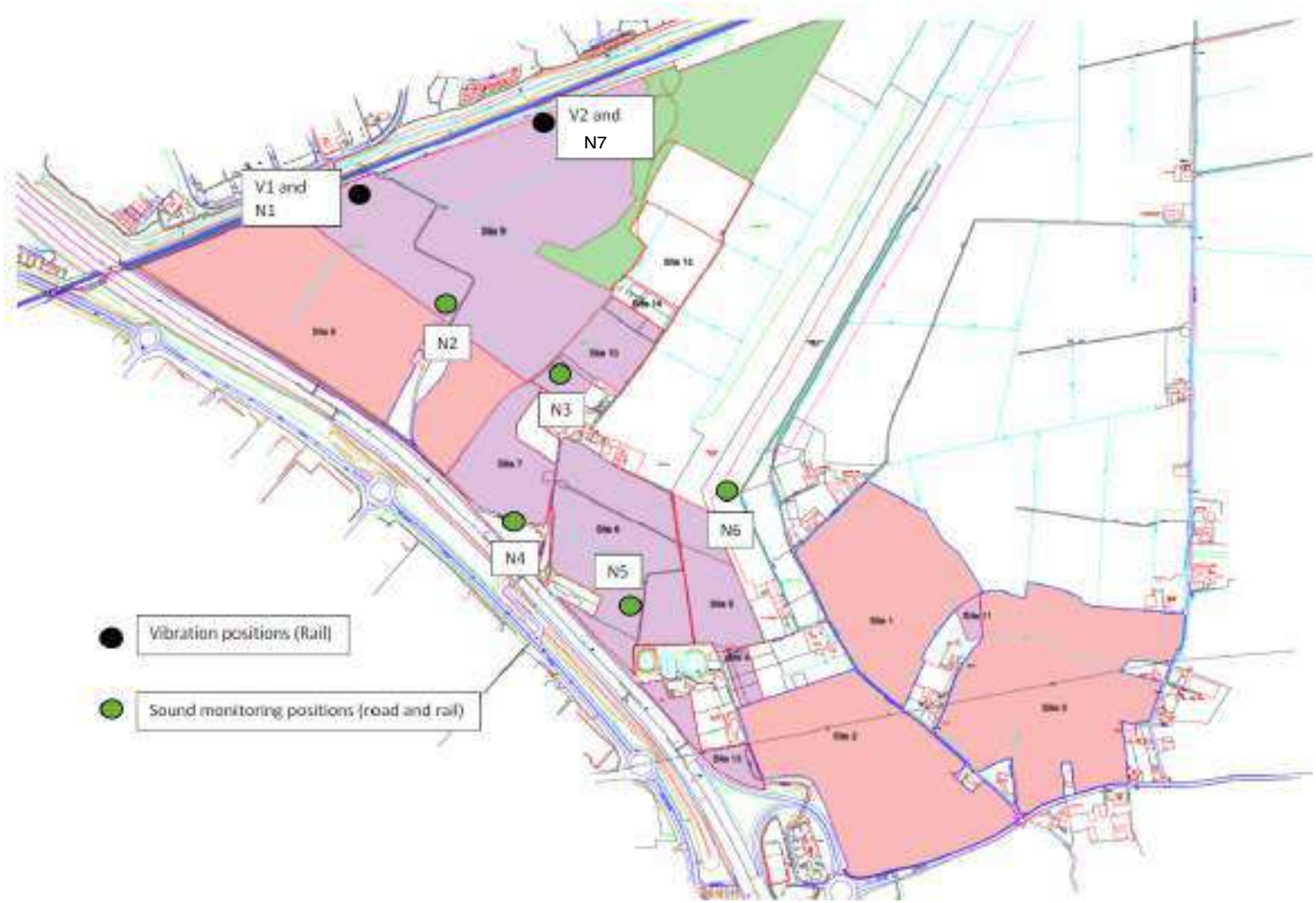
Appendix 2a: Road Traffic Predicted Noise Contours $L_{Aeq,16hour}$



Appendix 2b: Road Traffic Predicted Noise Contours $L_{Aeq,16hour}$



Appendix 3: Noise and Vibration Monitoring Positions



Appendix 4: Location of Noise Sensitive Receptors.

Glossary of Terms

Decibel (dB) The unit used to quantify sound pressure levels; it is derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is usually only perceptible under controlled conditions.

dB L_A Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB L_A broadly agree with an individual's assessment of loudness. A change of 3 dB L_A is the minimum perceptible under normal conditions, and a change of 10 dB L_A corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB L_A; normal conversation about 60 dB L_A at 1 meter; heavy road traffic about 80 dB L_A at 10 meters; the level near a pneumatic drill about 100 dB L_A.

$L_{A90,T}$ The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 1997 it is used to define background noise level.

$L_{Aeq,T}$ The equivalent continuous sound level. The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

L_{Amax} The highest A weighted noise level recorded during the time period. It is usually used to describe the highest noise level that occurred during the event.

NOEL No observed effect level: the level of noise exposure below which no effect at all on health or quality of life can be detected.

LOAEL Lowest observed adverse effect level: the level of noise exposure above which adverse effects on health or quality of life can be detected.

SOAEL Significant observed adverse effect level: the level of noise exposure above which significant adverse effects on health or quality of life can be detected.


MILLER GOODALL
ACOUSTICS AND AIR QUALITY

10. Air Quality Assessment

MILLER GOODALL
ACOUSTICS AND AIR QUALITY

AIR QUALITY ASSESSMENT

on behalf of

PATRICK PROPERTIES WARRINGTON LIMITED

for

AIR QUALITY FEASIBILITY STUDY FOR LAND SOUTH OF BIRCHWOOD, WARRINGTON

REPORT DATE: 19 JULY 2021

REPORT NUMBER: 102615

Summary

This air quality assessment has been undertaken to provide a feasibility study for the proposed mixed-use development on land to the south of Birchwood, Warrington.

This report provides a review of existing air quality in the vicinity of the proposed development and its suitability for the proposed use. It also provides a simple assessment of the impact of the proposed development on local air quality during both its construction and operational phases.

With the implementation of mitigation measures, dust impacts associated with construction are considered to have no residual effects when considered following IAQM guidance. The effects of dust generation during the construction phase can be suitably controlled with well-established mitigation measures. Effects during the construction, on air quality, do not present significant adverse issues should the development proceed.

Existing air quality around the development has been reviewed. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ are likely to be below their respective long and short-term objectives within the majority of the proposed development land, however, there is a potential concern relating to concentrations of pollutants, particularly annual average levels of NO_2 at areas close to the boundary with the M6 and within land designated as an Air Quality Management Area. However, the proposed site design includes low sensitivity uses, which are not subject to the annual mean air quality objectives, in the areas of concern.

The potential wider effects of air quality impacts arising from the development have been reviewed. Vehicles associated with the proposed development could travel to sensitive air quality locations and receptors in such numbers as to require a detailed air quality assessment should the development proceed to a planning application. These include existing human sensitive receptors on the routes into Warrington town centre, and ecological designations to the east and south of the routes providing access to the development. Any such impacts would be assessed for significance and mitigation could be provided to lessen any impact.

The proposed development, with suitable design, consideration of effects and a suitably sufficient detailed air quality assessment is considered suitable for development on the grounds of air quality.

Prepared By	Philip Walton	Reviewed By	Lesley Goodall
Signed	[redacted]	Signed	[redacted]
Date	19 July 2021	Date	19 July 2021

Record of changes

Version	Date	Change	Initials
1	19 July 2021	First issue	

Contents

1 Introduction

1.1 This air quality assessment has been undertaken to assess the feasibility of development on land to the soth of Birchwood, Warrington The site lies within the administrative boundary of Warrington Borough Council (WBC).

1.2 The report provides a review of the existing air quality in proximity to the proposed development site and assesses the potential impact of the proposed development on local air quality following Local Air Quality Management Technical Guidance[1]. The assessment also provides recommendations on the likely future assessments and mitigation to be required should the development proceed to the planning application stages.

1.3 The main pollutants of health concern from road traffic exhaust releases are nitrogen dioxide (NO_2) and fine particulates, normally assessed as the fraction of airborne particles of mean aerodynamic diameter less than ten micrometres (PM_{10}), since these pollutants are most likely to approach their respective air quality objectives in proximity to major roads and congested areas. This assessment has therefore focused on the impact of the proposed development on concentrations of NO_2, PM_{10} and $PM_{2.5}$

2 Site Description

2.1 The site is located approximately 4.7 km to the east of Warrington city centre and 2.9 km to the southeast of the M6/M62 interchange.

2.2 The northern boundary of the land is bound by the Liverpool to Manchester railway line. Open land borders the development land to the east. Junction 21 of the M6 is to the south with open land and a canal beyond. The M6 traverses in a southeasterly to northwesterly direction and bounds the western edge of the site. To the west of the M6 is commercial uses, with residential housing and the Warrington urban area beyond.

2.3 WBC has declared an Air Quality Management Area for a 50 m strip on either side of the M6, for its entire route through the WBC administrative area. Consequently, parts of the development land are located within the AQMA. The AQMA has been declared for potential exceedances of the NO_2 annual mean air quality objective.

2.4 The M6 is a heavily trafficked road, and it is not an unreasonable approach to assume the road vehicle emissions are causing air quality exceedances along its boundary. However, it is also worth stating that the AQMA declaration is based on an assumption of exceedance being likely, but there are very few continuously monitored locations along the M6; as many locations do not have any long term or relevant exposure that require monitoring. WBC operates one monitor at Junction 21, for a row of terrace houses, located between the road network, which is discussed further in this assessment.

2.5 The boundaries of the site and the location of the development in relation to the AQMA is shown in **Appendix A**. A wider view site location, showing monitoring, is provided in **Appendix B**.

[1] Department for the Environment Food and Rural Affairs (2018) '*Local Air Quality Management Technical Guidance Document LAQM.TG (16)*', London: Defra.

3 Proposed Development

3.1 The proposed development would be a mixed-use development and may include residential use, logistics, warehousing and an upgrade of the existing Birchwood Rail Station. The purpose of this assessment is to assess the feasibility of the development land for any of the above uses. Residential use is the most sensitive use proposed.

3.2 An early design for the site has been prepared, shown in Figure 1 which shows that the development is split into several development parcels. This initial design places the commercial uses along the western and southern boundaries of the site. The residential uses are located approximately 600 m to the east of the M6.

Figure 1: Site Design

3.2.1 At this stage, no detailed assessment has been undertaken to understand what the potential vehicle generation and routing may be from the development proposals. However, given the development size, an assumption can be made that the total vehicle generation will likely be well above the required for a detailed assessment.

4 Sensitive Uses

4.1 The sensitive uses at or potentially affected by the development are outlined in this section. These represent potential constraints, and an appropriate air quality assessment would be required to assess the air quality effects. However, this is not unusual or unique and an air quality assessment could suitably assess each sensitive use as part of a future planning application.

Within the development

4.2 Proposed sensitive receptors introduced by the development may potentially be located in areas of poor air quality. For example, next to the M6 boundary and near Junction 21.

Existing Sensitive Receptors and AQMA's

4.3 The road network to be utilised by vehicles arising from the development will likely travel past several existing sensitive receptors. The vehicle emission releases may cause adverse air quality changes to existing sensitive receptors on these routes.

4.4 The Motorway AQMA borders the site (M6/M62/M56). There are sensitive receptors located at Junction 21, M6 which may be impacted by future development flows. These existing sensitive receptors are located in an area that is subject to monitoring and known to be exceeding the NO_2 annual mean air quality objectives.

4.5 WBC has declared several roads in the town centre as an AQMA. Vehicles travelling westwards would enter this AQMA and may cause adverse air quality changes.

4.6 The vehicle emission releases may cause adverse air quality changes to existing sensitive receptors within these AQMA designations.

Ecological Designations

4.7 The land is located in close proximity to two ecological designations, both of which are likely to experience adverse air quality changes as they are adjacent to the likely future vehicle movement network to be used by the development traffic. Travelling southwards on the M6 results in vehicles passing the Woolston Eyes Site of Special Scientific Interest (SSSI). Vehicles leaving the site to the south, and then travelling eastwards on the A57 would pass the Rixton Clay Pits Local Nature Reserve (LNR), SSSI and Special Area of Conversation (SAC).

4.8 NO_2 and ammonia released from road vehicles are capable of causing damage to habitats and species due to nitrogen and acid deposition.

5 Policy Context

5.1 Air Quality Objectives

5.1.1 The standards and objectives relevant to the Local Air Quality Management (LAQM) framework have been prescribed through the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations 2002; the Air Quality Standards Regulations 2010 set out the combined Daughter Directive limit values and interim targets for Member State compliance. The UK left the EU on 31st January 2020 and is no longer a member state. However, the current framework of air quality legislation was converted into domestic law through the European Union (Withdrawal) Act 2018[2].

5.1.2 The current air quality standards and objectives (for the purpose of LAQM) are presented in **Table 1**. Pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence of how each pollutant affects human health. Pollutant objectives, however, incorporate target dates and averaging periods which take into account economic considerations, practicability and technical feasibility.

[2] UK Parliament. (2018): http://www.legislation.gov.uk/ukpga/2018/16/contents/enacted

Table 1: Air Quality Strategy Objectives (England) for the Purposes of Local Air Quality Management

Pollutant	Air Quality Objective	
	Concentration	Measured As*
Nitrogen dioxide (NO_2)	200 µg/m^3	1-hour mean not to be exceeded more than 18 times per year
	40 µg/m^3	Annual mean
Particles (PM_{10})	50 µg/m^3	24-hour mean not to be exceeded more than 35 per year
	40 µg/m^3	Annual mean
Particles ($PM_{2.5}$)	25 µg/m^3	Annual mean (target) (encouraged in Wales)
	15% cut in annual mean (urban background exposure)	

5.1.3 Where an air quality objective is unlikely to be met by the relevant deadline, local authorities must designate those areas as Air Quality Management Areas (AQMAs) and take action to work towards meeting the objectives. Following the designation of an AQMA, local authorities are required to develop an Air Quality Action Plan (AQAP) to work towards meeting the objectives and to improve air quality locally.

5.1.4 Possible exceedances of air quality objectives are generally assessed in relation to those locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective.

5.1.5 For the proposed commercial uses at the Site's, the annual mean air quality objectives would not apply, only the short-term objectives[1].

6 Methodology

6.1 Data Sources

6.1.1 The air quality feasibility assessment of the proposed development was undertaken with reference to information from a number of sources, as detailed in **Table 2**.

