Parkside Logistics and Rail Freight Interchange Study Addendum

Parkside West Rail Design and Noise and Acoustics Study

St. Helens Council

Project Number: 60494608
60494608-AEC-PARK-REP-101

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Quality information

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1. Executive Summary

This report details the inputs, results and conclusions of the Parkside West Rail Design and Noise and Acoustics Study undertaken as an addendum to the Parkside Logistics and Rail Freight Interchange Study (August 2016).

This study initially assesses the feasibility of high-level options for the location of a rail reception siding at Parkside West. A preferred option is then selected and an outline design and cost for a rail reception siding is established. The noise and acoustic impacts of the preferred option are then tested and the required land to accommodate the rail reception siding (allowing for any mitigation measures) is then identified. The proposed location and design aims to support the optimum operation of the intermodal freight terminal, making it attractive to operators from a cost and operational efficiency point of view.

A requirement for an 820m length siding was identified due to the anticipated train length to be served (750m), allowance for two locomotives (2x25m) and a 20m stopping allowance. In addition to this, the mainline connection, signal standback, Switches and Crossings (S&C) and headshunt/buffer end (60m) have been considered in the overall length of siding required. The alignment design was carried out in accordance with NR-L3-TRK-2049 (Network Rail Track Design Handbook), with minimum geometry criteria relaxed where possible to attempt to mitigate the noise impact; the minimum curvature achieved on the siding is 180m, versus the 150m minimum dictated by TRK-2049. The alignment details are shown on general arrangement drawing “60494608-AEC-PARK-DRG-100”.

The formation width was derived from applicable standards and allowances, with a high-level cut/fill analysis informing anticipated extents of earthworks. The land boundary derived from the outline rail alignment design is shown in drawing “60494608-AEC-PARK-DRG-101”.

Noise impact resulting from anticipated operational use of the reception sidings (a maximum of 10 trains per day) was assessed on the outline siding alignment using the ‘Soundplan’ software package. The results were compared to baseline noise levels from 2004 (Capita Symonds) and numerous defined metrics for assessment of ‘acceptable’ noise levels. Without any noise mitigation, annoyance and sleep disturbance would be expected at the residential receptors closest to the site in Banastre Drive. The baseline noise data indicates that the criteria are currently exceeded due to existing road and rail sources. With mitigation in the form of a 4m high noise barrier, the noise levels are reduced to an exceedance of +3 dB to the World Health Organisation (WHO) sleep disturbance criterion; note that baseline noise levels already exceed this criterion by +9 dB.

A costing exercise was carried out on the rail alignment, which (subject to a number of assumptions and exclusions) indicates a construction and indirect cost estimate to be £14,017,113.67. The total capital cost limit of the rail alignment is estimated to be £25,254,290.50. This takes into account the early stage of scheme development, with a standard risk figure of 60% applied to account for uncertainties, assumptions and the high-level nature of the outline design. Subject to further scheme development, this cost will likely change to reflect design development/refinement and a reduction in uncertainty.

Further design development is recommended, in partnership with key stakeholders such as Network Rail, in order to gain the necessary approvals for full planning permission.

2. Introduction

This study is being undertaken as an addendum to the Parkside Logistics and Rail Freight Interchange Study (August 2016) to inform the St. Helens Local Plan. The Study identified Parkside as a feasible and deliverable site for a Strategic Rail Freight Interchange (SRFI), and found that the opportunities for rail access at the site to/from the north, south, east and west are second to none in the North West and nationally. The Study subsequently concludes that land on both the west and east of the M6 will be required to enable rail access to any future SRFI from all four directions.

This study investigates the feasibility, land-take requirements, outline design and cost and noise impacts/mitigation for the provision of a reception rail siding and loop at Parkside West. This siding will allow trains from the north and east to enter the site and be fully removed from the national rail network; the proposed design is to support the optimum operation of an intermodal freight terminal and appeal to operators from a cost and operational efficiency point of view. This has resulted in the siding being able to fully accommodate a 750m train plus allowance for 2no. 25m locomotives (i.e. an additional 50m). Once in the reception siding, provision has been made for a headshunt and run-round loop to enable locomotives to decouple, reverse and re-connect at the opposite end of the train to allow train movements into the main intermodal terminal on the eastern side of the M6 motorway (to be designed). No other activity, aside from emergency maintenance, will take place in the reception siding. A cripple siding is assumed to be located on the site east of the M6 in accordance with discussions that took place with David Hunter, Senior Route Freight Manager London North Western Railway (SRFM LNWR).

Trains approaching from the south are expected to be the dominant flow, with reception siding expected to serve a maximum of 10 trains per day, which results in up to 40 separate movements over this section of track; arrival in/out and departure in/out.

This report details the methodology, assumptions and conclusions for the outline design of the rail siding and presents analysis of the noise impact on neighbouring residences along with proposed mitigation measures.

3. Rail Design

3.1 Introduction

The outline alignment design for the reception siding and loop for Parkside West identified in this study is assumed to connect to the Liverpool to Manchester, DSE* Down Line, enabling freight from the north (via Newton-Le-Willows Junction) and east to be fully received into the development and off the mainline rail network. Consideration was also given to the requirement for future connection of the siding to the main intermodal terminal east of the M6 motorway.

This study covers the outline alignment design, formation components/cross section, potential extent of earthworks and an indication of required land boundary to be safeguarded. The digital 3D alignment file is a direct input to the noise/acoustic assessment, which is covered in the relevant sections of this report.

*DSE – Engineer's Line Reference (route identification code)

3.2 Methodology

3.2.1 Route Development Overview

An initial desk study was carried out to identify the specific constraints and opportunities of the site. This included reference to:

- Geographical Information - Contour data, Ordnance Survey
- Aerial Photography
- British Geological Survey data
- Geometry of existing mainline rail network

This allowed a high-level options identification exercise to be carried out, which can be seen in Figure 1.

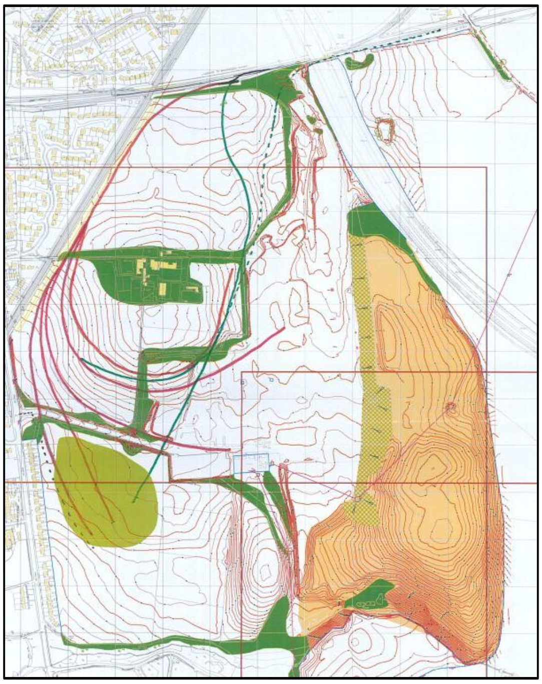

Figure 1 - Initial Option Identification

These options were developed into digital alignments using Bentley Rail Track v8i and overlain on supplied Ordnance Survey and Contour data. 4no. options (shown in Figure 2) were presented to St. Helens Council at an option selection workshop (6th October 2016, AECOM Altrincham), along with pros and cons and an indicative noise assessment.