Table 2: Key Information Sources

Data Source	Reference
Warrington Borough Council (WBC)	WBC (2020) *Air Quality Annual Status Report (ASR)*
Department for Environment Food and Rural Affairs (Defra)	Defra (2018) *Local Air Quality Management Technical Guidance TG(16)*
Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM)	EPUK and IAQM (January 2017) *Land Use Planning and Development Control: Planning for Air Quality (v1.2)*
Defra's LAQM Support Tools	Local Air Quality Management 1 km x 1 km grid background pollutant maps
Institute of Air Quality Management (IAQM)	IAQM (2014) *Assessment of Dust from Demolition and Construction* (v1.1) IAQM (2020) *A guide to the assessment of air quality impacts on designated nature conservation sites*
Natural England	(2018) *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitat Regulations*

6.2 Consultation

6.2.1 No consultation has been undertaken for this feasibility review. Should the development proceed to a planning application, the proposed air quality assessment methodology will be discussed with the relevant officer at WBC to ensure all matters are suitably addressed for any subsequent air quality assessment submitted to WBC Planning.

6.3 Construction Dust Assessment

6.3.1 The Institute of Air Quality Management (IAQM) provide guidance[3] on the assessment of air quality impacts arising from construction and demolition activities and has been used in this assessment. This section follows a risk assessment to determine the likely impact of the development on nearby receptor location during the construction phase and goes on to recommend mitigation measures that should be implemented to reduce any impact. The methodology for the assessment is shown in **Appendix C.**

6.3.2 The methodology for the construction phase has been completed to identify the potential impacts and any constraints at the development site. Rather than assessing each individual parcel of land, the construction phase assessment has been undertaken for all parcels, and the construction area of effect zones drawn from this red line. The study area in relation to the construction dust and the areas within less than 20 m, 20 m – 50

[3] Institute of Air Quality Management (2014) *Assessment of Dust from Demolition and Construction*

m, 50 – 100 m and 100 – 350 m, as per the IAQM methodology, from the proposed development site are shown in **Appendix D**. The nearest receptors, and those most at risk, are located within 100m of the construction site.

6.4 Air Quality Assessment

6.4.1 A simple air quality assessment has been completed to review the potential impact of vehicular emissions of NO_2, PM_{10} and $PM_{2.5}$ arising from road vehicles associated with the development on existing sensitive receptors, as well as a review of potential exposure of proposed sensitive receptors to existing air quality concentrations of NO_2, PM_{10} and $PM_{2.5}$. The assessment relies on already published information without quantification of impacts, and has been completed using sources such as the Local Authority's monitoring network and the Defra LAQM support tools.

6.4.2 The outcome and findings of this assessment inform the feasibility of the development land for the uses potentially proposed. Recommendations of the likely future assessments and potential mitigation required to assess these outcomes is included in this assessment.

7 Baseline Air Quality

7.1 Local Air Quality Management

7.1.1 The western boundary of the site is adjacent to the M6 carriageway and includes parts of the land designated as an AQMA. The receptors further into the development land are unlikely to be significantly affected by adverse air quality as the surrounding land is open and there are no major pollution sources to the east or south of the development land.

7.2 Air Quality Monitoring

Nitrogen Dioxide (NO_2)

7.2.1 WBC operates one air quality monitor near the development (DT5), which is located approximately 240 m to the southwest of the development on terrace houses at Junction 21. This is the nearest monitor to the site. WBC does not undertake any monitoring along the M6. Consequently, there is no monitoring representative of the free flowing sections of the M6, only at Junction 21 which is influenced by congestion and queuing.

7.2.2 WBC operate three air quality monitors on the A50, which is approximately 3.7 km to the west of the Site. Vehicles travelling westwards from the Site would travel to the A50. Further west of this location leads into the town centre and AQMA.

7.2.3 WBC operates an extensive air quality monitoring network in the town centre. Many of these monitors are recording NO_2 concentrations above the air quality objective. CM2 is an automatic monitor and is, therefore, the most accurate and representative of the town centre concentrations. CM2 is located approximately 6 km to the west of the site. CM1 is an urban background monitor, located approximately 6.8 km to the west of the Site.

7.2.4 The results from these monitoring points are shown in **Table 3**; the monitoring locations are shown in **Appendix B**.

Table 3: Annual Mean NO_2 Concentrations Monitored by the LA within the Study Area

Site ID and Type	Location		Annual Mean NO_2 Concentrations ($\mu g/m^3$)			
			2016	2017	2018	2019
DT 1 (Rural Background)	366949	392004	18.8	17.3	16.1	16.3
DT 5 (Roadside)	366102	389214	**44.2**	39.4	**45.6**	**41**
DT 27(Roadside)	362392	389101	**47.4**	**42.2**	37.9	35.1
DT 28 (Roadside)	362235	389248	**42.1**	38	35.1	32.5
DT 30 (Roadside)	362131	389473	-	-	**42.4**	35.9
CM1 (Urban Background)	359151	388218	25	21	21.4	20.5
CM2 (Roadside)	360015	387907	**47**	37.9	38.1	**41**
Annual Mean NO_2 air quality objective			40 $\mu g/m^3$			

7.2.5 The monitoring results in **Table 3** indicate that annual mean concentrations of NO_2 are above the NO_2 annual mean objective within the AQMAs (DT 5 & CM2). DT 5 is located close to the site, which may indicate NO_2 concentrations near the M6 may be exceeding the annual mean objective.

7.2.6 NO_2 concentrations measures at the monitors outside the AQMAs are elevated above background concentrations, but still below the annual mean objective.

7.2.7 The results indicate that the short-term objective for NO_2 is unlikely to be exceeded at any of the monitoring sites as annual mean concentrations are less than 60 μgm^3 [1].

Particulate Matter (PM_{10} & $PM_{2.5}$)

7.2.8 WBC undertakes PM_{10} background monitoring at CM1, as shown in **Table 4**.

Table 4: Annual Mean PM_{10} Concentrations Monitored by WBC within the Study Area

Site ID and Type	Location		Annual Mean PM_{10} Concentrations ($\mu g/m^3$)			
			2016	2017	2018	2019
CM1 (Urban Background)	359151	388218	16	12	13	17
Annual Mean PM_{10} Air Quality Objective			40 $\mu g/m^3$			

7.2.9 The monitoring results in **Table 4** indicate that annual mean concentrations of PM_{10} were below the air quality objective and target level respectively since 2016. WBC does not monitor for $PM_{2.5}$ monitor.

7.3 Background Concentrations

7.3.1 The CM1 background concentrations from the urban background air quality monitor are shown in **Tables 3** and **4**. For completeness, the background concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been obtained from the

background concentration maps provided by Defra for the grid squares covering the proposed development and nearby potential receptor locations[4]. The pollutant concentrations for 2030 are provided for context to show how concentrations are expected to reduce into the future, as a development of this size will likely require several years of construction build-out. These are shown in **Table 5** below.

Table 5: Background Pollutant Concentrations Obtained for the 1km x 1km Grid Squares Covering the Site and Potential Receptor Locations*

Grid Square	Pollutant	2021	2030
		(µg/m^3)	(µg/m^3)
365500, 390500	NO_2	17.74	12.15
	PM_{10}	13.15	12.66
	$PM_{2.5}$	8.26	7.87
365500, 389500	NO_2	18.32	13.00
	PM_{10}	12.91	12.41
	$PM_{2.5}$	8.33	7.93
366500, 389500	NO_2	16.18	10.98
	PM_{10}	13.19	12.71
	$PM_{2.5}$	8.11	7.72

** Background concentrations obtained from the latest 2018 based background maps*

8 Construction Dust Impact Risk Assessment

8.1 Step 1 – The Need for a Detailed Assessment

8.1.1 There are sensitive receptors located within 350m of the site boundary, therefore, a detailed assessment of the construction phase of the development has been undertaken. There are no ecological designations within 50m of the site boundary or trackout route which require assessment.

8.2 Step 2 – Assess the Risk of Dust Impacts

Step 2A Dust Emission Magnitude

The potential dust emission magnitude in relation to the development has been determined using the criteria detailed in **Table C1** in **Appendix C**. The scale and nature of works onsite were considered to determine the potential dust emission magnitude for demolition, earthwork activities, construction and trackout activities. Demolition would be minor and only include the removal of individual farm buildings that may be present. Information to determine the classification has been estimated from the site plans, Google Earth and information provided by the Applicant. The dust emission magnitude is outlined in **Table 6**.

[4] http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

Table 6: Dust Emission Magnitudes for Each Activity

Activity	Dust Emission Magnitudes	Justification for Sensitivity Classification
Demolition	Small	• total demolition volume estimated to be <20,000 m^3
Earthworks	Large	• the site area is >10,000 m^2
Construction	Large	• total building volume to be constructed is >100,000 m^3
Trackout	Large	• there are likely to be >50 HDV outward movements in any one day

Step 2B Sensitivity of the Receptors to Dust Soiling and Health Effects

8.2.1 The nearest sensitive receptors are residential receptors to the north in Birchwood and commercial receptors to the west of the M6. There are several isolated farmhouses near the development land, which may, or may not be included in the future development plans.

8.2.2 The sensitivity of area assessment has been completed based on the worst-case sensitivity of human receptors. A more detailed construction phase risk assessment could be completed for a future planning application. The approach taken for this report outlines the potential impacts and mitigation should the development proceed. In accordance with the criteria in **Table C2** in **Appendix C** and the IAQM guidance, the sensitivity of human receptors is **high**.

Step 2B Sensitivity of the Area to Dust Soiling and Human Health Effects of PM_{10}

8.2.3 The sensitivity of the area for dust soiling and human health effects has been determined using the criteria detailed in **Table C3 and Table C4** respectively in **Appendix C.**

8.2.4 The trackout route is assumed to be in the southern part of the site, exiting onto the A57 and travelling westwards to the M6.

8.2.5 The sensitivity of the area to dust soiling and human health for each activity is summarised in **Table 7**.

Table 7: Outcome of Defining the Sensitivity of the Area

Pollution	Activity	Sensitivity of the Surrounding Area	Justification for for Sensitivity Classification
Dust Soiling	Demolition	Low	There are 1 – 10 highly sensitive residential receptors within 50 m of a potential future demolition area.
	Earthworks	Low	There are 10 – 100 highly sensitive residential receptors within 100 m of the site boundary.
	Construction	Low	There are 10 – 100 highly sensitive residential receptors within 100 m of the site boundary.
	Trackout	Medium	There are 1 – 10 highly sensitive residential receptors within 20 m of a trackout route, up to 500 m from the site exit.
Human Health	Demolition	Low	There are 1 – 10 highly sensitive residential receptors within 50 m of a potential future demolition area. Background pollutant concentrations are below 24 µg/m^3

	Earthworks	Low	There are 10 – 100 highly sensitive residential receptors within 100 m of the site boundary. Background pollutant concentrations are below 24 µg/m^3
	Construction	Low	There are 10 – 100 highly sensitive residential receptors within 100 m of the site boundary. Background pollutant concentrations are below 24 µg/m^3
	Trackout	Low	There are 1 – 10 highly sensitive residential receptors within 20 m of a trackout route, up to 500 m from the site exit. Background pollutant concentrations are below 24 µg/m^3

Step 2C Risk of Impacts

8.2.6 The dust emission magnitude and sensitivity of the area were combined and the risk of impacts determined using the criteria detailed in **Table C5** to **Table C8** in **Appendix C.**

8.2.7 A summary of the risks, before mitigation measures are applied, for dust soiling and human health are shown in **Table 8**.

Table 8: Risk of Dust Impacts

Potential Impact	Dust Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	Low	Low	Medium
Human Health	Negligible	Low	Low	Low

8.3 Step 3 – Site-Specific Mitigation

8.3.1 Step 3 of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to the site risk for each activity. Good practice mitigation measures highly recommended for the proposed development taken from the IAQM guidance are detailed below.

8.3.2 The general mitigation measures (for site management, preparing and maintaining the site, operating vehicle/machinery, operations and waste management), are appropriate for a site with a 'Medium risk' classification (in this instance the site is classified as "Medium" risk due to trackout)[5]. Mitigation measures specific to demolition, earthworks, construction and trackout are proposed based on the risk classifications in **Table 8**. Recommended mitigation measures are shown in **Appendix E.**

[5] For those mitigation measures that are general, the highest risk category should be applied. For example, if the site is medium risk for earthworks and construction, but a high risk for demolition and track-out, the general measures applicable to a high risk site should be applied.

8.4 Step 4 – Determine Significant Effects

8.4.1 The characteristics of the site and the surrounding area suggest that mitigation would not be impracticable or ineffective. With the implementation of the above mitigation measures, therefore, the residual impacts from the construction are considered to be not significant, in accordance with IAQM guidance.

9 Effect of Air Quality on the Proposed Development

9.1 The background concentrations in **Table 5** indicate that background concentrations of NO_2 and PM_{10} are well below health-based air quality objectives of 40 µg/m^3 for both pollutants, and below the annual mean target level for $PM_{2.5}$. However, it is likely that the site is experiencing higher concentrations due to its proximity to the road network.

9.2 The development includes some commercial use, the annual mean air quality objectives do not apply to commercial uses but the short-term objectives are still relevant.

Short Term Air Quality Objectives

9.3 LAQM.TG(16) provides a qualitative screening approach to determine whether there is a risk of exceedance of the one-hour NO_2 air quality objective. If the ambient NO_2 annual mean concentration is above 60 µg/m^3 there is a risk that the one-hour objective (200 µg/m^3) may be exceeded.

9.4 Pollutant concentrations recorded at the nearby air quality monitors (including that nearest to the development, DT5) indicate NO_2 concentrations are well below 60 µg/m^3 which indicates that there are unlikely to be any exceedances of the short term objective for No2 and the site is, therefore, likely to be suitable for commercial use across the entirety of the site.

Long Term Air Quality Objectives

9.5 NO_2 concentrations recorded at DT5 indicated NO_2 concentrations are above the annual mean air quality objective at that location. DT5 is located near the M6, but is representative of congestion and reduced speeds which can be a source of increased vehicle emissions. Whereas the traffic on the M6 passing the proposed development will be, mostly, free flowing.

9.6 The M6 AQMA declared by WBC in 2003 is not based on any specific monitoring at the development land but is based on historical modelling studies. Whilst emissions from road vehicles and background pollution concentrations have decreased since the AQMA was declared there is still a possibility, however, that areas close to the M6 will experience levels of NO_2 above the annual mean air quality objective.

9.7 The inclusion of non-sensitive uses, or commercial uses, nearest the M6 boundary is favourable as these sensitive receptors do not have a sufficient exposure time to be subject to the annual mean air quality objective. As outlined, there is little risk of the short term air quality objectives being exceeded. Based on the current site design (Figure 1), which places residential receptors well beyond the M6, there is concluded to be little on site air pollution risk to future sensitive receptors.

9.8 To inform any future planning application, an air quality assessment, possibly supported by NO_2 monitoring, will be required to predict air quality concentrations across the development site. A detailed assessment will be sufficient to assess air quality concentrations across the development land. This would also be able to identify

areas of potential air quality exceedances and be able to define mitigation to protect future sensitive receptors from air pollution.

10 Impact of the Proposed Development on Existing Air Quality

10.1 The EPUK/IAQM guidance[6] specifies an assessment of air quality is required where a proposal is expected to generate:

- more than 500 light-duty vehicle movement (LDV) or 200 heavy-duty vehicle (HDV) movements outside of an AQMA;
- more than 100 LDV movements or 25 HDV movements near or within an AQMA; and/or
- Introduce a new junction.