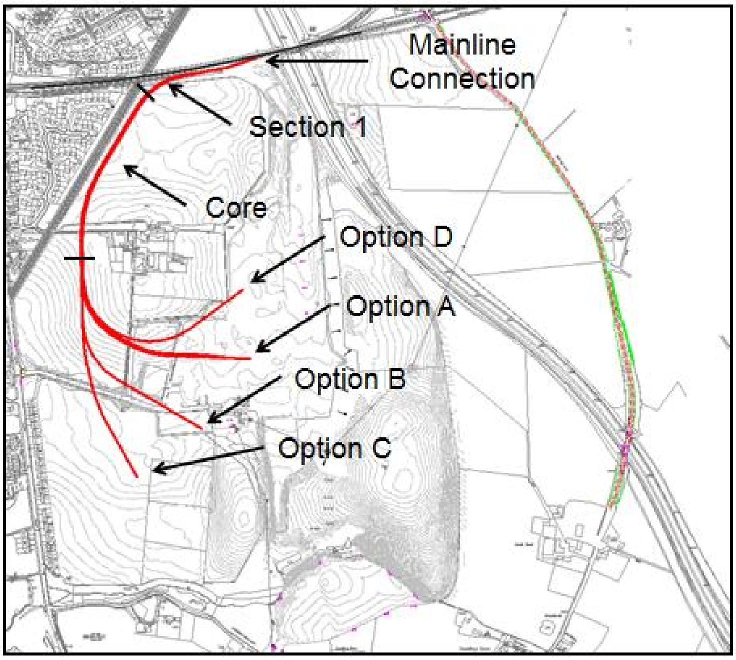

Figure 2 - Option Selection Workshop Alignments

Option B was found to be most preferable to St. Helens Council as earthworks were minimised and the impact on the developable floorspace was anticipated to be less than for other options .

The route of the siding was then refined following the workshop and subjected to further optimisation and review from a technical, rail alignment perspective.

3.2.2 Earthworks and Land Take Requirements

Land take requirements of the options were assessed based on a set formation width (of 16.4m), with an allowance for earthworks (cuttings and embankments) provided beyond this and acoustic barrier. Contour data was compared to the vertical elevation of the proposed alignment, which allowed an estimate of cut/fill requirements and an approximation of cutting/embankment widths to be made. Adding this to the core formation width of the two track siding and loop arrangement provided an envelope at points along the alignment from which a land boundary could then be obtained. This is shown on drawing "*60494608-AEC-PARK-DRG-101*".

3.3 Assumptions and Constraints

Project delivery risks are identified on the Project Risk Register – attached as Appendix A "*60494608-AEC-PARK-REG-100*". Design assumptions are discussed within this section; for a full set of design assumptions, please refer to the Assumptions Log "*60494608-PARK-REG-101*", included as Appendix B.

3.3.1 Alignment

Outline alignment centrelines have been developed in sufficient detail so as to inform the required land boundary requirements for the western reception siding and loop. They are based on Ordnance Survey and contour data supplied to AECOM by St. Helens Council and are designed in accordance with applicable Network Rail and Railway Group standards along with established best practice in alignment design:

- Track Design Handbook – NR/L3/TRK/2049
- Design and Construction of Track – NR/L2/TRK/2102
- Signalling Design Handbook – NR/L2/SIG/11201
- Signal Positioning and Visibility – GE/RT8037

The design speed of the alignment is 15mph. The design speed is constrained by the achievable geometry of the siding and loop within the footprint of the scheme. The minimum curve radius designed within the siding is 150m, which is the minimum radius as recommended for use in sidings by Network Rail (TRK/2409). The extent of tight radii have been minimised where possible in attempt to mitigate noise impact of the alignment; low radii curves traversed at low speeds are known to be noisy and produce curve squeal.

Vertical alignment design has been undertaken at a very high level to inform likely cut and fill requirements, costing and to input to the 3D noise model. The gradient of the alignment has been designed with topography and fall of the site away from the mainline (DSE) in mind; a continuous fall of 1 in 500 is used, which corresponds to the Network Rail recommended maximum gradient on a siding. The exceptions to this assumption are the alignment sections at the connection to the mainline and the headshunt/buffer end, which have been designed flat to mitigate roll-away of locomotives.

3.3.2 Siding and Loop Length

To service the number of trains required per day (maximum 10), a siding with a single loop was determined sufficient for operational purposes. The total required length of the siding is based on the following assumptions and shown in Figure 3:

- 25m - Signal standback
- 800m – Siding length to allow for 750m train plus two locomotives (25m each)
- 20m – Stopping allowance
- 50m – Headshunt
- 10m – Buffer end
- Associated length for switches and crossings

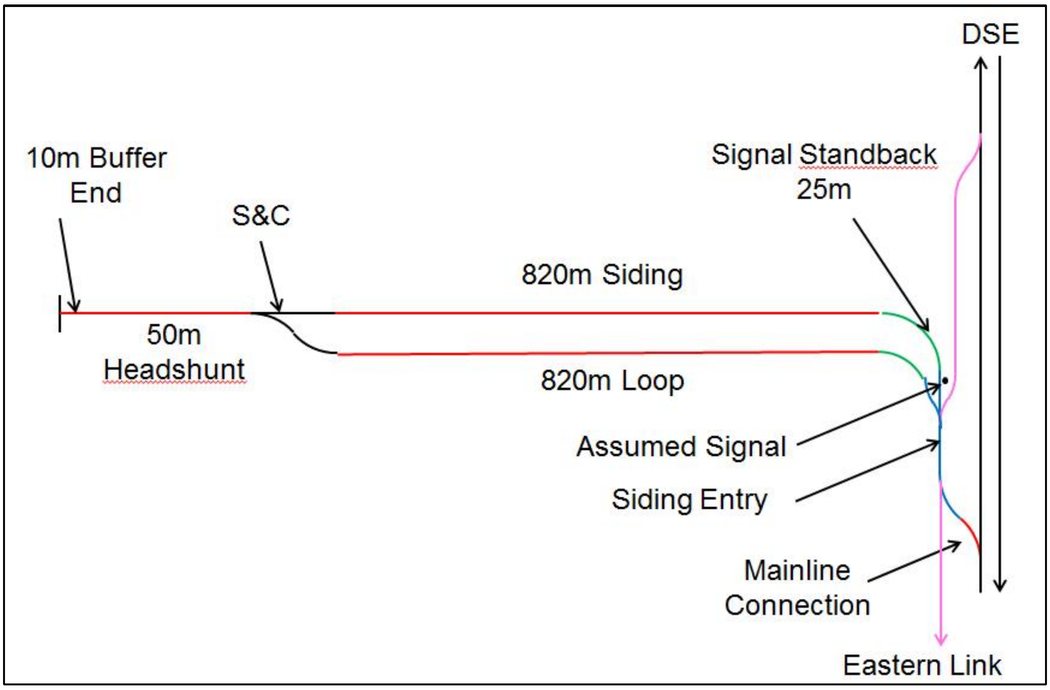

Figure 3 - Siding Schematic

3.3.3 Trackform

It is assumed that trackform will be of typical ballasted construction. No design has been carried out and costing has assumed a generic rate for such track type.

3.3.4 Spatial Configuration

A typical cross section has been developed (shown in Figure 4) and assumed for purposes of determining corridor width and, hence, land safeguarding requirements for the siding. The route has made allowance for 5m spacing between track centrelines, which allows for unscheduled maintenance activities to be undertaken in the 'six-foot' gap between the parallel tracks (TRK/2049). Passive provision has been made spatially for the siding to be electrified with 2m allowance for clearance to Overhead Line Electrification (OLE) poles. Vehicular access has been allowed for on either side of the siding and loop for maintenance and repair activities by way of a 3m access road. The earthworks extent varies along the alignment depending on cut/fill requirements. An additional (nominal) 2m allowance for acoustic mitigation (i.e. noise barrier) has also been made.

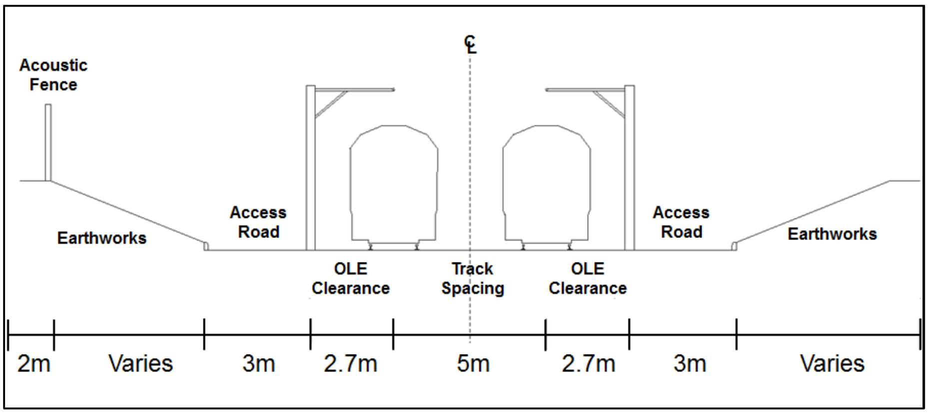

Figure 4 - Formation Width

The overall rounded corridor width is therefore 18.5m (not including earthworks) for twin track sections. Where only one track is required (e.g. at headshunt), the corridor width reduces to 13.5m and where one track and no access road is required (e.g. connection to mainline) the corridor width reduces to 5.5m (both excluding earthworks).

3.3.5 Connection to Mainline

The site is a former colliery, with the previous connection to the DSE (down) line for the former colliery sidings still detailed on the Ordnance Survey data. This point on the mainline is located on a 3333m radius curve. Newton Le Willows junction is located around 50m to the east of this point, which allows trains to access the West Coast Mainline (WCML) and an associated crossover is located in the M6 underbridge section of track. Best practice dictates that an allowance of 25m should be made between adjacent Switch and Crossing (S&C) to prevent coach bogies straddling opposing geometry, as this creates track wear and a noisy ride. The disused turnout is approximately 25m from the crossover for Parkside junction, making this point the eastern limit of the new Parkside connection.

The site is constrained in width at the northern end, with a post and rail boundary fence to the west; the alignment needs to be offset from this based on the assumed formation width (discussed in section 3.3.4). The fixed length of alignment required to keep 25m straight sections between adjacent S&C and before introducing this curve means that the mainline connection needs to be as far to the east as possible; this facilitates geometrical design with radii in excess of 150m and reduces noise impacts. The design therefore assumes 'reinstatement' of a new turnout at this eastern limit to be a fixed point.

3.3.6 Topography and Earthworks

Contour data provided by St. Helens Council was reviewed; topography of the site was found to be undulating and steep in some areas. Design of the siding has taken this topography into account as far as reasonably practicable in that the horizontal alignments 'follow' contours where possible based on the 'idealised' 1:500 constant gradient. This approach attempts to reduce the extents of cut and fill required, which in turn minimises the land boundary through a reduced earthworks footprint. Comparing the existing ground level to the proposed rail alignment at regular intervals enabled a high level cut/fill assessment to be carried out. Based on a 1:2.5 slope gradient, this enabled the earthworks component of the total formation width to be approximated.

3.3.7 Ground Conditions

As the site is a former colliery, it is not unreasonable to assume that contaminated ground will exist, however this cannot be confirmed unless a Ground Investigation is carried out. There is a risk that unmarked coal mining shafts and routes of drilling exist in addition to the shafts and air vent routes identified on the topographical survey may exist within the site. Development of the proposed alignment has taken cognisance of the known features only.

Online British Geological Survey borehole scans have been used to gain a basic understanding of the geological profile of the site. These freely available scans are limited in number and do not cover the area within the identified land boundary for the rail alignment. As such, a full Ground Investigation should be carried out to confirm the sub-surface geological conditions. Two borehole scans were accessed within the site (SJ59 NE43 and SJ59 NW46), which suggest superficial deposits of sandstone, compacted sand/gravel, mudstone and clay. There is no evidence of subsurface peat deposits in either of these boreholes which could have implications on the track bed foundation type and complexity.

3.3.8 Future Connections

The design takes cognisance of the need to allow for further connection to the DSE from the west and an eastern spur within the site to enable rail access into the main freight terminal. Allowance for this has been made within the alignment design and the land boundary made sufficiently wide to accommodate some flexibility in any future development proposals.

3.4 Route Description

The route description section will cover the 3no. options developed post-workshop, which used 'Workshop Option B' as a basis for development – these options are shown in Figure 5. The write-up covers the main siding only, not the associated loop - which is simply a parallel track offset by 5m (as outlined in section 3.3.4).

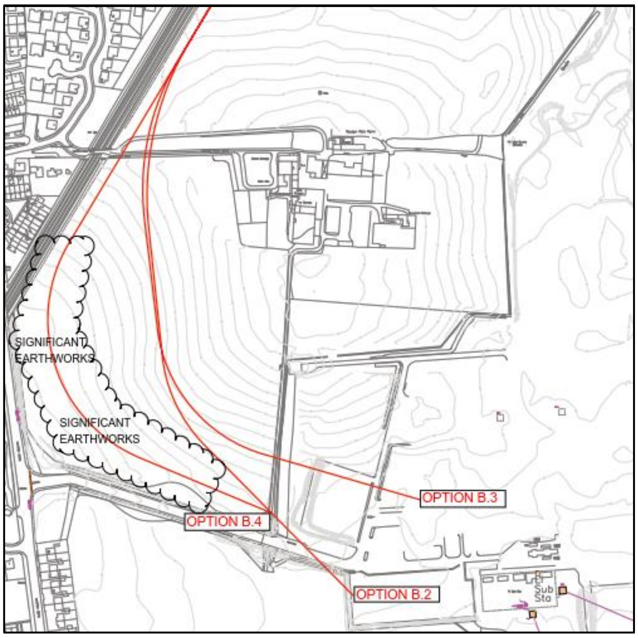

Figure 5 - Options B.2, B.3 and B.4

3.4.1 Section 1 – Mainline Connection

The proposed BV8 turnout from the mainline (down DSE) is located to the west of the M6 underbridge at the site of the former turnout for the disused colliery siding; this is 25m from the adjacent crossover to the up line which facilitates movements to and from Parkside Junction.

Risk - The turnout is flexed as it is located on a 3,333m radius curve on the DSE mainline. This curve will likely have cant (superelevation of the outer rail to aid cornering) on it, along with an associated transition curve (gradually introduces change in geometry to create a smooth ride). To provide a turnout in this area the radius will need to have 0mm cant applied, and the transition lengths modified so that the rate of change of cant deficiency is reduced to less than 55mm/s. It is therefore likely that works are needed on the mainline to accommodate a turnout here, which could potentially impact on the adjacent Parkside Junction.

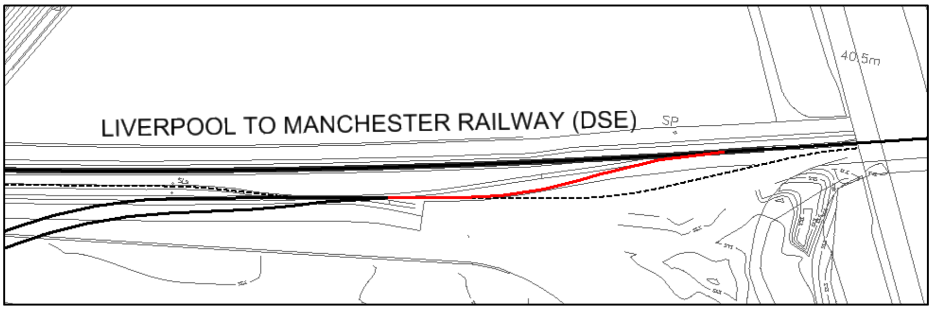

Figure 6 - Mainline Connection

This turnout type and configuration will facilitate freight movements on and off the network at 15mph (see section 3.3.1). Existing ground contour data has not been supplied for this short section. The proposed alignment would be flat through this section to account for the S&C and to avoid any level changes between the existing mainline and the new, diverging route in such close proximity. A section of straight track, parallel to the existing mainline, to facilitate a future eastern connection has been designed into this scheme.