10.2 The development land is large and is expected to exceed these criteria, therefore, a detailed air quality assessment would be required. This would require the use of air dispersion modelling that is suitably verified to local air quality monitoring data to ensure a robust assessment. The assessment would need to focus on the pollutants most likely to arise from traffic-generating proposals, which includes concentrations of NO_2, PM_{10} and $PM_{2.5}$. Predictions would be required at existing sensitive receptors adjacent to the future road network routes to be used by development-generated vehicles.

10.3 The spatial scope of the air quality modelling would be defined by transport generation and routing, which is not at a stage which can be commented upon yet. However, due to the site location, it is likely any future assessment would need to consider routes into Warrington.

10.4 It is not possible to quantify the potential impact of the development within this feasibility study. However, it is considered that suitable mitigation could be provided to account for any potential impacts that may be projected.

10.5 Electric vehicle charging is a common inclusion in most developments now. Electric vehicle charging infrastructure and charging points will be required at the development.

10.6 Natural England[7] & IAQM[8] has published guidance on the assessment of air quality impacts to ecological habitats. The Guidance documents state a detailed air quality assessment of air quality impacts to designated habitats when more than 1,000 LDV or 200 HDV movements pass within 200 m of a designated habitat. Critically, these criteria must be applied for two scenarios:

- In-isolation – this is the total traffic (on the road(s) passing within 200 m of a designation) from the development only.
- In-combination – this is the total traffic (on the road(s) passing within 200 m of a designation) from the development and any other committed development traffic flows.

[6] EPUK and IAQM (January 2017) *Land Use Planning and Development Control: Planning for Air Quality (v1.2)*

[7] Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.

[8] Institute of Air Quality Management, 2020. A guidance to the assessment of air quality impacts on designated nature conservation sites.

10.7 If either of these criteria are met, then a detailed air quality assessment is required to assess the potential for nitrogen deposition, acidity deposition and critical load. The requirement to assess air quality changes at the Woolston Eyes SSSI and Rixton Clay Pits LNR, SSSI and SAC will need to be determined when further traffic information is available. If impacts to the SAC were found, this may require further Habitat Regulation Assessment studies. Air quality impacts can be suitably assessed using air dispersion modelling, and potential impacts can be mitigated.

10.8 The proposed development has the potential to impact on existing sensitive human and ecological sensitive receptors. A detailed air quality assessment would be required and mitigation, as necessary, to ensure not significant effects.

11 Recommendations

11.1 The feasibility study has identified potential air quality effects that will require further investigation and assessment. However, no significant adverse effects have been identified at this stage and it is concluded any adverse effects identified in an assessment can be mitigated.

11.2 Should the development proceed to a planning application stage, the following assessments and actions would be required:

- Construction phase risk assessment – this would expand on the risk assessment presented in this report. Mitigation to reduce the potential for dust generation and transportation would be outlined in the assessment.
- Detailed assessment using air dispersion modelling (ADMS-Roads) – an assessment of the vehicular emissions arising from the operational phase of the proposed development. This would assess the air quality change at existing sensitive receptors and the air quality concentrations across the development land.
- Ecological assessment (if required). Mitigation may be required subject to the findings of the assessment.
- Site design – preparation of the site design to incorporate non-sensitive uses in air quality areas of concern.
- Mitigation – The air quality assessment will inform the level of mitigation required. By default, best practice mitigation will likely include a travel plan and the incorporation of electric vehicle charging infrastructure.

12 Summary of Impacts and Conclusion

12.1 A road traffic emissions assessment was undertaken to consider the impact of vehicle exhaust emissions associated with the proposed development, on identified receptor locations within the study area.

12.2 The assessment considered whether the proposed development could significantly change air quality during the construction phase. With the implementation of mitigation measures, the dust impacts from the construction are considered to have no residual effects following IAQM guidance.

12.3 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ are likely to be below their respective long-term and short-term objectives at the proposed development site which is therefore considered suitable for commercial use with regards to air quality.

12.4 The traffic associated with the proposed development is not expected to have a significant impact on local air quality when considered in accordance with IAQM Guidance[6].

APPENDICES

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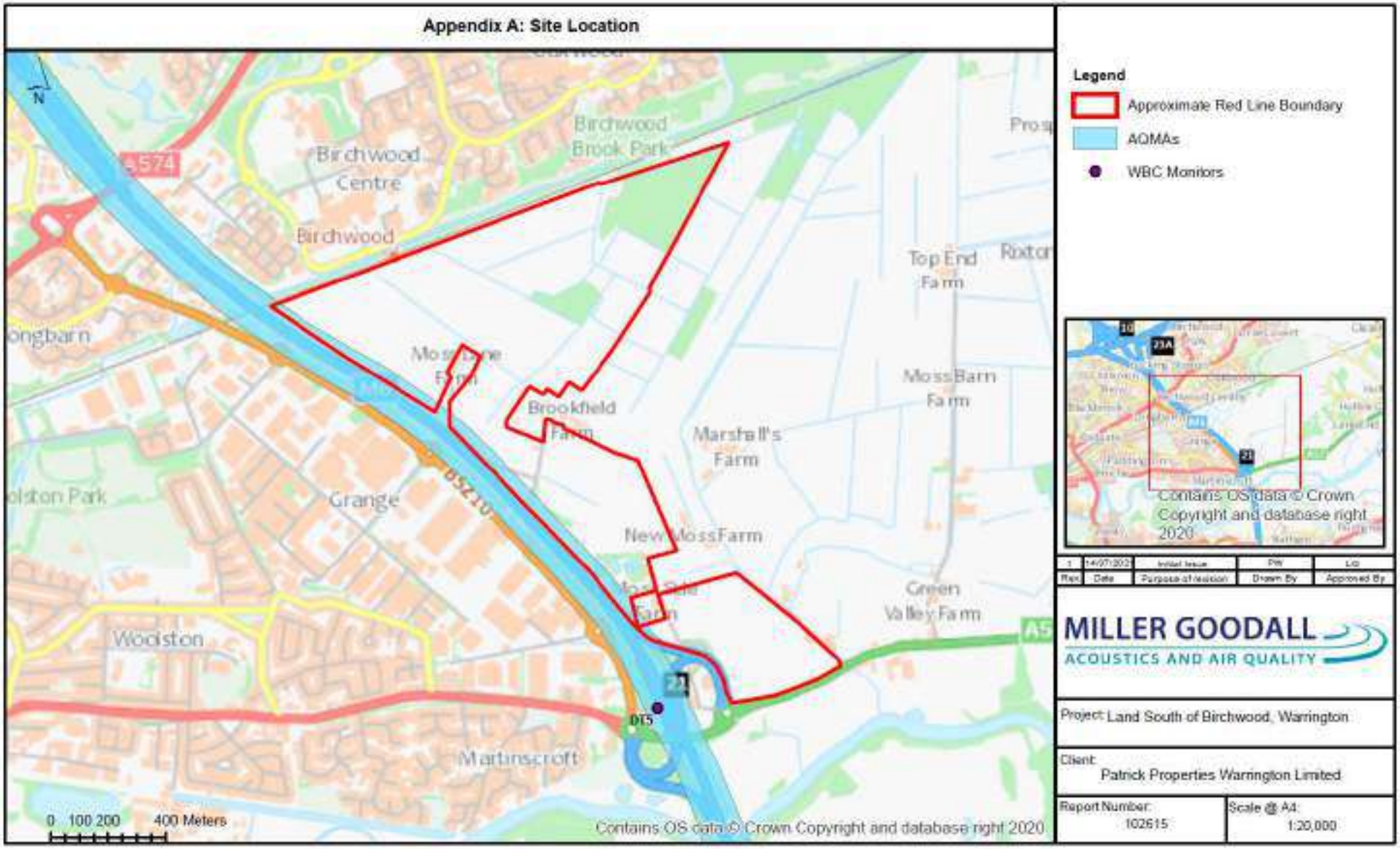
Appendix A: Site Location
N
Birchwood Centre
Birchwood
Birchwood Brook Park
Top End Farm
Moss Barn Farm
Brookfield Farm
Marshall's Farm
Grange
New Moss Farm
Green Valley Farm
Woolston
Martinscroft
A574
A5
A57
DT5
0 100 200 400 Meters
Contains OS data © Crown Copyright and database right 2020
Legend
Approximate Red Line Boundary
AQMAs
WBC Monitors
Contains OS data © Crown Copyright and database right 2020
MILLER GOODALL
ACOUSTICS AND AIR QUALITY
Project: Land South of Birchwood, Warrington
Client: Patrick Properties Warrington Limited
Report Number: 102615
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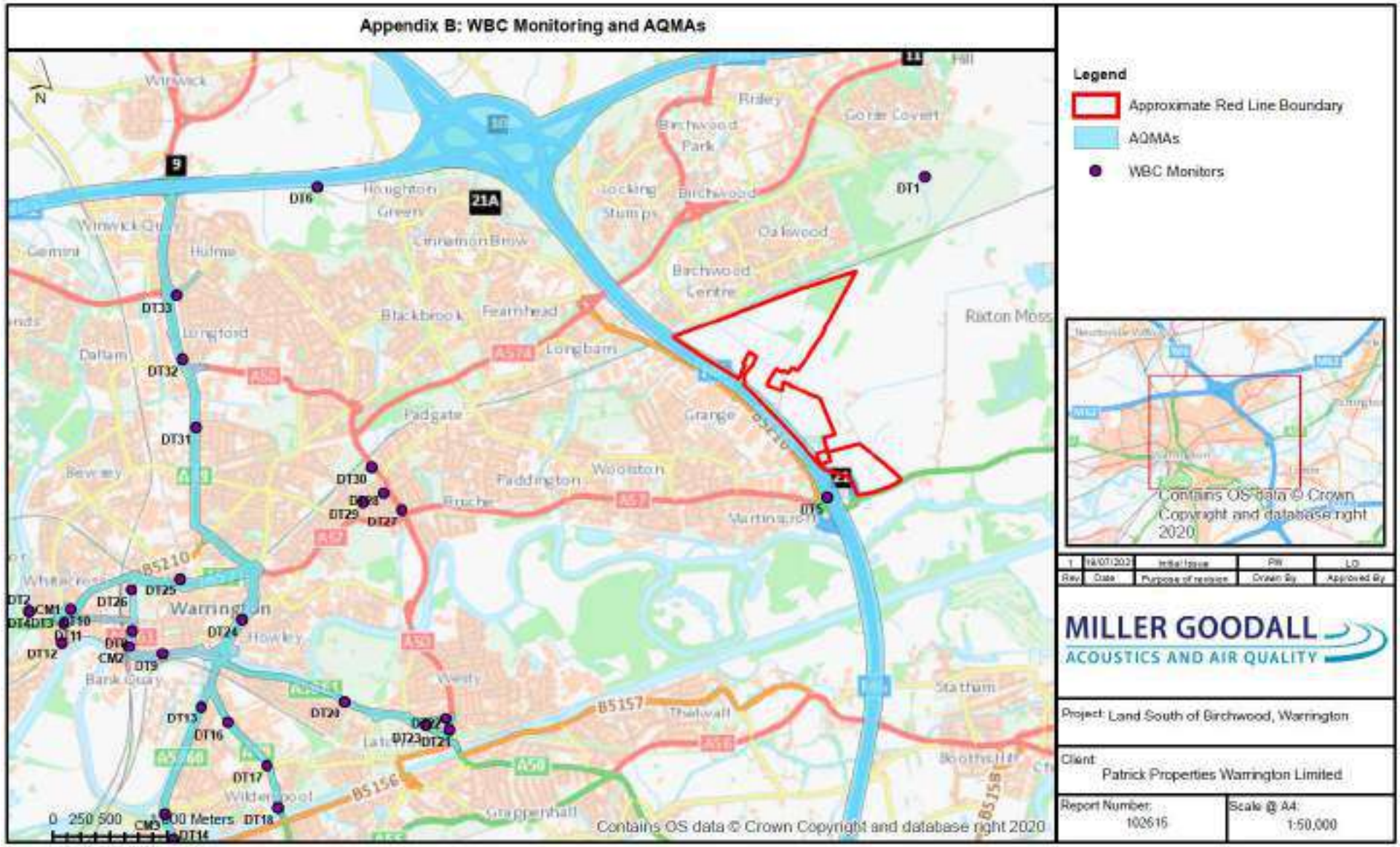
Appendix B: WBC Monitoring and AQMAs
N
Legend
Approximate Red Line Boundary
AQMAs
WBC Monitors
DT1
DT2
DT3
DT4
DT5
DT6
DT7
DT8
DT9
DT10
DT11
DT12
DT13
DT14
DT15
DT16
DT17
DT18
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DT21
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CM1
CM2
CM3
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ACOUSTICS AND AIR QUALITY
Project: Land South of Birchwood, Warrington
Client: Patrick Properties Warrington Limited
Report Number: 102615
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Appendix C: Dust Risk Assessment Methodology

The following section outlines criteria developed by the IAQM for the assessment of air quality impacts arising from construction and demolition activities. The assessment procedure is divided into four steps and is summarised below:

Step 1: Screen the Need for a Detailed Assessment

An assessment will normally be required where there are human receptors within 350 m of the site boundary and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s). Ecological receptors within 50 m of the site boundary or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), are also identified at this stage. An ecological receptor refers to any sensitive habitat affected by dust soiling. For locations with a statutory designation, such as a Site of Specific Scientific Interest (SSSI), Special Area of Conservation (SACs) and Special Protection Areas (SPAs), consideration should be given as to whether the particular site is sensitive to dust. Some non-statutory sites may also be considered if appropriate.

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is 'negligible' and any effects will not be significant.

Step 2: Assess the Risk of Dust Impacts

In step two, a site is allocated to a risk category on the basis of the scale and nature of the works (Step 2A) and the sensitivity of the area to dust impacts (Step 2B). These two factors are combined in Step 2C to determine the risk of dust impacts before the implementation of mitigation measures. The assigned risk categories may be different for each of the construction activities outlined by the IAQM (construction, demolition, earthworks and trackout). A site can be divided into zones, for example on a large site where there are differing distances to the nearest receptors.

Step 2A: Define the Potential Dust Emission Magnitude

Dust emission magnitude is based on the scale of the anticipated works and is classified as Small, Medium or Large. The IAQM guidance recommends that the dust emission magnitude is determined separately for demolition, earthworks, construction and trackout. **Table C1** describes the potential dust emission class criteria for each outlined activity.