3.4.2 Section 2 – Core

The starting position of the first curve into the site is constrained as discussed in section 3.3.5, and its curvature constrained by the narrow width of the site to the north. Common to all options, this section achieves a 180m radius curve, which is greater than the 150m Network Rail minimum allowable curvature in a siding (TRK/2049). This is a sensitive area of the site due to close proximity to neighbouring housing. The provision of a flatter radius will likely reduce the noise impact of the scheme through mitigating curve squeal to a degree. Refer to noise section of report for further details. Following this, the alignment runs straight and parallel to the western boundary and the WCML, offset from the boundary such that earthworks, noise mitigation and access roads are allowed for within the overall formation width.

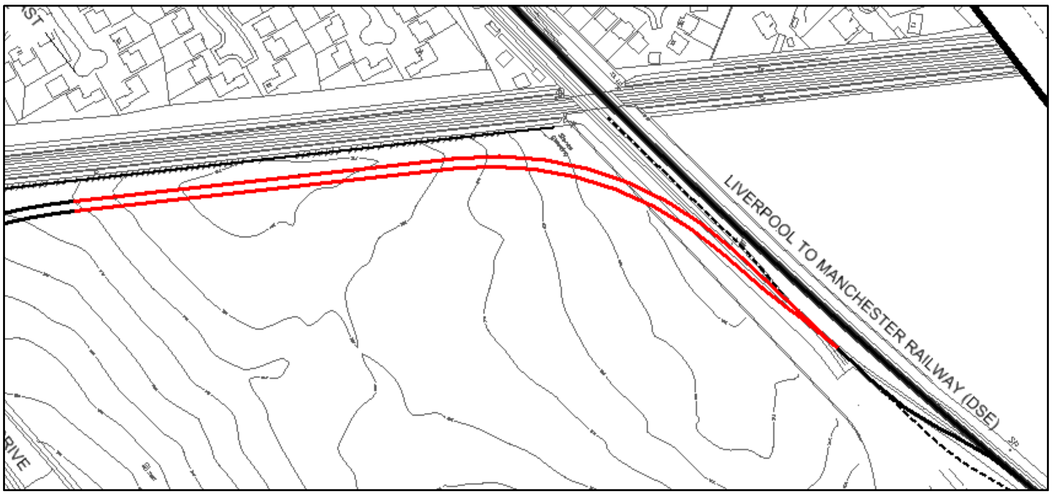

Figure 7 - Core Siding

Given the constraints mentioned, 'following' contours with the core alignment is made difficult. Keeping close to the site boundary is preferable from the perspective of the wider development (so as not to create a strip of unusable land) and there is a hill in the middle of the site. As such, 'threading' the alignment through this gap and keeping the alignment straight (reducing noise impacts) is considered the best approach.

The vertical alignment falls at a constant rate of 1:500 and it is anticipated that (given current information) the alignment section will be mainly in cutting, with some short sections of fill due to the undulating ground profile.

3.4.3 Section 3.1 – Option B.2

Option B.2 is the preferred option, selected by St. Helens Council due to the reduced curvature (and associated less noise generation) and the reduced impact on developable floorspace. The alignment curves to the south-east to follow the existing contours of the site; minimising extents of required cut and fill. Two horizontal curves of 300m and 250m radii facilitate this orientation change, with the alignment terminating with a 50m straight, level section of headshunt. The positioning allows for future access opportunities to maintenance access roads along the siding.

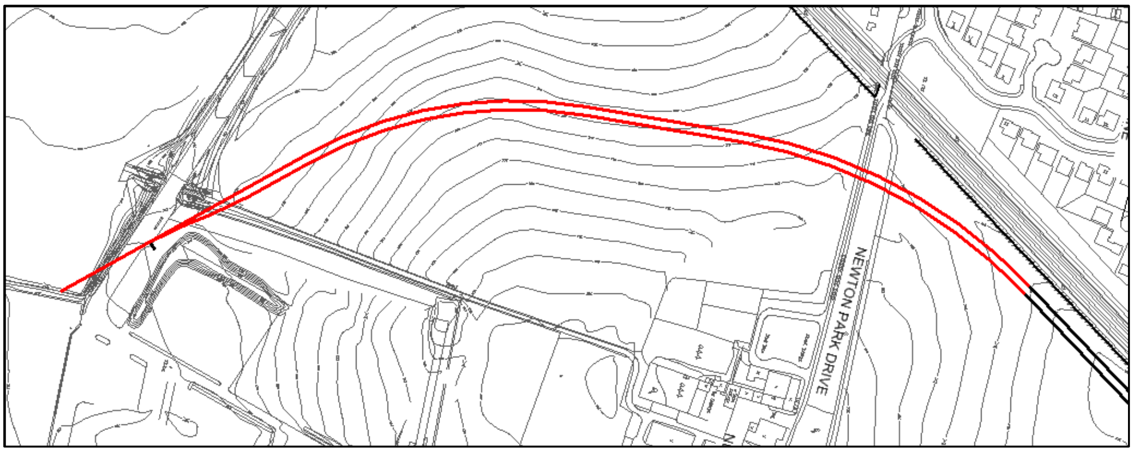

Figure 8 - Option B.2

Vertically, the alignment maintains a constant fall of 1:500 before levelling out to flat for the headshunt section to mitigate for vehicle roll-away. Provision for a sliding buffer stop has been made; an overrun risk assessment should be undertaken at the next stage of development.

Based on the contour data provided, it is anticipated that Option B.2 will require earthworks equating to 9,400 cubic metres of material (assuming a nominal soil bulk density of 1600kg/m^3 in the absence of a detailed GI and no earth retaining structures).

3.4.4 Variants - Option B.3 and B.4

Options B.3 and B.4 are variants that were presented to St. Helens Council for consideration.

Option B.3 comprises tighter geometry than Option B.2, with 250m and 200m radius curves, but follows the contours of the site more closely. As such, cut and fill and the overall land take of the option are reduced. The main drawback of this option is that it would generate a tighter curvature than Option B.2 which could have greater operating noise implications. Option B.3 would require less cut and fill and has been included in the final land boundary extents to facilitate some flexibility in site layout. It is considered that any additional noise matters can be addressed through mitigation..

Based on the contour data provided, it is anticipated that Option B.3 will require earthworks equating to approximately 8,000 cubic metres of material (assuming a nominal soil bulk density of 1600kg/m^3 in the absence of a detailed GI and no earth retaining structures).

Option B.4 follows the western boundary more closely in attempt to minimise the land take from the site. Using the tightest allowable 150m radius curve, the alignment turns to the east and runs parallel to the existing spine road. This alignment presents significant challenges due to site topography and anticipated noise impacts. The alignment traverses a significant set of closely spaced contours where the ground quickly falls away. As such, the alignment would require a significant section of embankment to be created. Not only is this expensive and complex engineering, the associated noise impacts (being higher up and a lot closer to neighbouring residences) would also likely be significant – especially considering the curve is very tight in this area. This option was ruled out from further development for these reasons.

Based on the contour data provided, it is anticipated that Option B.4 will require earthworks equating to approximately 24,000 cubic metres of material (assuming a nominal soil bulk density of 1600kg/m^3 in the absence of a detailed GI and no earth retaining structures).

3.5 Land Boundary

The land boundary identified for safeguarding is shown on drawing "*60494608-AEC-PARK-DRG-101*". The boundary is comprised of the formation as outlined in section 3.3.4 along with anticipated earthworks along the route. The 'fan' at the buffer end also takes option B.3 into account, showing that the end point of the siding can be manoeuvred somewhat to suit the desired balance between cut/fill and impact on the wider development plans. The boundary around the mainline connection point has been extended to match the landscaped areas shown on Inset A of the above drawing. This is to allow for the greatest scope for modifications to the siding entrance arrangement following discussions with and input from Network Rail.

3.6 Costing

Following finalisation of Option B.2, AECOM undertook a costing exercise to provide a high-level estimate of the capital cost of installation of the rail infrastructure and the anticipated earthworks for the scheme. Assumptions and exclusions are detailed in sections 3.6.2 and 3.6.3 respectively.

3.6.1 Summary

The construction and indirect cost of option B.2 has been estimated at £14,017,113.67, which includes for direct construction works, contractor's costs (preliminaries, overheads and profit) and project/design team fees.

Additional allowances should be made on top of this figure to reflect the impact of construction on the existing national rail network (DSE Line) and a risk allowance reflecting the very early stage of scheme development. An industry standard risk figure of 60% has therefore been allowed for on top of design and construction costs. This reflects uncertainties such as the unknown Network Rail specific requirements, unknown ground conditions, no existing coal mining risk assessments, the accuracy of data provided and a lack of topographical survey. The total estimated cost limit, taking these additions into account, is £25,254,290.50. Following further design development, the estimate will need to be re-visited and refined accordingly.

No allowance for OLE, signalling or power has been made as the scope of these works is as yet unknown. The cost is broken down as shown in Table 1 and Table 2.

As the reception siding will be subject to relatively low operational speeds, there is a possibility that re-conditioned rail may be suitable for use; this could represent an economically efficient and environmentally beneficial solution. Further investigation to assess the viability of this approach is recommended, but it has been known to "allow cost savings of more than 50% compared to new rails"[1].

	Group Element	Total Cost £
1	**Direct Construction Works**	
1.01	Railways Control Systems	-
1.02	Train Power Systems	-
1.03	Electric, Power and Plant	-
1.04	Permanent Way	4,094,721.27
1.05	Operational Telecommunication Systems	-
1.06	Buildings and Property	-
1.07	Civil Engineering	4,055,427.31
1.08	Enabling Works	119,535.00
	DIRECT CONSTRUCTION WORKS COST (A)	**8,269,683.58**
2	**Preliminaries, Overheads and Profit**	
2.01	Preliminaries @ 30%	2,480,905.07
2.02	Contractor Overheads and Profit (@15% of A plus Prelims)	1,612,588.30
	INDIRECT CONSTRUCTION WORKS COST (B)	4,093,493.37
	CONSTRUCTION COST (C)	**12,363,176.95**
3	**Project / Design Team Cost**	
3.01	Design Team Fees @10% of A	826,968.36
	Project Team @10% of A	826,968.36
	EMPLOYER INDIRECT COSTS (D)	**1,653,936.72**
	CONSTRUCTION AND INDIRECT COST	**14,017,113.67**

Table 1 – Estimate of Construction and Design Cost for Option B.2

	Group Element	Total Cost £
	CONSTRUCTION AND INDIRECT COST	**14,017,113.67**
4	**Other Project Costs**	
	Disruption of Asset Use – Employers Costs, Possessions	165,393.67
	Schedule 4 Costs for Disruptive Possessions	620,226.27
	Insurances – Network Rail Fee Fund*	700,855.68
	Industry Risk Fund (IRF)*	280,342.27
	OTHER PROJECT COSTS (E)	**1,766,817.90**
5	**Risk Allowance @ 60%**	**9,470,358.94**
	COST LIMIT EXCLUDING INFLATION (F)	**25,254,290.51**

Table 2 – Estimate of Total Cost Limit for Option B.2

* Network Rail Fee Fund and Industry Risk Fund applied to the AFC less risk, inflation, possession management costs and any compensation costs (including Schedule 4 and 8 costs)

[1] Vossloh Rail Services "http://www.vossloh-rail-services.com/media/downloads/pdfs/prospekte/7_Rail_Reconditioning_by_VRS.pdf"

3.6.2 Assumptions:

The following assumptions have been made to enable a pricing exercise to be undertaken:

- Base date is 4Q16
- Prepared using the Rail Method of Measurement Volume 1, Cost Planning, July 2014.
- Ballast is 10.435m wide and 0.3m thick.
- Sleepers every 0.76m.
- Allowance has been made for drainage running the length of the track.
- Allowance has been made for connection to existing drains at both ends of the track.
- Earthwork quantities have been calculated using the Existing Ground Level taken from contours on supplied topo data and proposed rail level taken from Bentley Rail Track vertical alignment.
- Ground conditions to have superficial deposits of sandstone, compacted sand/gravel and mudstone (British Geological Survey free online borehole scans).
- Embankments will be seeded both sides of the track. Allowed for 2m width of seeding both sides.
- Post and rail boundary fence to run the length of the track.
- Assumes drainage will be required running the length of both roads along the edge of the cutting.
- Allowance has been included for the excavation of the track foundations. It has been assumed that the length of the track will have to be excavated 10.435m wide and 1m deep so the top of the rail is at the required level.
- Roads build up is assumed to be a permanent Asphalt construction with a capping layer (0.35m), sub base (0.3m), base course (0.06m) and wearing course (0.04m).
- Roads will have a kerb along one edge and edgings along the other.
- Allows for general site clearance to the area within the land boundary.
- NWR benchmark data has been used to calculate the percentage add-ons for the indirect costs.
- Includes an allowance for mainline possessions and Schedule 4 costs in the estimate.

3.6.3 Exclusions

The following items are excluded from the estimate:

- Optimism Bias
- Inflation
- Compensation to 3rd parties affected by the works.
- Planning and approval charges.
- Track Formation Design – depending on GI results, additional material under the ballast may be required
- Costs associated with Statutory Fees (e.g. HMRI, Local Authority, etc.) unless specifically identified.
- Costs associated with taxes and levies, including VAT.
- Costs associated with licences and all associated costs and fees.
- Overhead Line Electrification and infrastructure, Signalling and Power.
- Structures or retaining walls along the route such as the M6 underbridge.
- Service ducts or lighting to the roads
- Connection to the Mainline (Eastern connection, DSE (Down) connection, Eastern connection and Parkside junction).
- Cost of the Acoustic Fence due to extent of fencing unknown at time of pricing.
- Operation and maintenance requirements.
- Land acquisition costs.
- Works associated with providing temporary or permanent access to Newton Park Farm and the Sub Station.
- Any allowance for dealing with Contaminated Land.
- Taxation Assessment.
- Allows no cost for the abandonment and recovery of old materials and the treatment of any existing track.

5. Noise study

5.1 Introduction

The noise impacts of the operation of the reception siding have been considered throughout the rail design, with the most affected receptors located to the west of the site, for example the residential properties in Banastre Drive. The existing noise sources in this area include the WCML railway, the Liverpool to Manchester Line ('DSE') to the north and the M6 to the east (Figure 2). Vibration generated from the operation of the siding is expected to be negligible and has not been considered in this work. Construction noise and vibration are also not considered at this stage. An assessment of the noise impacts has been carried out by prediction of the noise from the operation of the siding and comparison of the levels with relevant criteria and the existing baseline noise.

The noise terminologies used in this document are explained in Appendix C.

5.2 Baseline Noise Levels

Baseline noise levels were measured in 2004 as part of an earlier study [2] and included attended and unattended measurements at three locations near to the prospective reception siding (Figure 9).