Table C1: Criteria Used in the Determination of Dust Emission Magnitude

Activity	Criteria used to Determine Dust Emission Magnitude		
	Small	Medium	Large
Demolition	Total building volume <20,000 m^3, construction materials with low potential for dust release.	Total building volume 20,000 m^3 – 50,000 m^3, potential dusty construction material.	Total building volume >50,000 m^3, potentially dusty construction material.
Earthworks	Total site area <2,500 m^2, soil type with large grain	Total site area 2,500 – 10,000 m^2, moderately dusty soil type	Total site area >10,000 m^2, potentially dusty soil type
Construction	Total building volume <25,000 m^3.	Total building volume 25,000 – 100,000 m^3.	Total building volume >100,000 m^3.
Trackout	<10 outward HDV trips in any one day. Unpaved road length <50 m.	10-50 outward HDV trips in any one day. Unpaved road length 50-100 m.	>50 outward HDV trips in any one day. Unpaved road length >100 m.

Step 2B: Define the Sensitivity of the Area

The sensitivity of the area takes into account the following factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of receptors;
- the local background PM_{10} concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of windblown dust.

The criteria detailed in **Table C2** is used to determine the sensitivity of the receptor in relation to dust soiling, health effects and ecological effects.

Table C2: Criteria for Determining Sensitivity of Receptors

Sensitivity of Receptor	Criteria for Determining Sensitivity		
	Dust Soiling Effects	Health Effects of PM_{10}	Ecological Sites
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms	Residential properties, hospitals, schools and residential care homes	International or national designation *and* the features may be affected by dust soiling
Medium	Parks, places of work	Office and shop workers not occupationally exposed to PM_{10}	Presence of an important plant species where dust sensitivity is uncertain or locations with a national designation with features that may be affected by dust deposition
Low	Playing fields, farmland, footpaths, short-term car parks and roads	Public footpaths, playing fields, parks and shopping streets	Local designation where features may be affected by dust deposition

Table C3 and **Table C4** are then used to define the sensitivity of the area to dust soiling and human health effects. This should be derived for each of construction, demolition, earthworks and trackout.

Table C3: Sensitivity of the Area to Dust Soiling Effects on People and Property.

Receptor Sensitivity	Number of Receptors	Distance from Source (m)*			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

*distances considered are to the dust source

Table C4: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentrations	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

The sensitivity of the area is then summarised.

Step 2C Define the Risks of Impacts

The dust emission magnitude from **Table C1** and sensitivity of the area and receptors from **Table C2**, **Table C3** and **Table C4** are combined, and the risk of impacts from each activity (demolition, earthworks, construction and trackout) before mitigation is applied, is determined using the criteria detailed in **Table C5** to **Table C8.**

Table C5: Risk of Dust Impacts - Demolition

Potential Impact Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table C6: Risk of Dust Impacts- Earthworks

Potential Impact Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table C7: Risk of Dust Impacts- Construction

Potential Impact Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table C8: Risk of Dust Impacts- Trackout

Potential Impact Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3 Determine Site Specific Mitigation

Step three of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to whether the site is a low, medium or high risk site.

Step 4 Determine Significance of Residual Effects

At step four the significance of residual effects is assessed. For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.

There may be cases where, for example, there is inadequate access to water for dust suppression to be effective, and even with other mitigation measures in place there may be a significant effect. Therefore, it is important to consider the specific characteristics of the site and the surrounding area to ensure that a conclusion of no significant effect is robust.

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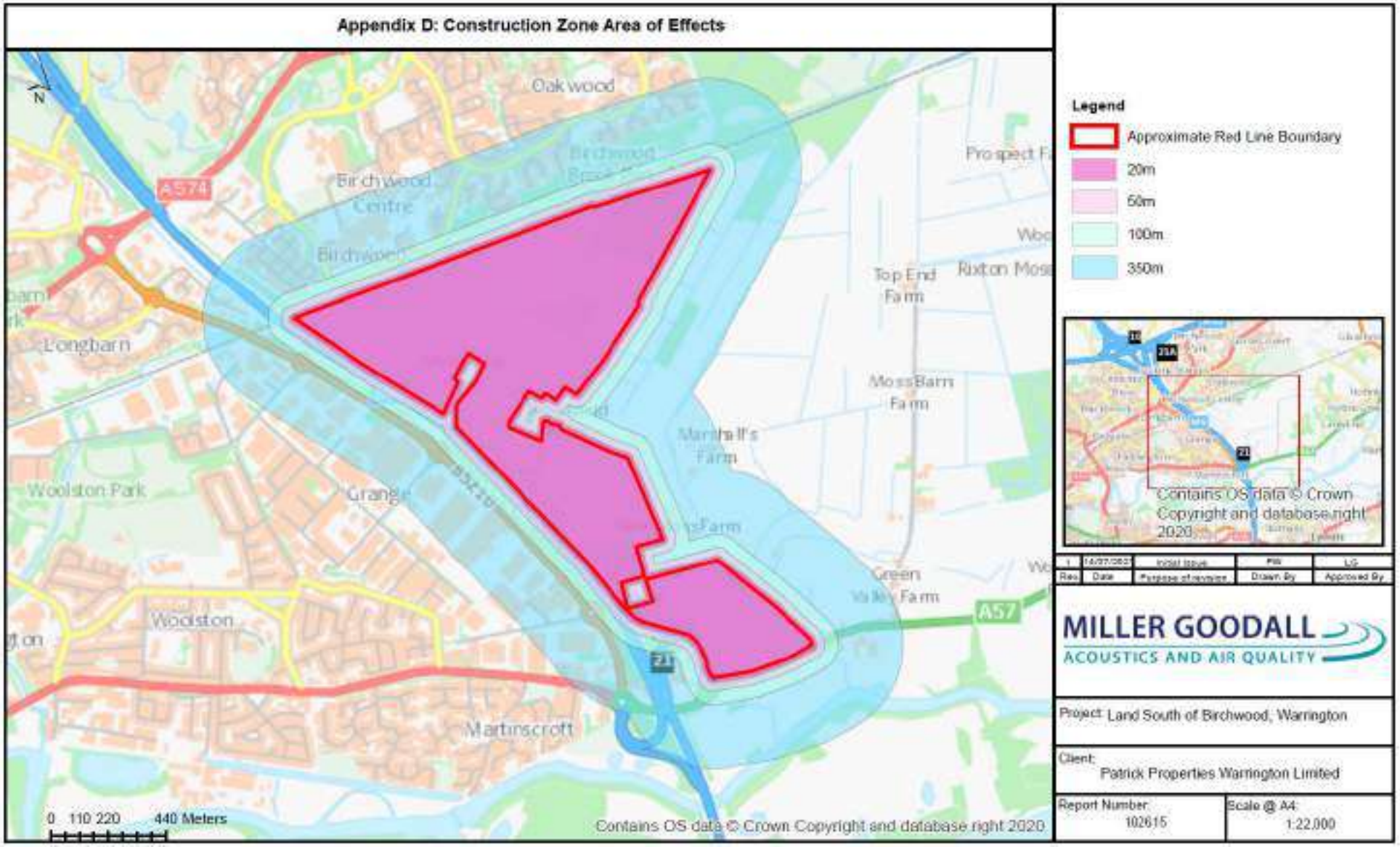
Appendix D: Construction Zone Area of Effects



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Appendix E: Dust Assessment Mitigation

xx Highly Recommended **x Desirable**

Measures relevant for demolition, earthworks, construction and trackout.

Mitigation Measure	Medium Risk
Communications	
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	xx
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	xx
Display the head or regional office contact information.	xx
Develop and implement a Dust Management Plan (DMP).	xx
Site management	
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	xx
Make the complaints log available to the local authority when asked.	xx
Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	xx
Monitoring	
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.	x
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.	xx
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	xx
If requested by the Local Authority: Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority; where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	xx
Preparing and maintaining the site	
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	xx
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	xx
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.	xx

Avoid site runoff of water or mud.	xx
Keep site fencing, barriers and scaffolding clean using wet methods.	xx
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	xx
Cover, seed or fence stockpiles to prevent wind whipping.	xx
Operating vehicle/machinery and sustainable travel	
Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable.	xx
Ensure all vehicles switch off engines when stationary - no idling vehicles.	xx
Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	xx
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).	x
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	xx
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	x
Operations	
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	xx
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	xx
Use enclosed chutes and conveyors and covered skips.	xx
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	xx
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	xx
Waste management	
Avoid bonfires and burning of waste materials.	xx

Measures specific to construction.

Mitigation Measure	Low Risk
Avoid scabbling (roughening of concrete surfaces) if possible.	x
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	x

Measures specific to trackout.

Mitigation Measure	Medium Risk
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	xx
Avoid dry sweeping of large areas.	xx
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	xx
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable	xx
Record all inspections of haul routes and any subsequent action in a site log book.	xx
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	xx
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	xx
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	xx
Access gates to be located at least 10 m from receptors where possible.	xx

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Glossary of Terms

AADT Annual Average Daily Traffic flow

Air Quality Standard Pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence of how each pollutant affects human health and the environment

Air Quality Objective Pollutant Objectives incorporate future dates by which a standard is to be achieved, taking into account economic considerations, practicability and technical feasibility

Annual Mean A mean pollutant concentration value in air which is calculated on a yearly basis, yielding one annual mean per calendar year. In the UK air quality regulations, the annual mean for a particular substance at a particular location for a particular calendar year is:

(a) in the case of lead, the mean of the daily levels for that year;

(b) in the case of nitrogen dioxide, the mean of the hourly means for that year;

(c) in the case of PM_{10}, the mean of the 24-hour means for that year.

Annoyance (Dust) Loss of amenity due to dust deposition or visible dust plumes, often related to people making complaints, but not necessarily sufficient to be a legal nuisance.

AQAP Air Quality Action Plan

AQEG Air Quality Expert Group

AQMA Air Quality Management Area

AQMP Air Quality Management Plan

AQO Air Quality Objective

AQS Air Quality Strategy for England, Scotland, Wales and Northern Ireland

Background Concentrations The term used to describe pollutant concentrations which exist in the ambient atmosphere, excluding local pollution sources such as roads and stacks

CO Carbon monoxide

Construction Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc.

Construction Impact Assessment An assessment of the impacts of demolition, earthworks, construction and trackout. In this Guidance, specifically the air quality impacts.

Defra Department for Environment, Food and Rural Affairs

Demolition Any activity involved with the removal of an existing structure (or structures). This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time.

Deposited Dust that is no longer in the air and which has settled onto a surface. Deposited dust is also sometimes called amenity dust or nuisance dust, with the term nuisance applied in the general sense rather than the specific legal definition.

DMRB Design Manual for Roads and Bridges

DMP Dust Management Plan; a document that describes the site-specific methods to be used to control dust emissions.

Dust Solid particles that are suspended in air, or have settled out onto a surface after having been suspended in air. The terms dust and particulate matter (PM) are often used interchangeably, although in some contexts one term tends to be used in preference to the other. In this guidance the term 'dust' has been used to include the particles that give rise to soiling, and to other human health and ecological effects. Note: this is different to the definition given in BS 6069, where dust refers to particles up to 75 µm in diameter.

Earthworks Covers the processes of soil-stripping, ground-levelling, excavation and landscaping.

Effects The consequences of the changes in airborne concentration and/or dust deposition for a receptor. These might manifest as annoyance due to soiling, increased morbidity or morality due to exposure to PM_{10} or $PM_{2.5}$ or plant dieback due to reduced photosynthesis. The term 'significant effect' has a specific meaning in EIA regulations. The opposite is an insignificant effect. In the context of construction impacts any effect will usually be adverse, however, professional judgement is required to determine whether this adverse effect is significant based in the evidence presented.

EPAQS Expert Panel on Air Quality Standards

EPUK Environmental Protection UK

HDV Heavy Duty Vehicle

Impacts The changes in airborne concentrations and/or dust deposition. A scheme can have an 'impact' on airborne dust without having any 'effects', for instance if there are no receptors to experience the impact.

LAQM Local Air Quality Management

LDF Local Development Framework

LDV Light Duty Vehicle

Mg/m^3 Microgrammes (of pollutant) per cubic metre of air. A measure of concentration in terms of mass per unit volume. A concentration of 1 µg/m^3 means that one cubic metre of air contains one microgramme (millionth of a gramme) of pollutant

NO_2 Nitrogen Dioxide

NOx A collective term used to represent the mixture of nitrogen oxides in the atmosphere, as nitric oxide (NO) and nitrogen dioxide (NO_2)

NPPF National Planning Policy Framework

Nuisance The term nuisance dust is often used in a general sense when describing amenity dust. However, this term also has specific meanings in environmental law:

Statutory nuisance, as defined in S79(1) of the Environmental Protection Act 1990 (as amended from time to time).

Private nuisance, arising from substantial interference with a person's enjoyment and us of his land.

Public nuisance, arising from and act or omission that obstructs, damages or inconveniences the right of the community.

Each of these applying in so far as the nuisance relates to the unacceptable effects of emissions. It is recognised that a significant loss of amenity may occur at lower levels of emission than would constitute a statutory nuisance.

Note: as nuisance has a specific meaning in environmental law, and to avoid confusion, it is recommended that the term is not used in a more general sense.

$PM_{2.5}$ The fraction of particles with a mean aerodynamic diameter equal to, or less than, 2.5 µm. More strictly, particulate matter which passes through a size selective inlet as defined in the reference method for the sampling and measurement of $PM_{2.5}$, EN 14907, with a 50% efficiency cut-off at 2.5 µm aerodynamic diameter

PM_{10} The fraction of particles with a mean aerodynamic diameter equal to, or less than, 10 µm. More strictly, particulate matter which passes through a size selective inlet as defined in the reference method for the sampling and measurement of PM_{10}, EN 12341, with a 50% efficiency cut-off at 10 µm aerodynamic diameter

RSS Regional Spatial Strategy

Running Annual Mean A mean pollutant concentration value in air which is calculated on an hourly basis, yielding one running annual mean per hour. The running annual mean for a particular substance at a particular location for a particular hour is the mean of the hourly levels for that substance at that location for that hour and the preceding 8759 hours

Trackout The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.


MILLER GOODALL
ACOUSTICS AND AIR QUALITY

11. South Station Place, Birchwood Socio-Economic Assessment

South Station Place, Birchwood Socio-Economic Assessment
for
Patrick Properties

September 2021

Report completed/submitted by:	Esther Cordingley and Kirsten Powell
Proof check completed by:	Lee Williamson
Date:	3rd September 2021
Report reviewed by:	Kirsten Powell
Date:	2nd September 2021

Contents

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Key Messages

An Important Development Opportunity

South Station Place represents a significant development opportunity, both for Warrington and the North West. Proximity to the M6 and M62 axis – providing both north-south and east-west linkages – and rail networks and the scale of development opportunity will allow the scheme to respond to widely acknowledged demand in the logistics and industrial sectors, as well as accommodating a growing population. The flexibility of the scheme to respond to diverse occupier requirements, given the scale of plots that can be made available if required, enables it to provide a distinct proposition in the market that can respond to both current and future needs.

A Strategically Aligned Proposition

The national Build Back Better agenda recognises Government's levelling up agenda, presenting an opportunity for the north of England to increase its contribution to the national economy. The need to create high quality jobs that support prosperity is recognised, along with the role of housing in supporting growth and reducing disparities.