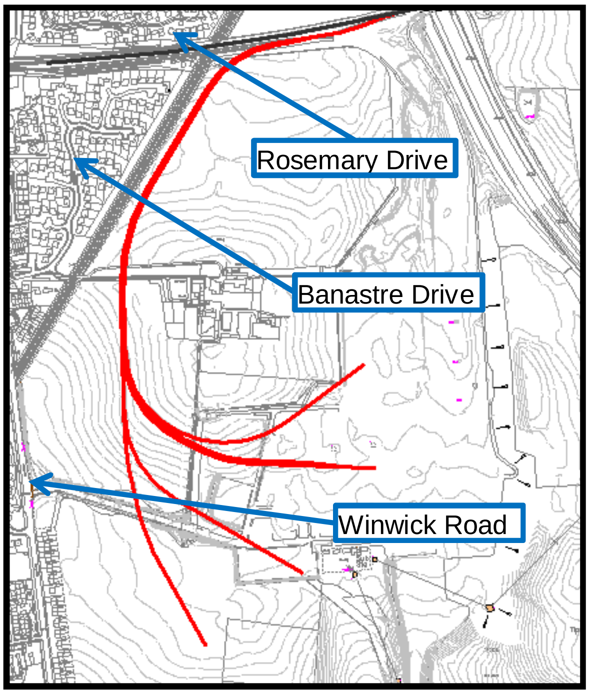

Figure 9 - Baseline Noise Measurement Locations

Limited data was obtained at the most relevant receptor for this study (Banastre Drive) with measurements made over 2 hours during a weekday and 1.5 hours during a weekday night at the "grassed area close to site entrance and West Coast Main Line" (Table 3). Observations on site noted that noise from passenger and freight trains on the WCML were audible, as well as road traffic on the M6. The noise levels measured during the day and night periods were the same, indicating that the noise sources did not significantly reduce at night. This is unusual as typically there is less road and rail traffic during the night; the measurements illustrate high night-time noise levels experienced at these receptors.

Period	$L_{Aeq,T}$	L_{AFmax}
Day (0600h to 0000h)	55 dB	69 dB
Night (0000h to 0600h)	55 dB	69 dB

Table 3 – Measured Baseline Noise at Banastre Drive

2 Parkside Rail Freight Interchange Noise and Vibration Assessment. Capita Symonds report ZACY/002613/Rep2FIN for Astral Developments Ltd, July 2009.

5.3 Assessment of Noise Impact

The effects of noise can include annoyance, sleep disturbance and, at high levels, adverse health effects. Variations between individuals and the characteristics of the noise mean that there is no single definitive methodology or criterion for assessing these effects. A number of methods and metrics have been developed and those relevant to this work are presented in Table 4.

Source	Impact	Period	Criteria	Position
Noise Insulation Regulations using the Calculation of Railway Noise	Qualification for noise insulation due to operational railway noise	Day (0600h to 0000h)	68 $L_{Aeq,18h}$	Outside residential rooms, free-field level
		Night (0000h to 0600h)	63 $L_{Aeq,6h}$	
Night Noise Guidelines for Europe, World Health Organisation	Sleep disturbance	Night (2200h to 0600h)	45 dB $L_{Aeq,8h}$	Outside bedrooms, free-field level
			60 dB L_{AFmax}	
Guidelines for Community Noise, World Health Organisation	Outdoor amenity	Day (0600h to 2200h)	55 dB $L_{Aeq,16h}$ 'seriously annoyed'	Outdoor areas, free-field level
			50 dB $L_{Aeq,16h}$ 'moderately annoyed'	
Recent railway environmental assessments, e.g. High Speed 2	Annoyance to railway noise	Day	50 $L_{Aeq,18h}$	Outside residential rooms, free-field level
		Night	40 $L_{Aeq,6h}$	
		Anytime	85 dB L_{AFmax}	
		Anytime	Increase in L_{Aeq} of no more than +3 dB (minor impact)	

Table 4 – Assessment of Noise Impact

5.4 Noise Modelling

The noise from the trains operating on the reception siding has been modelled using the 'SoundPlan' commercial software package. This software includes an implementation of the Calculation of Railway Noise (CRN) and the prediction of the propagation of noise over a digital ground model to quantify the effects of ground absorption and screening. Maximum noise level calculations (L_{AFmax}) have been undertaken outside of this package.

The modelling assumptions are detailed in the Assumptions Log (Appendix B) and summarised below:

- Ten trains will arrive from the north/east and use the reception sidings. Each train will enter the sidings, the locomotives will 'run round' and then haul the train to the loading/unloading area. The procedure will be reversed for the train to exit the site. This results in 40 movements in total, 20 into the sidings and 20 out.
- Trains will arrive and depart evenly throughout the day and night.
- Each train will comprise: 2 x Class 66 locomotives and 35 x container flats (4 axle, disc or composite tread brakes, refrigerated containers).
- Trains will operate at 15 mile/h (the maximum line speed of the sidings)
- Jointed track has been assumed throughout the sidings as continuously welded rail (CWR) cannot be used on tight radii. This will result in an increase of +2.5 dB in wheel-rail rolling noise due to impact noise at the rail joints.
- Curve squeal mitigation is implemented on the sidings.
- Each train movement cycle will comprise:
  - Train arrival, coasting (wheel-rail rolling noise) and braking only
  - Train stationary: idling noise for 5 minutes as locomotive is uncoupled
  - Locomotive 'run round': locomotive wheel-rail rolling noise
  - Train stationary: idling noise for 5 minutes as locomotive is coupled and the brake reservoirs recharged

  - Train exit: locomotives on ‘full power’

- Refrigeration units located on each container with the following assumptions:
  - Refrigeration units upon container flats will be operational for 26% of each train movement cycle (they will not operate when the locomotive is uncoupled)
  - Modelled as point sources at a height of 4 m above ground.

The noise sources used in the modelling are presented in Table 5. Noise levels from refrigeration units will vary considerably between types and age. As an estimate of the likely noise from such units in the future, the maximum noise level prescribed by the EU Technical Specification for Interoperability[3] for stationary freight wagons has been assumed.

Noise source	CRN rolling noise correction	CRN full power noise correction	L_{AFmax} full power	L_{AFmax} idling	L_{Aeq} idling
Class 66 loco	+13 dB	-13.4 dB	89 dB at 7.5 m	77 dB at 7.5 m	75 dB at 7.5 m
Container wagon / refrigeration unit	+7.5 dB	-	-	-	65 dB at 7.5 m

Table 5 – Noise Sources

5.5 Predicted Noise

The predicted daytime L_{Aeq} noise levels from the preferred Option B.2 are presented in Figure 1 in Appendix D as a noise contour map. As the trains are spaced evenly throughout the day and night periods, the noise L_{Aeq} levels are the same for the day and night periods. Hence only a single noise map is presented for both periods.

The predicted L_{Aeq} and L_{AFmax} noise levels are summarised in

Table 6

Period / source	Predicted noise level
Day	48 dB $L_{Aeq,18h}$
Night	48 dB $L_{Aeq,6h}$
Locomotive idling	61 dB L_{AFmax}
Locomotive on full power	73 dB L_{AFmax}

Table 6 – Predicted Noise Levels for Nearerst Receptor in Banastre Drive

5.6 Noise Assessment

Table 7 compares the predicted noise levels from the preferred Option B.2 with the criteria introduced in Section 5.3.

Three exceedances of the criteria are predicted:

- WHO sleep disturbance criterion of 45 dB $L_{Aeq,8h}$ by +3 dB. Note that the measured baseline noise levels exceed this criterion by +10 dB.
- WHO sleep disturbance criterion of 60 dB L_{AFmax} by +13 dB. Note that the measured baseline noise levels exceed this criterion by +9 dB.
- Annoyance due to railway noise criterion on 40 dB $L_{Aeq,6h}$ by +8 dB. Note that the measured baseline noise levels exceed this criterion by +15 dB.

[3] EU Commission Regulation Number 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem ‘rolling stock — noise’

Source	Impact	Period	Criteria	Criteria met/exceeded
Noise Insulation Regulations using the Calculation of Railway Noise	Qualification for noise insulation due to operational railway noise	Day (0600h to 0000h)	68 $L_{Aeq,18h}$	Met
		Night (0000h to 0600h)	63 $L_{Aeq,6h}$	Met
Night Noise Guidelines for Europe, World Health Organisation	Sleep disturbance	Night (2200h to 0600h)	45 dB $L_{Aeq,8h}$	Exceeded by +3 dB
			60 dB L_{AFmax}	Exceeded by +13 dB
Guidelines for Community Noise, World Health Organisation	Outdoor amenity	Day (0600h to 2200h)	55 dB $L_{Aeq,16h}$ 'seriously annoyed'	Met
			50 dB $L_{Aeq,16h}$ 'moderately annoyed'	Met
Recent railway environmental assessments, e.g. High Speed 2	Annoyance to railway noise	Day	50 $L_{Aeq,18h}$	Met
		Night	40 $L_{Aeq,6h}$	Exceeded by +8 dB
		Anytime	85 dB L_{AFmax}	Met
		Anytime	Increase in L_{Aeq} of no more than +3 dB (minor impact)	Met

Table 7 – Assessment of Unmitigated Noise Impact

5.7 Mitigation

Noise mitigation has been investigated in the form of a 4 m high noise barrier located on the western side of the site. A noise contour map illustrating the effect of such a barrier is given in Figure 2 in Appendix D.

This barrier reduces the noise levels by approximately 10 dB resulting in levels below the criteria with the exception of:

- WHO sleep disturbance criterion of 60 dB L_{AFmax} by +3 dB. Note that the measured baseline noise levels exceed this criterion by +9 dB.

7. Discussion and Conclusion

7.1 Rail Design

Outline alignment design suggests that, feasibility-wise, there is an engineering solution to providing a rail reception siding at Parkside West. The solution has been developed to ensure functionality in operation of the reception siding; a loop provides a locomotive run around and an emergency second siding for stabling, the siding length allows a train to fully exit the national rail network and the headshunt is designed to accommodate 2no. locomotives.

A number of assumptions and risks have been identified (detailed within Appendix A and B) which should be confirmed, managed and mitigated where possible during further design development. Curvature has been maximised where possible to attempt to mitigate the noise impact of the siding operation and is in excess of the minimum curvature specified by Network Rail standards. Due to the undulating site, strict gradient criteria and the wide formation width of the siding, there are significant earthworks associated with the outline design. It is recommended that the design is developed to a greater level of detail, supplemented by topographical survey and ground investigation – and including resources dedicated to signalling, electrification and power design. Close liaison with Network Rail going forward will be essential to the success of the scheme in order to gain the necessary approvals and acceptance of the design.

An indication of the land boundary to be safeguarded against development has been provided to support development of the St Helens Local Plan This is shown on drawing "60494608-AEC-PARK-DRG-101".

7.2 Noise Study

The noise impact resulting from the use of the preferred rail reception siding Option B.2 has been assessed by comparison of the predicted noise against relevant criteria and the existing baseline noise. Without any noise mitigation, annoyance and sleep disturbance would be expected at the closest residential receptors to the site (Banastre Drive). However the available baseline noise data indicates that the criteria are also exceeded due to the noise from the existing road and rail sources. In this case, it is likely that the residents have become accustomed to the current noise environment, including adapting room usage within their properties (e.g. sleeping in rooms on the west side of the houses).

Mitigation in the form of a noise barrier on the western edge of the site provides significant noise reductions and results in a 3 dB exceedance the WHO sleep disturbance criterion. This criterion is currently exceeded by 9 dB from existing noise sources. Depending on how often the criterion is exceeded by the baseline noise, the additional effects of the new railway noise may or may not significantly increase the likelihood of sleep disturbance.

Although a number of the noise criteria are currently exceeded by the existing noise environment, the preferred rail reception siding Option B.2 should not contribute to the adverse effects experienced by the local residents. A barrier such as the one investigated during this work may also have beneficial effects in screening of the noise from the M6 and the non-rail noise sources from future development at Parkside West . Hence noise mitigation should be included in any future development proposals and developed during the Environmental Impact Assessment and detailed design stages. The possibility of locating the barrier on the west side of the WCML should also be investigated, as this may also provide additional screening of the noise of trains operating on the national rail network.

8. Appendices

8.1 A | 60494608-AEC-PARK-REG-100 - Project Risk Register

Please see following page.

Project	Parkside LRFI - Addendum
Document Number	60494608-AEC-PARK-REG-100
Document Title	Parkside LRFI Project Risk Register