Within the sub-region, the Cheshire and Warrington Local Industrial Strategy highlights the role that both the logistics and manufacturing sectors can play in supporting economic growth and prosperity.

The South Station Place development presents an opportunity to respond to both the national and sub-regional policy drivers, generating benefits for the local area and contributing to national growth and prosperity ambitions.

A Significant Economic Contributor

Warrington is a strong performer in the regional economy reporting a higher than average resident employment rate, higher jobs density and workplace-based employment growth over the last ten years in excess of the North West average. It therefore has a role to play in supporting the region to reduce the performance gap with the national average, in support of the levelling up agenda.

The scale of economic contribution to be secured through both the scheme's construction and operations is considerable. The construction programme alone is expected to directly support 2,670 jobs during the 3-5-year construction period. As well as providing construction employment for skilled labour, the intention to engage in an apprentice programme will help to ensure that the workforce of the future begins to be established which, in turn, can generate longer term impacts for the Warrington economy.

Once operational, the size of the site provides an opportunity to offer employment opportunities of scale and variety. It is estimated that, once fully operational, the scheme could accommodate approximately 3,000 jobs on-site, providing opportunities across varied occupations and skills levels.

Supporting the Economic Recovery

As the country recovers from the COVID-19 pandemic, opportunities to kickstart development and attract new business and employment opportunities are to be welcomed. The South Station Place development responds to the widely acknowledged need to meet the needs of a strong logistics sector, whose growth has been fuelled by the pandemic but where the long-term nature of demand is also evident.

This presents an opportunity to support the economic recovery in Warrington but also, due to the strength of transport links and recognised existing commuting flows, recovery across the wider North West.

Responding to Market Demand

The North West logistics market – as the primary target market for the South Station Place development – remains buoyant with recognised shortfalls in supply, particularly to meet requirements for Grade A

accommodation and larger scale units. The scheme provides an opportunity to meet market requirements, supporting Warrington and the North West to cater for the needs of a growing population and changing consumer habits.

Warrington already has an established reputation in the logistics marketplace and there is a need to consider where requirements of scale – both individually and in totality – can continue to be accommodated within Warrington, allowing successes to date to be built upon. The South Station Place scheme provides a solution.

A Generator of Wider Benefits

The forecast economic benefits are not expected to occur in isolation. The development also offers potential for a series of wider benefits to be unlocked, supporting the local area, businesses and residents to experience positive impacts from the development.

Wider anticipated benefits will include:

- Significant induced and indirect benefits as on-site activity supports further growth through supply chains and the recirculation of wages in the economy.
- Health and wellbeing benefits as workers and residents attracted to the area make use of the open space on their doorstep for leisure purposes.
- Supporting opportunities for increased flexibility on the Network Rail network through the identification of land to provide a turnback facility.

1. Introduction

Assessment Scope

ekosgen, an independent economic development and regeneration consultancy, was appointed by Patrick Properties to conduct a Socio-Economic Assessment of the proposed development of land to the south of Birchwood Railway Station (known as South Station Place) in Birchwood, Warrington, in the North West of England. This report presents the assessment findings.

The scheme is proposed to deliver 2.1 million ft² of new employment space and 750 new homes, representing important additions to the both the local employment and residential land and property offer. From an employment perspective, the site is intended to cater predominantly to the needs of warehousing and logistics sector businesses, recognising demand in the local marketplace, with an element of industrial workspace to also be created.

This report was commissioned to understand the socio-economic context in which the scheme will be delivered and the impacts it is anticipated to generate. Further details are provided in the following sections.

Assessment Approach

An up to date economic baseline has been prepared for Warrington to establish the local context within which the scheme will be developed, acknowledging latest statistics and recent trends in the data. The report also outlines how the scheme will contribute to local economic growth ambitions (including in reference to both economic and demographic growth forecasts) and establishes the scale of forecast economic potential to be generated by the scheme, through the creation of new employment opportunities and the consequent uplift in Gross Value Added (GVA) in an area with recognised growth potential.

The assessment has considered:

- The latest development plans prepared by Patrick Properties, outlining intended site uses and the scale of development to be accommodated.
- The collection and analysis of published socio-economic statistics, including statistics available through: the Annual Population Survey (APS); the Business Register and Employment Survey (BRES); Office for National Statistics Regional Accounts; the Indices of Multiple Deprivation (IMD); and ONS Household Projections.
- The local, sub-regional and national policy context in which plans will be taken forward, demonstrating how the scheme aligns with policy priorities from a socio-economic perspective.
- The market context – from both a commercial and residential perspective – in which the scheme will be delivered and the market requirements it can help to satisfy.
- Forecast change in Warrington's household, population and employment levels, providing the context in which the South Station Place scheme will be developed and operate.

Report Contents

The remainder of this report provides:

- **Section 2:** provides an overview of the development proposal, including the site location, development context, scale and nature of development proposed and target markets.
- **Section 3:** details the socio-economic context in Warrington at present and with reference to recent trends, including in comparison to the position in comparator areas.

- **Section 4:** the delivery context, detailing forecast household, population and employment growth trends and the market and policy rationale to intervene.

- **Section 5:** forecast scheme impacts, detailing the scale and nature of quantified benefits expected to be secured during both the construction and operational phases as well as anticipated non-quantifiable benefits.

2. The South Station Place Development

Site Location

The South Station Place scheme is located directly to the south of Birchwood railway station and is bounded to the west by the M6, to the south by the A57/River Mersey and the east by Holly Bush Lane. It is approximately 3.5 miles north east of Warrington town centre; 12.3 miles west of Manchester city centre and 19.4 miles east of Liverpool city centre.

Source: ArcGIS and ekosgen mapping

Site Accessibility

The site is strategically located close to the strategic road and rail networks. It will be accessed off the A57 and the site is 0.7 miles from Junction 21 of the M6, as well as in close proximity to the M62 (with both junction 10 and junction 21a – which serves as the interchange with the M6 – within 2 miles of the site) and the M56 (with junction 9 approximately 4 miles away). The location therefore provides strong access to the North West's strategic road network and on into North Wales, as well as providing the opportunity to serve the local Warrington market.

Proximity to the public transport network represents a further strength. Birchwood Station – providing access to the National Rail network – is located immediately to the north of the site, providing rail links to Manchester and Liverpool. Although there is no direct access from the station to the south at present, the development proposals would introduce a new access point.

The local bus network serving the area comprises:

- To the north of the site, routes 17, 17c, 25, 28, 28e and 98 serving Birchwood station providing links to Callands (17), Warrington (25,28) and Oakwood (98).
- To the south of the site on Manchester Road routes 40B and 100 Salford Reds providing connections to Hollins Green, Lymm (40B) and Shudehill.
- To the south west of the site on Manchester Road, routes 3, 40B and 100 Salford Reds, providing connections to Martinscroft (3), Shudehill, Lymm (40) and Warrington.
- To the north west of the site on Harpers Road, routes 28, 28A, and 28 E providing connections to Leigh, Gorse Covert, and Warrington.

The Development Context

Although the site identified for development itself is within the Green Belt, the wider area is already densely developed to accommodate both employment and residential requirements and, as described above, it is well served by transport links. Within close proximity of the site, developments include:

- The Grange Employment Area – located across the M6 providing light industrial and warehousing accommodation across more than 200 acres.
- Birchwood Boulevard – an office focused development to the north of the station that includes a series of regional and national headquarters buildings as well as smaller premises.
- Large residential areas, including Birchwood to the north and Martinscroft to the south west.

An airstrip is also located on the site's boundary.

Birchwood station serves as an important commuter stop, both allowing workers to access opportunities in the Birchwood area and supporting local people to travel into Manchester and Liverpool for work. Although catering for approximately 0.6 million passengers per year, the station has a very limited service offer and can provide an intimidating environment, particularly after dark. It is classed as a category D station by Network Rail, meaning it is medium staffed and expected to cater for 250,000-500,000 trips per annum, suggesting it is under-categorised.

The Development Proposal

The proposed development will create a new mixed-use development on a 100 hectare site (of which approximately 80 hectares will be developed) which is currently in the Green Belt, immediately adjacent to Birchwood station and the M6 motorway. The scheme is proposed to deliver:

- 2.1 million ft^2 of commercial floorspace, comprising approximately 80% B8 accommodation and 20% B2 units;
- a new station link road and park and ride facility, providing access to the station from the south for the first time;
- a new station/community hub facility providing 10,000 ft^2 of space that is expected to accommodate a GP, nursery, café and co-working space;
- a reserved strip of land to allow Network Rail to accommodate a future turn back facility; and
- over 45 acres of public open space and woodland for informal use.

Individual plot plans will be determined on a case by case basis to satisfy market demands, within the overall development quantum outlined above. As the site is in the Green Belt, Patrick Properties are seeking to demonstrate that very special circumstances exist to allow its development. The scale of economic benefits to be unlocked and the opportunity to support the growth of a local economy and provide employment opportunities for local residents forms part of the scheme's rationale.

Target Market

The development will target the warehousing and distribution and industrial markets which continue to demonstrate strong demand within the North West (see Section 4). Given these uses, the primary occupier markets will be the transport and logistics and manufacturing sectors. As demonstrated in Section 3, these sectors already form an important part of the local economy and have been growing in recent years. Further site supply could support continued sector growth.

Recognising market demand, it is intended that approximately 80% of the employment land will accommodate B8 requirements and 20% B2 requirements. A small element of service employment space will also be provided by the station.

The scheme is intended to remain flexible to allow the requirements of a range of sub-sectors and individual occupier requirements to be satisfied, as they are identified. The scale of the development opportunity provides the ability to meet requirements of a range of scales. Current planning is however based on an anticipated focus on logistics and industrial requirements of approximately 250,000 ft^2 with a number of units of approximately 20,000 ft^2 also anticipated to satisfy varied needs. The proposals have been informed by research undertaken by BE Group – a Warrington based multi-disciplinary planning and property consultancy – with further details provided in Section 4.

3. The Socio-Economic Baseline Position

This section details the baseline socio-economic conditions in Warrington with comparisons made to the position in comparator areas to place the statistics in context. Consideration is given to the characteristics of the local population, the business and employment base within the borough and the economic contribution that the area generates.

Understanding the baseline position sets the context for the assessment of forecast impacts that follows in Section 5. In this later section, consideration is given to both the scale of the economic benefits that are expected to be generated – relative to the baseline – and the opportunities for local people to benefit from the development.

Characteristics of the Local Population

This element of the assessment has considered the characteristics of the residents of Warrington and comparator areas[1]. Where data allows for key indicators comparisons to a local assessment area is referenced, which comprises four Middle Layer Super Output Areas (MSOA's) covering the proposed development site and the surrounding area, as shown in the map which can be found in Appendix A to this report.

This section presents residence-based statistics before considering workplace-based statistics in a later sub-section.

Demographics

Total Population

ONS Population Estimates show that in 2020, Warrington was home to almost 209,400 people, accounting for 22% of the population of Cheshire and Warrington. Over the last ten years (2010-2020) Warrington's population has grown by 4%, an uplift of more than 8,000 people. Although the population growth rate has been below that reported regionally (5%) and nationally (7%) it represents a significant local population gain which supports demand for housing and employment opportunities.

As of 2019[2], the local assessment area (surrounding the proposed development site)[3], has a population of 25,186, accounting for 12% of Warrington's population. Between 2011 and 2019[4], the population of the area has fallen by 5%, compared to growth of 4% across Warrington, 4% in the North West and 6% nationally during this time.

Working Age Population

The 2020 ONS Population Estimates statistics show that just under 130,000 Warrington residents (62%) were of working age (16-64), a proportion in line with the regional and national average. In the local assessment area, the proportion is 60%, as of 2019.

The latest count represents a small reduction (-1%) over the last ten years at a time when growth (albeit of a limited scale) has been reported regionally (1%) and nationally (3%). The fall has been driven by a reduction in the population aged 25-49 years – the core of the working age population – by 6% over the last 10 years.

[1] Regional and national comparisons are applied throughout this section. For key indicators, and where data allows, comparisons to the sub-regional and local assessment area are also referenced.

[2] The latest available data at MSOA level

[3] See Appendix A

[4] Earliest data available at MSOA level is 2011

In common with the trend reported regionally and nationally, Warrington's population growth has been driven by an increase in the population aged 65+. By 2020, this age group accounted for 19% of the population, up from 16% in 2010 – an increase of more than 8,300 people. This rate of increase (26%) was higher than that recorded regionally (19%) and nationally (22%).

Providing a range of employment opportunities can play an important role in attracting working age residents into an area. South Station Place can play a role in this context with proximity to transport links expected to appeal to commuters and the on-site open space providing an attractive setting while the scale of employment opportunities will also support Warrington's position as a growing employment location. The proposed provision of a care home on the site will also play a role in catering for the needs of an ageing population.

Ethnic Profile

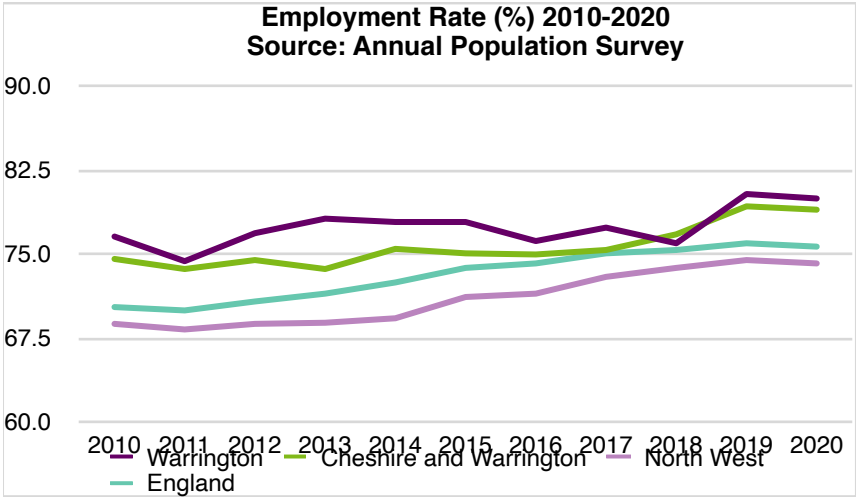
At the time of the 2011 Census, 96% of Warrington's population identified themselves to be of White ethnic origin. This rate was higher than the proportions reported regionally (90%) and nationally (85%). The largest ethnic minority group within Warrington was people of Asian/Asian British ethnicity, accounting for 2% of the population. In all cases, ethnic minority communities in Warrington account for a smaller proportion of the population than regionally and nationally.

Employment Rate

Annual Population Survey statistics show that in 2020 80% of Warrington's working age population were in employment, a total of 103,200 people. This compares to an average employment rate regionally of 74% and nationally of almost 76%, as of 2020.

Warrington's resident employment rate has increased by 3.4 percentage points over the last 10 years, resulting in 4,600 additional people being in employment, despite a reduction in the working age population. This level of change is below the percentage change recorded regionally and nationally with both comparator areas reporting a 5.4 percentage point increase in the employment rate.

As the chart below shows, Warrington has broadly followed the trend reported across comparator areas over the last ten years. The employment rate has remained consistently above the regional and national average as well as the sub-regional rate in all years but one.



Unemployment and Economic Inactivity

ILO Unemployment

Warrington's ILO unemployment rate[5] stood at 3.0% of residents aged 16+ in 2020, a count of 3,300 residents. This compares to a rate of 4.2% regionally and 4.6% nationally, showing that Warrington is performing favourably.

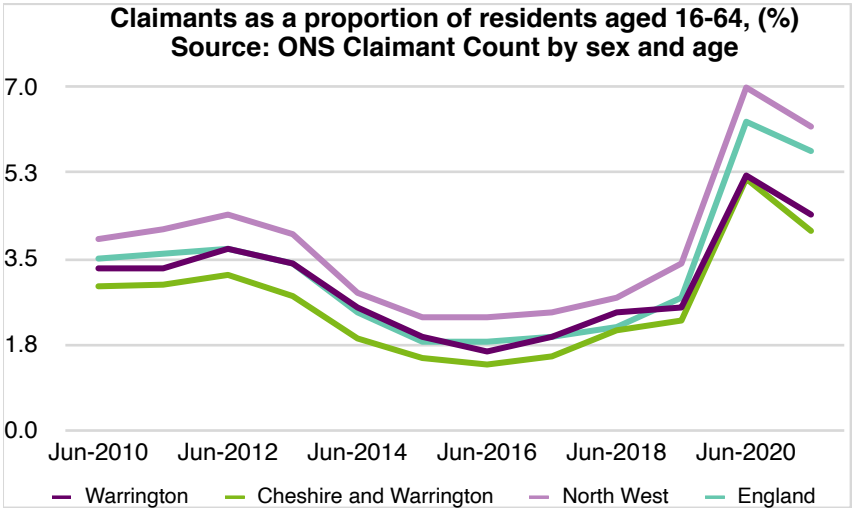
Over the last 10 years, the ILO unemployment rate has fluctuated in Warrington but overall there has been a reduction of 3.3 percentage points (pp). This compares to a reduction of 4.2 pp regionally and 3.4 pp nationally, with both comparator areas having a higher unemployment rate as the starting point.

As the impact of the COVID-19 pandemic started to be felt between the 2019 and 2020 figures, the Warrington ILO unemployment rate increased by 0.2 percentage points (+200 people) – a rate much lower than recorded nationally (+0.7 pp) but marginally higher than regionally (+0.1 pp) – suggesting resilience within the economy and workforce. The true impact of the pandemic on unemployment levels does however remain to be seen as the furlough scheme comes to an end.

Claimant Count

Claimant Count[6] statistics show that in June 2021 5,785 Warrington residents aged 16+ were claimant unemployed, equating to 4.4% of the population aged 16-64. This follows a peak claimant level over the last 10 years of 6,740 (5.2%) in June 2020. Over a ten-year period, the claimant unemployment rate has increased by 1.1 percentage points and the actual number of claimants has increased by 1,505 people. The COVID-19 pandemic will however have impacted on figures during the last year of published data.

When compared to trends regionally and nationally, Warrington has typically performed better. As of June 2021, claimants accounted for 4.4% of the working age compared to 6.2% regionally and 5.7% nationally. Across the last ten years, the proportion of claimants of unemployment related benefits in Warrington has remained consistently below the regional average and, broadly in line with the national rate, although the last two years data suggests that Warrington is performing more positively.



[5] Defined as those without a job, who have been actively seeking work in the past four weeks and are available to start work in the next two weeks and those out of work, who have found a job and are waiting to start it in the next two weeks. In each year reported, the figures cover the period from January to December

[6] A measure of the number of people who are receiving benefits principally because they are unemployed, including both those who remain on Jobseeker's Allowance (JSA) and those who are claiming the unemployment-related elements of Universal Credit

Within the local assessment area, there were 625 claimants of unemployment related benefits in June 2021, accounting for 11% of all claimants in Warrington. The proportion of all claimants accounted for by the area has been broadly consistent since the data at MSOA level became available in 2013.

The age profile of claimants shows that, in common with the trend regionally and nationally, residents aged 18-24 are over-represented. In June 2021, this age group accounted for 18.5% of claimants in Warrington compared to 15% of the working age population. Considering the actual number of claimants, the 50+ age group has seen the most significant increase in the number of claims since 2010, reporting an increase of 96%.

The Impact of COVID-19

The Job Retention Support Scheme (commonly referred to as furlough) has played an important role in protecting employment across the country, as the COVID-19 pandemic impacted on the operations of many businesses across the country.

At the peak, 30,300 Job Retention Support Scheme recipients were reported in Warrington in July 2020, equating to 29% of eligible employment. This timing coincides with the peak recorded regionally (32%) and nationally (32%), although with Warrington fairing slightly more positively. Numbers are on a downward trajectory with the number of employments on furlough as of 30th June 2021 being 5,600[7], equating to 6% of eligible employment compared to 7% England-wide and 6% across the North West.

Despite the support available, the uplift in claimant unemployment between 2019 and 2020 – when the claimant rate more than doubled from 2.5% to 5.2% of the working age population in the June of each year and an additional 3,410 claimants were registered – suggests that some elements of the Warrington economy (or other areas where Warrington residents work) have not been able to sustain their operations. A reduction in claimants between 2020 and the figures reported in July 2021 (as reported above) do however suggest that the economy is starting to recover.

Economic Activity and Inactivity

In 2020, 106,500 Warrington residents identified themselves as economically active, a rate of 82.6% of 16-64 year olds. Since 2010, this rate has increased by 2.1 percentage points.

When viewed against the position in comparator areas, Warrington out-performs the regional (77.6%) and national (79.5%) averages. Change over the last 10 years has however been stronger in these locations, suggesting that the performance gap is narrowing.

At 17.4% in 2020 (22,500 people) Warrington's economic inactivity rate was one of the lowest percentages it has recorded over the last 10 years. Reflecting the difference in the economic activity rate, Warrington continues to report an inactivity rate that is significantly lower than regionally (22.4%) and nationally (20.5%). Within the Cheshire and Warrington sub-region, Warrington's rate is higher than Cheshire West and Chester's (15.5%), but lower than Cheshire East's (20.8%).

The three most reported reasons for economic inactivity are the same locally, regionally and nationally. They do however appear in a different order. In Warrington being a student is the primary reason for inactivity, which is also the case nationally whereas it is the second most common reason regionally. Although accounting for 21.4% of all instances, inactivity due to long term sickness is less commonly reported in Warrington than regionally and nationally.

Top Three Reasons for Economic Inactivity, 2020			
	Warrington	North West	England
Student	29.3%	25.5%	27.1%

[7] Provisional figure

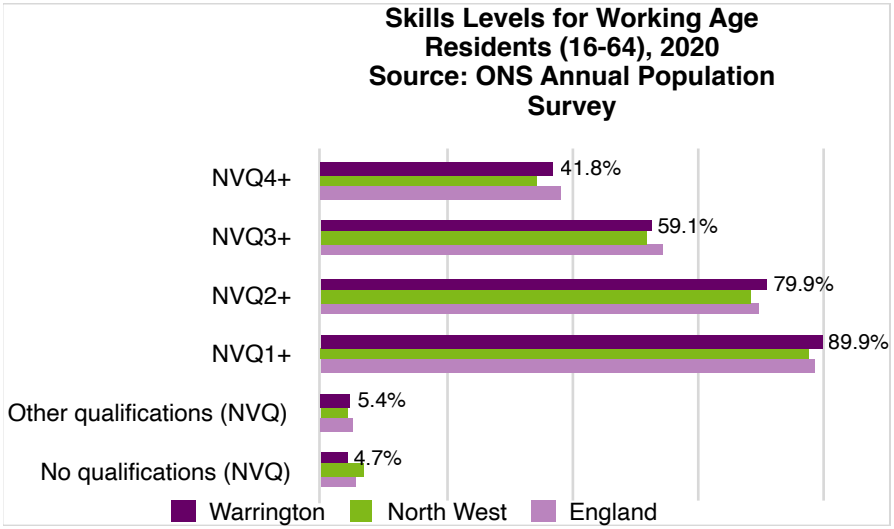
Long term Sick	21.4%	26.8%	22.8%
Looking after Family/home	20.4%	20.3%	20.9%

Source: Annual Population Survey

Resident Skills

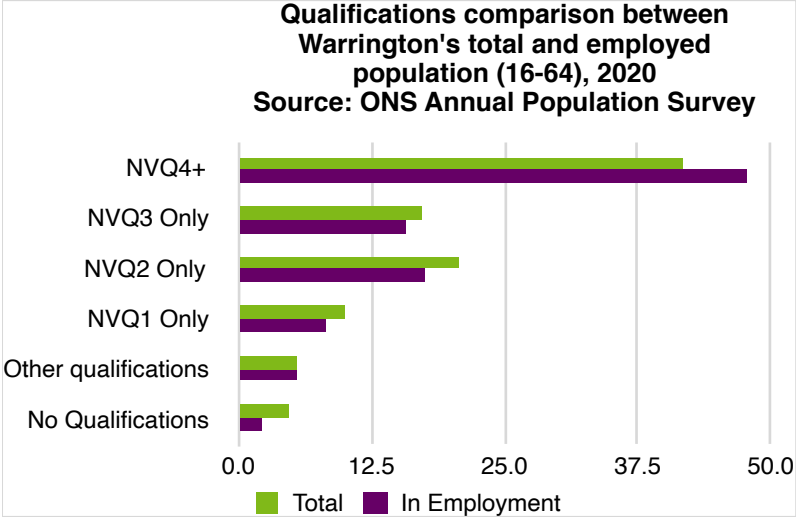
Figures from ONS for 2020 show that over two fifths (41.8%) of the working age population in Warrington hold qualifications at NVQ Level 4 or above while almost three fifths (59.1%) have qualifications at NVQ Level 3 or above. In both cases, the proportion exceeds the North West averages and is marginally below the national average. Warrington also out-performs comparators at NVQ Levels 1 and 2.

At 4.7%, the proportion of Warrington's working age population in possession of no qualifications is considerably lower than the proportion reported both regionally (7.5%) and nationally (6.2%).



Significant upskilling of the population has occurred over the last ten years which will have helped Warrington residents to meet employer requirements. Between 2010 and 2020, the number of residents qualified to NVQ Level 4+ has increased by 28% while the proportion with no qualifications has fallen by 44%. The uplift in the proportion of the population qualified at NVQ Level 4+ has however been lower than the gains made regionally (+34%) and nationally (+42%).

Comparison of the qualifications held by the population of Warrington as a whole versus those in employment shows that high level skills are in demand. While the proportion of people in employment holding NVQ 4+ qualifications significantly exceeds the proportion in the population as a whole (47.8% compared to 41.8%), people with no qualifications account for only 2.2% of people in employment compared to 4.7% of the population.



Resident Occupations

Annual Population Survey data for 2020 shows that professional occupations are held by more than a fifth (21.3%) of Warrington residents

while a further 17.7% are in associate professional and technical occupations. Both occupations account for a higher proportion of employment than regionally (21.1% and 14.8%) with the same being true for associate professional and tech occupations relative to national trends (15.9%). Over-representation is also evident in caring, leisure and other service and process, plant and machine operative occupations.

Over the last ten years, some restructuring of the occupation base has occurred, mirroring trends nationally. Gains have been recorded in professional and associate professional and technical occupations – supported by the increasing skills base of the population – while occupations including elementary roles have declined. As considered in Section 5, the proposed development will create opportunities across a range of occupations that are aligned to Warrington residents' skills.

Resident Employment by Occupation, 2020

Occupation	Warrington	North West	England
1: Managers, directors and senior officials	10.3%	10.4%	11.8%
2: Professional occupations	21.3%	21.1%	22.9%
3: Associate prof & tech occupations	17.7%	14.8%	15.9%
4: Administrative and secretarial occupations	10.1%	11.0%	10.1%
5: Skilled trades occupations	7.1%	9.3%	9.1%
6: Caring, leisure and other service occupations	10.2%	8.8%	8.7%
7: Sales and customer service occupations	8.0%	7.9%	6.7%
8: Process, plant and machine operatives	7.0%	6.1%	5.4%
9: Elementary occupations	8.0%	10.3%	9.2%
Total	**100.0%**	**100.0%**	**100.0%**

Source: Annual Population Survey

Earnings

Annual Survey of Hours and Earnings data for 2020 shows the Warrington's median average resident earnings are in line with the regional average but almost £2,000 below the national average. When considering workplace earnings, Warrington performs more positively, exceeding the regional average and being 99% of the national average. This suggests that higher paid workers commute into the area for work.

Earnings growth in Warrington over the last 10 years has fallen behind the regional and national averages for both residents and workers. Growth in resident earnings in particular is shown to have been constrained relative to experience in the comparator areas. If Warrington had experienced the same level of earnings growth as reported regionally, median annual resident earnings would now be £27,383 (£3,144 more than the current rate) and workplace earnings would be £26,221 (£420 higher than reported).

Resident and Workplace Median Annual Earnings, 2010-2020			
2020 earnings	**Warrington**	**North West**	**England**
Resident	£24,239	£24,334	£26,055
Workplace	£25,801	£24,294	£26,062
Growth (2010-2020)			
Resident	+7.7%	+21.7%	+20.8%
Workplace	+19%	+20.9%	+22.2%

Source: ASHE, 2010-2020

Deprivation

The Index of Multiple Deprivation (IMD) 2019 showed that Warrington was the 148th most deprived local authority out of 317 local authorities in England with 8% of LSOA's in the most deprived 10% in the country, up from 147th (out of 326) in 2015, showing a slightly improving position. Warrington performs relatively poorly in the health domain, ranking 88th in the country.

Part of the local assessment area (LSOA Warrington 005D) falls within the 10% most deprived in the country with a rank of 3,066 out of 32,844.

The Employment and Business Base

This section of the analysis considers the characteristics of employment and businesses located within Warrington, i.e. workplace-based statistics. While many of the jobs detailed in this sub-section may be held by Warrington residents, some will be occupied by residents who commute in from other areas.

The Local Employment Offer

Employment Count

BRES data shows that Warrington's total employment count in 2019 was 141,000, comprising 139,000 employees (98.6%) and 2,000 people who are self-employed or other (1.4%). Warrington accounted for 4.0% of employment in the North West. The four MSOAs that form the local assessment area for the purpose of this report accommodate 23% of employment in Warrington – 33,000 posts.

Over the last ten years, (2009-2019), Warrington recorded employment growth of 20.5% - providing 24,000 additional jobs – exceeding the rates recorded regionally (12.2%) and nationally (12.8%). Performance within the last 5 years (2015-2019) has remained strong with employment in Warrington growing by 12.8% compared to growth of 7.2% regionally and 4.7% nationally.

Within the local assessment area, employment increased by 11.9% over five years, equating to 3,500 additional jobs.

Working Patterns

Consideration of working patterns shows that a higher percentage of employees in Warrington work full-time, accounting for 71.6% of employees (while 28.4% work part-time) compared to 68.1% of employees working full-time across the North West and nationally.

At the time of the 2011 Census, 50,422 Warrington residents (59%) remained in the local authority for work while 34,737 residents (41%) worked elsewhere, 91% of which were working elsewhere in the North West. The most common workplace destinations for Warrington residents were Halton, Manchester, Trafford and Liverpool, which accounted for 42% of out-commuters.

In 2011, 49,224 people commuted into Warrington for work, making it a net importer of labour. Residents in the neighbouring local authorities of St Helens, Wigan, Halton and Cheshire West and Chester, accounted for the largest numbers of those commuting into the local authority (47%).

The MSOA defined local assessment area had a net inflow of labour of 13,439 in 2011, with 8,363 assessment area residents commuting out of the area to work, while 21,802 residents from elsewhere commuted in. Of the assessment area residents commuting out of the area, 50% work

elsewhere in Warrington. Outside of Warrington the most popular workplace destination for assessment area residents was Manchester followed by Trafford, Halton and Salford accounting for 44% of those commuting outside the local authority. Of those commuting into the assessment area for work, 7,771 (36% of in-commuters) came from elsewhere in Warrington. Residents from Wigan, St. Helens, Halton, Cheshire West and Chester and Manchester accounted for the largest numbers of those commuting into the assessment area, outside of the local authority, accounting for 44% of those commuting into the area for work.

Proximity to the motorway network, as well as rail links is expected to play a role in supporting these commuting patterns, which the South Station Place scheme could continue to support.

Occupation Profile

Workplace based Annual Population Survey data for 2020 shows that within Warrington professional occupations account for the highest share of employment at 22.0%, followed by associate professional and technical occupations at 14.8%, reflecting the prominence of these occupations both regionally and nationally. Relative to comparator areas, Warrington has a slight over-representation of employment in occupations including elementary, process, plant and machine operatives and caring, leisure and other service occupations.

When compared to the occupation profile of residents, the workplace analysis suggests:

- Over-representation of elementary and administrative and secretarial occupations relative to the local population; and
- A number of residents working in associate professional and technical and skilled trade occupations will travel outside the area for work.

Workplace Employment by Occupation, 2020

Occupation	Warrington	North West	England
1: Managers, directors and senior officials	10.2%	10.5%	11.8%
2: Professional occupations	22.0%	21.3%	22.9%
3: Associate prof & tech occupations	14.8%	15.0%	16.0%
4: Administrative and secretarial occupations	12.5%	11.1%	10.1%
5: Skilled trades occupations	5.9%	9.0%	9.1%
6: Caring, leisure and other service occupations	9.1%	8.7%	8.7%
7: Sales and customer service occupations	7.8%	8.0%	6.7%
8: Process, plant and machine operatives	6.6%	6.2%	5.4%
9: Elementary occupations	11.1%	10.2%	9.2%
Total	**100.0%**	**100.0%**	**100.0%**

Source: Annual Population Survey

Over the last ten years, the occupation profile of employment in Warrington has seen gains reported in associate professional and technical (+5.6pp), professional (+2.2pp) and caring, leisure and other service occupations (+3.3pp) while the other occupational categories have reported a declining share of employment. Growth in the share of employment accounted for by higher skilled occupations mirrors the trend reported regionally and nationally.

Sector Profile

BRES data from 2019 shows that Warrington's primary sectors of employment are: professional, scientific and technical; wholesale and retail trade; administrative and support activities; and human health and social work with each accounting for more than 10% of total employment. Whilst these prominent sectors reflect trends evident regionally and nationally, Warrington has above average representation in the professional, scientific and technical sector (accounting for just 9% of employment regionally and

nationally) and administrative and support service activities (8% regionally and 9% nationally).

Employment by Sector, 2019

	Warrington	
Industry	**Count**	**Percent**
A: Agriculture, forestry and fishing	350	0.2
B: Mining and quarrying	40	0.0
C: Manufacturing	7,000	5.0
D: Electricity, gas, steam and air conditioning supply	900	0.6
E: Water supply; sewerage and waste management	1,500	1.1
F: Construction	9,000	6.4
G: Wholesale and retail trade	22,000	15.6
H: Transportation and storage	10,000	7.1
I: Accommodation and food service	8,000	5.7
J: Information and communication	4,000	2.8
K: Financial and insurance	1,750	1.2
L: Real estate	1,750	1.2
M: Professional, scientific and technical	23,000	16.3
N: Administrative and support service activities	19,000	13.5
O: Public administration and defence	5,000	3.5
P: Education	7,000	5.0
Q: Human health and social work	15,000	10.6
R: Arts, entertainment and recreation	2,500	1.8
S: Other service activities	2,250	1.6
Total	**141,000**	**100%**

Source: Business Register and Employment Survey

Sector Specialisms

Considering the MSOA defined local assessment area's share of employment (compared to accounting for 23% of employment overall) shows the greatest over-representation within the following sectors:

- Financial and insurance activities (48% of sector employment in Warrington);
- Real estate activities (46%);
- Construction (41%);
- Manufacturing (33%); and
- Transportation and storage (28%).

This shows strong representation within the two primary sectors to be targeted by the South Station Place development – transportation and storage and manufacturing – with the area providing potential to support further growth. The opportunity for a local construction sector of scale to benefit from the development is also apparent.

Over the last ten years (2009-2019), Warrington has recorded its largest employment gains in the professional, scientific and technical activities (+12,000 jobs); administrative and support service activities (+5,000 jobs); transportation and storage (+3,000 jobs); and human health and social work (+3,000 jobs) sectors. The rate of employment growth in each of these sectors exceeded the national average.

Location Quotient's (LQ), is a measure of specialisation compared to the national average), a LQ above 1 indicates that the area has a higher

proportion of employment in that sector than the national average, while an LQ less than 1 indicates that the area is under-represented in employment terms. LQ analysis reveals Warrington has notably higher than average concentrations, compared to the national average, of employment in:

- Professional, scientific and technical activities (with a LQ of 1.90)
- Water supply; sewerage, waste management and remediation activities (1.68)
- Administrative and support service activities (1.64).

Looking at the assessment area, reveals a relative concentration of employment in construction (2.29) and professional, scientific, and technical activities (2.02). Transportation and storage is also strongly represented in the assessment area, with a LQ of 1.75, demonstrating an existing strength to build on.

Employment Density

Job density[8] in Warrington in 2019 was 1.18 – significantly above the North West (0.86) and England (0.88) averages. Over the last 10 years, Warrington has consistently recorded a higher job density than in comparator areas, with job density increasing by 25.5% over the last 10 years, from 0.94 in 2009, compared to growth of 16.2% regionally and 14.3% nationally.

The Local Business Base

Scale of the business base

In 2020, Warrington was home to 9,405 businesses, accounting for 3.5% of the North West business base. Since 2010, the business base has grown significantly by 3,330 businesses; an uplift of 54.8%, compared to 30.3% across the North West and 33.0% nationally.

The assessment area was home to 1,190 businesses in 2020, having been a small uplift – 45 businesses or 3.9% - since 2016. As of 2020, the assessment area accounted for 12.7% of all businesses in Warrington – a proportion significantly less than its share of employment.

Size profile

In line with the position regionally and nationally, micro enterprises – those employing less than 10 people – dominate Warrington's business base accounting for 89.9% of all businesses. Although the numbers are small, Warrington does have a higher than average proportion of large businesses employing 250 or more, and, when compared to the national average, a higher than average proportion of medium sized businesses as well.

Business Counts by Sizeband, 2020

	Warrington	North West	England
Micro (0 to 9)	89.9%	88.8%	89.7%
Small (10 to 49)	7.8%	9.2%	8.4%
Medium-sized (50 to 249)	1.7%	1.7%	1.5%
Large (250+)	0.5%	0.4%	0.4%

Source: UK Business Counts

The assessment area has a different size profile of businesses with a smaller proportion of micro businesses (79.1%), and a larger share of large businesses totalling 15, 1.3% of the business base.

Sectoral profile

[8] Job density is defined as the number of jobs in an area divided by the resident population aged 16-64 in that area.

UK Business Counts data shows that the largest sectors in Warrington's business base of 9,405 enterprises in 2020 were:

- Professional, scientific and technical activities (2,475 businesses, 26.3% of the business base);
- Administrative and support services (1,210 businesses, 12.9%); and
- Construction and wholesale and retail (each accounting for 1,050 businesses, 11.2% of the business base).

The sectors that will provide a particular focus for the South Station Place development are: transportation and storage which currently has 490 businesses in Warrington, 5.2% of the business base; and manufacturing accounting for 460 businesses, 4.9% of the total.

Over the last 10 years, the transportation and storage sector has been one of the fastest growing elements of Warrington's business base recording a 88.5% increase (+230 businesses);); a growth rate that is greater than recorded regionally (84.7%). Other fast-growing elements of the business base have been administrative and support services (163.0%, +750 businesses) and professional, scientific and technical activities (98.8%, +1,230 businesses) both of which have grown at a faster rate than across the region and nationally. Although reporting a lower rate of growth, the manufacturing business base in Warrington (a target for the South Station Place development) has grown by 95 units over the last ten years, a growth rate of 26.0%, exceeding the trend reported regionally and nationally.

The local business base structure broadly follows the borough wide trend. Within the local assessment area, the largest sectors are:

- Professional, scientific and technical activities (210 businesses, 17.6%);
- Construction (180 businesses, 15.1%); and
- Wholesale and retail (175 businesses, 14.7%).

Both the transportation and storage and manufacturing sectors – the target sectors for the development – are over-represented in the local assessment area relative to the Warrington average. In 2020, the former accounted for 5.9% of the business base and the latter 8.0%.

Data for the local assessment area only allows a five-year trend to be considered but over this period, in absolute numbers, the construction and administrative and support services have reported the most significant gains in business numbers.

Economic Contribution

As of 2019, Warrington contributed gross value added (GVA, a measure of economic output) worth £7.76bn to the economy, 4.1% of the North West total (in line with Warrington accounting for 4.0% of employment and 3.5% of the business base in the region – which reflects the higher proportion of large businesses). The transportation and storage and manufacturing sectors play a key role in Warrington's economy, generating £1bn of GVA in 2019, 13.2% of the economy wide total. The economic contribution of manufacturing is overrepresented in Warrington accounting for 7.7% of GVA compared to the sector accounting for 4.5% across the North West and 4.2% nationally.

Since 2009, Warrington's annual GVA contribution has grown by £2.4bn, an uplift of 46%, above the growth rate experienced across the North West (36%) and nationally (42%). The key sectors which have helped to drive GVA growth include administrative and support service activities, with an uplift of 240% (compared to 93% regionally and 87% nationally) and professional, scientific and technical activities with a growth rate of 125% (compared to 45% regionally and 57% nationally). The economic contribution of transportation and storage and manufacturing sectors have also grown at a faster rate in Warrington (66% and 52% respectively) compared to across the North West (52% and 33%) and nationally (47% and 37%) in the past 10 years since 2009. Through developments such as South Station Place, these sectors can therefore play a role in supporting

Warrington and the north of England as a whole to reduce the national performance gap.

GVA per worker in Warrington was £55,014 in 2019, exceeding the North West average (£53,787) but falling below the national average (£62,682). Since 2010 GVA per worker growth has grown by 18%, in line with the North West growth rate but below the national growth of 22%.

4. The Delivery Context

Proposals for South Station Place have been developed to recognise a series of drivers of demand. Consideration has been given to the ability of the scheme to respond to existing strengths, known opportunities and forecast growth within the local economy and population as well as the market trends the scheme is designed to address. Importantly, consideration has also been given to the opportunity for the development to support local, sub-regional and national policy ambitions as well, showing that the scheme has both a strong strategic and market fit.

Responding to Forecast Growth

The proposed development provides an opportunity for Warrington to respond to forecast growth within both the population – as residents and consumers – and the economy.

A Growing Population

ONS Population Projections suggest that by 2040 Warrington will be home to almost 217,100 people – an increase in population of 6,468 (+3.1%) over 20 years. Whilst Warrington's forecast population growth is lower than that anticipated regionally and nationally – with 6.6% and 7.9% growth forecast respectively – the borough will need to plan for a growing population, as well as a changing age profile.

By 2040, Warrington is forecast to have experienced significant change in its age structure with growth driven by those aged 65 and above. In 2040, those aged 65 and over are forecast to account for 25.7% of Warrington's population and those aged 80 and above will be 8.0% of the population – following growth of 39% (+15,640 people) in the 65 plus age group since 2020.

Both overall population growth and a changing age structure will generate new consumer, service and housing demands that the South Station Place development can play a role in addressing.

A Growing Economy

Oxford Economics employment forecasts from 2018, as presented in the 2019 Economic Development Needs Assessment Update, suggest that between 2017 and 2037 Warrington will be home to an additional 12,700 jobs, an uplift of 8.9%, above the regional (3.4%) and UK (6.6%) forecast growth rate[9] over this period. Within Warrington's growth forecasts, an additional 1,000 jobs are forecast to be created within the distribution sector. A regular supply of market responsive accommodation will be required to meet business needs.

Responding to Market Need and Demand

Commercial market trends and requirements

The logistics market – which is the primary target market for the South Station Place development, given the proposed focus on B8 accommodation, has been thriving for a series of years and remains buoyant. The COVID-19 pandemic has further supported the shift towards online retail, accelerating a trend that was already evident in the market and has been driving demand for space.

Sites that offer access to the national motorway network and are close to major population centres are particularly attractive to both large scale warehouse clients and local delivery hubs which are driving further demand. The South Station Place development potentially provides an opportunity to respond to these and wider needs.

The North West market

[9] North West and UK figures come from the 2018 Oxford Economics Greater Manchester Forecasting Model

Agent reports demonstrate that logistics space within the North West remains in high demand. According to a 2021 research report by Savills on the logistics market in the North West[10], the supply of warehouse space fell by over 29% in 2020 to 4.07m ft² across 20 units. Despite continued development, supply have been impacted by exceptionally high demand with take-up of 5.16m ft² recorded in 2020, the best year on record and 38% above the long-term annual average for the region.

Applying the five-year average annual take-up of 4.27m ft² suggests there is only 0.98 years' worth of supply in the region. This position leads the author to comment: *"The current supply shortage and minimal development pipeline will keep vacancy rates low and push on prime rents"*.

At 5.19%, the vacancy rate was the lowest ever recorded and occupier preference is for Grade A supply. The supply of units is also skewed towards small provision with 65% of supply falling within the 100,000–200,000 sq ft size band, which can not satisfy all market needs. In contrast, no units above 500,000 sq ft were on the market.

Knight Frank[11] note that while online retail and distribution firms continue to drive market demand in the region, that have also been notable deals from manufacturers. They note that the supply of available Grade A industrial provision of above 100,000 sq ft remains limited.

The Warrington market

Research by BE Group shows that there is 10.5 million sq ft of industrial floorspace in Warrington at present, of which 8.5% is vacant and only 7.9% is new build. During 2020, 66 industrial deals were completed in Warrington for a total of almost 1.6m sq ft, demonstrating strong market demand. Together, Woolston and Birchwood, areas close to the South Station Place site, accommodated requirements in excess of those at Omega last year. With motorway access a key requirement for logistics businesses, proximity to the M6 and M62 axis – providing both north-south and east-west links – is particularly prized.

The Omega development – providing immediate access to the M62 at Junction 8 and being situated 3 miles west of the M6 / M62 interchange, midway between Manchester and Liverpool – has allowed Warrington to capture a growing share of the logistics and industrial market. With over 4 million sq ft of commercial floorspace now developed, a series of national names have been attracted to the site, bringing new employment opportunities and increased market awareness to the borough.

The South Station Place presents an opportunity to build on this positive experience and strong market appetite. While the intention is to build units speculatively, a high level of pre-lets are anticipated, given strong market demand. Similarly, although the current intention is to focus provision around the 250,000 sq ft mark, Patrick Properties recognise the site's ability to accommodate larger requirements (including above 500,000 sq ft in response to the absence of supply) and plans could be flexed to meet market needs. The ability to accommodate business requirements is therefore strong.

Building on Patrick Properties' Track Record

Based in the North West, Patrick Properties have an established track record of delivering successful distribution and industrial schemes in the region that have satisfied market needs. They currently have 1.6 million sq ft of assets in their portfolio and have developed approximately 1.5 million

[10] https://www.savills.co.uk/research_articles/229130/309575-0

[11] https://content.knightfrank.com/research/491/documents/en/logic-north-west-q1-2021-8006.pdf

sq ft of development over time, as well as acquiring existing assets from other parties.

Examples of their schemes include:

- Graphite Industrial Estate – a 10.6 acre industrial estate on the edge of the Peak District built entirely by Patrick Properties to provide 345,000 sq ft of B1, B2 and B8 accommodation.

- Stakehill 185 – a new build Logistics & Warehouse Facility to the north of Manchester city centre providing 185,000 sq ft of accommodation, including 12,000 sq ft of Cat A specification offices over 3 floors.

- Titan – a 520,000 sq ft warehouse development in Knowsley that comprises three interconnecting units and has been subject to rebuild including new roofs, external cladding, power floated floors with a floor loading of 50 KN, plus refurbished offices and WC's.

Each of the schemes has been well-received by the market enabling the needs of existing and incoming businesses to be accommodated.

Supporting Growth Ambitions

National Policy Drivers

In 2021 the Government published ***Build Back Better: our plan for growth*** which sets out the Government's plans to support economic growth through significant investment in infrastructure, skills and innovation.

"Our plan to build back better takes a transformational approach, tackling long-term problems to deliver growth that creates high-quality jobs across the UK"

The plan recognises the unprecedented impact COVID-19 has had on the UK's economic environment and the need to minimise lasting economy damage and support economic recovery, highlighting that *"jobs are the key to economic prosperity"* noting *"it is crucial that we create the right conditions to unlock that investment and create jobs and growth".*

Back Better reinforces the government's commitment to 'levelling up' and the intention to address regional inequalities, rebalance the economy and 'level up' underperforming and left-behind parts of the UK.

Sub-Regional Policy Drivers

Cheshire and Warrington Local Industrial Strategy (March 2019) articulates the key priorities and interventions between 2019 and 2030. The three overarching priorities of the LIS are to raise productivity, increase business resilience and increase earnings power of residents, including by building on the areas sectoral strengths, creating a more dynamic business base as well as encouraging entry level positions, including apprenticeships.

The LIS highlights continued importance of the manufacturing which is a critical part of the Cheshire and Warrington economy, which accounts for around a quarter of GVA and almost 10% of employment and drives exporting activity and inward investment.

Logistics is also referenced as an important and fast-growing sector for Cheshire and Warrington, where further significant growth is anticipated. Given the extensive national road and rail network and proximity to neighbouring ports and airports, Cheshire and Warrington is regarded as a prime logistics location. In regards to the logistics sector the LIS highlights the need to *"work closely with our Local Authority Partners and private sector developers and landowners to identify the land and infrastructure needed to accommodate that growth in a sustainable way"*.

Building a Better Future Together: Supporting Recovery in Cheshire and Warrington (2021) sets out the short-term plans to restart the economy and enable the LEP to return to growth and deliver on the vision

for Cheshire and Warrington. Business growth is a key priority for recovery, while other objectives include: *"supporting skills and employment opportunities locally, channelling investment to provide opportunity and growth for all our communities, levelling up economic disparities, and boosting town centres and high streets"* and *"delivering high value jobs, housing and infrastructure"*.

The South Station Place development provides an opportunity for Warrington to respond to the national and sub-regional policy drivers outlined above.

5. Forecast Scheme Impacts

Introduction

A scheme of the scale proposed at South Station Place provides an opportunity to generate significant benefits for the local economy, both during the construction and operational phases. The anticipated scale and nature of benefits – including wider non-quantifiable benefits expected to be generated for local residents and the economy – are considered in this section.

Whilst the ultimate scheme impacts will be dependent on the final development mix and the occupiers that go on to be secured, this section provides a best estimate, based on current scheme details. All benefits are presented as gross impacts, reflecting the total scale of benefits that could be supported before any additionality adjustments are applied. Overall additionality is, however, expected to be high reflecting that:

- Benefits could not be secured in this location if the scheme did not proceed and employment growth will be constrained by an absence of appropriate sites and premises to meet business requirements, i.e. deadweight is low.
- Benefits are expected to primarily be captured in Cheshire and Warrington with the wider beneficiary area expected to remain predominantly within the North West, i.e. leakage is low.
- The scale of the site will cater for several new requirements being satisfied in the sub-region so although some jobs may be displaced as businesses relocate within Cheshire and Warrington overall displacement is expected to be moderate.

Economic Impacts

Temporary Construction Impacts

The South Station Place development has an estimated construction cost of £315.5m to be delivered over three to five years. This scale of investment will generate considerable temporary benefits for the local economy, both through the posts it directly supports and as indirect (as funds re-circulate through supply chains) and induced (as the construction workforce spend their wages) impacts are experienced across the economy.

Applying the average cost per full time equivalent (FTE) in the Construction sector in the North West, suggests the construction phase of the development will support 2,670 construction jobs, supporting a GVA impact of £173.7m, using the average GVA per FTE for Warrington. Given the estimated build out period of between three and five years, suggests between 534 and 890 construction jobs will be supported per annum.

Applying the HCA Additionality Guide sub-regional multiplier for regeneration through physical infrastructure, suggests the direct, indirect and induced impacts of the construction phase will support 3,551 FTEs and generate GVA of £231m across its duration.

Forecast Construction Impacts		
	Jobs (FTEs)	**GVA**
Direct	2,670	£173.7m
With multipliers	3,551	£231.0m

Source: ekosgen calculations using Annual Business Survey, Business Register and Employment Survey (BRES) and the Annual Population Survey, ONS Regional Accounts and HCA Additionality Guidance

Discussions are underway with a local apprentice programme provider to allow a series of apprenticeship opportunities to be offered to local people, allowing them to gain skills and on-site practical experience.

Permanent Operational Impacts

Scale of economic benefits

The South Station Place development is proposed to deliver 2.1 million ft² of new employment space with approximately 80% of accommodation expected to be B8 and 20% B2.

Using HCA Employment Density Guide benchmarks for B8 and B2 accommodation suggests, once fully occupied the development will accommodate around 3,000 FTE jobs. This scale of employment and the target sectors of transportation and logistics and manufacturing will create a range of employment opportunities across a range of skills levels and occupations, providing diverse employment opportunities for local residents, including entry level roles. Applying GVA per FTE benchmarks relevant to the sectoral mix expected to be accommodated (for B8 and B2 uses), GVA of £188.4m is estimated to be generated per annum.

Considering the multiplier effects generated through spill-over effects through the spending in the supply chain (indirect impacts) and knock-on consumer spending e.g. via wages (induced impacts) and applying HCA Additionality Guide local multipliers for B2 and B8 uses, suggests the operational phase will support a further 875 FTEs in the local economy and GVA of £56.9m.

Therefore, taking into account direct, indirect and induced economic impacts of the scheme, once complete and fully occupied, the scheme could support an estimated 3,894 FTEs and a GVA contribution of £245.3m per annum.

Forecast Operational Impacts		
	Jobs (FTEs)	**GVA**
Direct	3,019	£188.4m
With multipliers	3,894	£245.3m
Source: ekosgen calculations using HCA Employment Densities Guide and ONS Regional Accounts		

The employment offer

While the occupiers are yet to be determined, the scheme will primarily support warehousing and logistics sector businesses as well as offering some industrial workspace. The jobs accommodated onsite will cater to a range of skill levels, reflecting both sector needs and Warrington's skills profile. The table below sets outs the anticipated skills and occupational profile of the development, based on the anticipated sectoral mix and ONS Annual Population Survey and SOC codes methodology.

Skills and Occupational Profile			
		FTEs	%
Skills Profile			
	Level 4+	490	16%
	Level 3	617	20%
	Level 2	606	20%
	Level 1	1,306	43%
	Total	***3,019***	*100%*
Occupational Profile			
	Managers, Directors and Senior Officials	297	10%
	Professional Occupations	223	7%

Associate Prof. & Technical Occupations	292	10%
Administrative and Secretarial Occupations	235	8%
Skilled Trades Occupations	295	10%
Sales and Customer Service Occupations	192	6%
Process, Plant and Machine Operatives	179	6%
Elementary Occupations	1,306	43%
Total	***3,019***	*100%*

Source: ONS Annual Population Survey and SOC Code Methodology

The range of mid-level and low skilled roles will provide accessible employment opportunities for residents, contributing to growth and supporting inclusive growth and prosperity aspirations. By providing a mix of roles, opportunities for career provision will also be available on-site.

The relatively high share of elementary occupations aligns with the occupational profile for Warrington which has an above average proportions of employment in these roles, compared to the wider sub-region and nationally.

Wider Anticipated Benefits

There are several wider benefits expected to be supported by delivery of the South Station Place development, including:

Attracting and retaining businesses: The significant scale of employment space being delivered, will help meet the demand for logistics and industrial workspace and ensure businesses and jobs are able to be retained and attracted in the area, encouraging further investment into the area.

Benefits to the Exchequer: The 2.1m ft² of employment space has the potential to support business rates of £4.0m per annum, while through the jobs accommodated £19.0m of income tax and national insurance tax income will be contributed to the public purse. Business rates, income tax and national insurance will contribute to the provision and safeguarding of public services and facilities, during a time of ongoing pressure on public finances which has been deepened by the pandemic.

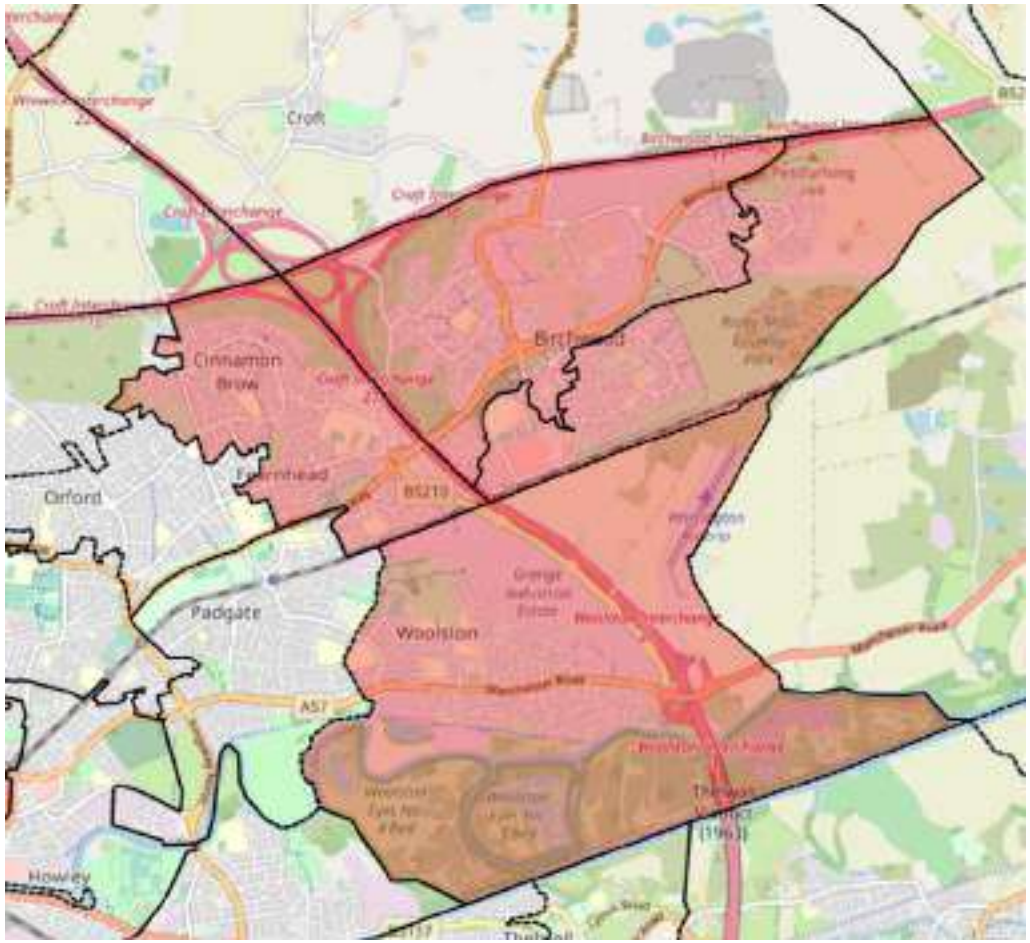
Reducing reliance on car travel for work: The co-location of new employment space and community services, as well as the proximity to the public transport network, with the development providing access to the south of Birchwood Station, supports aims to reduce journey times and reliance on car travel helping to support Council's low carbon objectives.

Supporting improvement of the station environment: At present Birchwood Station has a lack of on-site facilities for commuters and other travellers to use. The South Station Place development will significantly enhance both the arrival experience and facilities available to station uses, including through the provision of parking and a café that provides an inviting and safe environment for travellers.

Unlocking future rail network opportunity: By making allowance within the plans for land to be reserved for use as a turnback, the development creates new flexibility on the rail network. This is the only identified viable opportunity to accommodate such a facility and one that will be missed if the scheme does not proceed.

Providing access to open space: The development will safeguard a large area of public open space and woodland which will be available to use by residents and workers from within the development but also from adjoining local communities. The benefits of walking, cycling and generally spending time outside are well recognised and having access to green space has been increasingly valued during the pandemic. It is therefore a key feature of the proposals that will generate benefits for the local community.

Appendix A: Map of the Local Assessment Area



Source: OpenStreetMap via NOMIS