Version: 02
Date : 12/04/2017

AECOM

St.Helens Council

No	Risk Details	Risk Status	Category	Type	Owner	Pre-Mitigation: Risk (1=Low, 5=High) Probability	Impact	Overall Risk Rating	Implications for Project Progression	Implications Quantified	Mitigation Measures for Risks	Mitigation Owner	Post-Mitigation: Risk (1=Low, 5=High) Probability	Impact	Overall Risk Rating	Implications for Project Progression	Implications Quantified	Latest Review Date
1	Unknown ground conditions within M6 embankments	Open	Ground Conditions	Risk	St. Helens Council	3	5	15	Additional costs and possible missed information which could influence route construction of the box tunnel under the M6, cost and timescale.	Increased cost and programme delay implications to be advised at a later stage	Site ground investigation to determine ground conditions of M6 embankment and surrounding area..	St. Helens Council	2	5	10	Additional costs and possible missed information, variations and additions to scheme options.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
2	Box tunnel constructed below surrounding ground level	Open	Highways	Risk	St. Helens Council	4	5	20	If no gravity drainage solution possible, then pumping would be required, leads to maintenance issues and possibility a flood could compromise the whole site operations	Time and cost in pumping systems and on-going maintenance. Risk of closure of tunnel if pumping equipment fails or during maintenance of the same.	Avoid drainage pumping if at all possible, but if unavoidable, plan out maintenance regime, agree this with maintaining organisation and ensure that they stick to it.	St. Helens Council	2	5	10	Drainage pumping required due to location of box tunnel, additional costs and future maintenance liability.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
3	Interaction with Highways England	Open	Highways	Risk	St. Helens Council	5	5	25	Lack of co-operation, opposing agendas, slowness of responses to submissions, legal hurdles, etc., could delay progression of design through the various stages from concept to detailed design.	Increased cost and programme delay implications to be advised at a later stage	Early engagement, collaborative working and keep in the loop with all relevant issues relating to the Project.	St. Helens Council	3	5	15	Time and Programme delay, overall scheme progression if no design solution agreed.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
4	Interaction with Local Highway Authority	Open	Highways	Risk	St. Helens Council	4	5	20	Lack of co-operation, opposing agendas, slowness of responses to submissions, legal hurdles, etc., could delay progression of design through the various stages from concept to detailed design.	Increased cost and programme delay implications to be advised at a later stage	Early engagement, collaborative working and keep in the loop with all relevant issues relating to the Project.	St. Helens Council	2	5	10	Time and Programme delay, overall scheme progression if no design solution agreed.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
5	Possibility of a High water table in surrounding area	Open	Ground Conditions	Risk	St. Helens Council	4	4	16	Ground pumping may be required to lower ground water adjacent to structures below existing ground level. Overall stability of M6 embankments could be compromised and location of box tunnel and construction of box tunnel could be affected.	Increased cost and programme delay implications to be advised at a later stage	Site ground investigation to determine ground conditions of surrounding area.	St. Helens Council	2	4	8	Time and Programme delay, overall scheme progression if no design solution agreed.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
6	Leakage of Methane Gas	Open	Ground Conditions	Risk	St. Helens Council	4	2	8	Delay of scheme, design implications and route selection position of box tunnel under M6	Methane gas build-up in structures. Health and Safety compromised during construction and operation of the structures.	Determine risk of methane (mine gas) ingress from surrounding ground. Design in measures to prevent build-up of explosive gases in structures.	St. Helens Council	2	2	4	Time and Programme delay, overall scheme progression if no design solution agreed.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
7	Construction issues with existing utilities	Open	Highways	Risk	St. Helens Council	4	3	12	Delay of scheme, design implications and route selection.	Increased cost and programme delay implications to be advised at a later stage	Obtain data from statutory undertakers at appropriate stage of project.	St. Helens Council	2	3	6	Delay of scheme and additional costs.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
8	Construction issues with existing M6 motorway infrastructure	Open	Highways	Risk	St. Helens Council	4	3	12	Delay of scheme, design implications and route selection position of box tunnel under M6	Increased cost and programme delay implications to be advised at a later stage	Obtain data (if available) from Highways England at a later project stage.	St. Helens Council	2	3	6	Delay of scheme and additional costs.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
9	Land take (If required for work in replacing existing Parkside road bridge)	Open	Highways	Risk	St. Helens Council	3	5	15	Delay to programme, delay to scheme.	Increased cost and programme delay implications to be advised at a later stage	Early engagement with affected landowners.	St. Helens Council	2	5	10	Delay of scheme and additional costs. Objections from stakeholders at Public Inquiry (if required).	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
10	Pinpointing a specific location for the M6 box tunnel.	Open	Highways	Risk	St. Helens Council	3	5	15	No scope to move the location of the Box tunnel within a specified range dependent of ground conditions	Increased cost and programme delay implications to be advised at a later stage	Detailed topographic survey and ground investigation to determine ground conditions of surrounding area to enable the optimum position of the box structure to be developed.	St. Helens Council	2	5	10	Delay of scheme and additional costs.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
11	Bridge construction over live rail	Open	Highways	Risk	St. Helens Council	4	4	16	Additional Costs and delay to the programme	Increased cost and programme delay implications to be advised at a later stage	Consider alternative design and construction methods.	St. Helens Council	3	4	12	Delay of scheme and additional costs.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
12	Interaction with Network Rail and associated approvals	Open	Rail	Risk	St. Helens Council	5	5	25	Engagement with Network Rail crucial to future scheme development - Lack of co-operation, delayed turnaround of comments on submissions, legal hurdles, etc., could delay progression of design through the various GRIP stages.	Increased cost and programme delay implications to be advised at a later stage	Engagement with Network Rail as early as possible in design development, collaborative working, multi-disciplinary workshops and regular communication.	St. Helens Council	3	5	15	Time and Programme delay, overall scheme progression if no design solution agreed.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
13	Connection to DSE mainline	Open	Rail	Risk	St. Helens Council	5	5	25	There is a risk that Network Rail impose constraints or restrictions on the connection to the mainline that means the connection point/arrangement may be subject to change. This may alter the feasible route of the rail sidings and not be in-keeping with the development plans for the rest of the site.	Increased cost and programme delay implications to be advised at a later stage.	Reinstatement of disused turnout for former colliery site proposed currently - the position of S&C infrastructure to connect to the siding is the same. Land boundary has been kept wide at the connection point to facilitate movement and change in design.	St. Helens Council	2	5	10	Potential to delay scheme and require a more complex engineering solution, leading to increased costs.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
14	Unknown Ground Conditions - Track Foundation	Open	Ground Conditions	Risk	St. Helens Council	4	4	16	If undesirable ground conditions (e.g. peat) found, then this will alter the track bed and foundation construction from a 'standard' solution. May require an expensive engineering solution such as piled foundations	Increased cost and programme delay implications to be advised at a later stage	Desktop study using British Geological Survey online data undertaken. Suggests that superficial ground make-up is compacted sandy/gravel. Full ground investigation to be carried out before detailed design.	St. Helens Council	2	4	8	Potential to delay scheme and require a more complex engineering solution, leading to increased costs.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
15	Clearance under existing M6 bridge	Open	Structures	Risk	St. Helens Council	3	5	15	Insufficient clearance/envelope to fit third track under the existing M6/DSE bridge may require alterations to existing or a new structure. Therefore, added complexity, time and cost for the design	Increased cost and programme delay implications to be advised at a later stage	Confirm measurements of structure prior to design development. Inspection from aerial mapping suggests lateral clearance is sufficient for third track	St. Helens Council	2	5	10	Potential to delay scheme and require a more complex engineering solution, leading to increased costs.	Increased cost and programme delay implications to be advised at a later stage	14/10/2016
16	Freight Timetable/Pathing	Open	Freight	Risk	St. Helens Council	4	5	20	Existing Network is very full, so freight paths likely to be constrained. Requires interaction with Network Rail to agree on level of service. Impact on viability of scheme	Implications to be advised at a later stage. Scheme viability impacts.	Early engagement with Network Rail and freight route managers	St. Helens Council	3	5	15	Potential to affect operability of the scheme as a whole	Implications to be advised at a later stage. Scheme viability impacts.	14/10/2016

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Project	Parkside LRFI - Addendum	Version: 02 Date :12/04/2017	AECOM St.Helens Council
Document Number	60494608-AEC-PARK-REG-100		
Document Title	Parkside LRFI Project Risk Register		

No	Risk Details	Risk Status	Category	Type	Owner	Pre-Mitigation: Risk (1=Low, 5=High) Probability	Pre-Mitigation: Impact	Pre-Mitigation: Overall Risk Rating	Pre-Mitigation: Implications for Project Progression	Pre-Mitigation: Implications Quantified	Mitigation Measures for Risks	Mitigation Owner	Post-Mitigation: Risk (1=Low, 5=High) Probability	Post-Mitigation: Impact	Post-Mitigation: Overall Risk Rating	Post-Mitigation: Implications for Project Progression	Post-Mitigation: Implications Quantified	Latest Review Date
17	Fixing the rail land boundary at this stage due to minimum acceptable geometry and gradients	Open	Land	Risk	St. Helens Council	4	5	20	Nature of rail siding and minimum curvature/gradient impose strict constraints on alignment routing. Minimising cut and fill and complying with 'standards' means the rail siding will have an impact on available development land.	Implications to be advised at a later stage. Scheme viability impacts.	Early engagement with Client before land boundary for rail siding is fixed. Relaxation of standards may be pursued, although not recommended for operational and noise purposes. Can explore options that do not attempt to minimise cut and fill and leave more developable space, but this will lead to increased complexity and cost.	St. Helens Council	2	5	10	Potential to affect operability/buildability of the scheme as a whole	Implications to be advised at a later stage. Scheme viability impacts.	14/10/2016
18	Colliery Site - Unexpected Contaminated Ground or shafts	Open	Land	Risk	St. Helens Council	4	4	16	Discovery of such ground conditions would require remedial works and export of material - adding cost and programme delays. Cannot build on top of a disused shaft, which do not appear to be in the vicinity from study of the topographical data.	Implications to be advised at a later stage. Scheme viability impacts.	Ground Investigation to be carried out prior to design development. Topographical survey suggests that the mine shafts and associated coring (indicated by air vents) are away from alignment chosen.	St. Helens Council	3	4	12	Potential to delay scheme and require a more complex engineering solution, leading to increased costs.	Implications to be advised at a later stage. Scheme viability impacts.	14/10/2016
19	Accuracy of supplied topographical data	Open	Rail	Risk	St. Helens Council	3	4	12	Alignment and hence land boundary has been derived based on following contour data to minimise cut and fill. Inaccuracy of the data could lead to increased cut and fill requirements or increased land boundary requirements.	Implications to be advised at a later stage. Scheme viability impacts.	Ground survey data provided by professional organisation, will have undergone QA checks. OS mapping consulted, which appears to support the contour data supplied. Recommend to compare with another digital dataset to establish consistency	St. Helens Council	2	4	8	Potential to delay scheme and require a more complex engineering solution, leading to increased costs.	Implications to be advised at a later stage. Scheme viability impacts.	14/10/2016
20	Level of detail of alignment design is outline only	Open	Rail	Risk	St. Helens Council	3	4	12	Alignment needs to be developed to a further level of detail along with specific requirements for earthworks and acoustic mitigation. Risk of change to formation width and land boundary	Implications to be advised at a later stage. Scheme viability impacts.	Land boundary designed to conservative assumptions and allows room for design development and alignment tweaks. Alignment is compliant with desirable standards, geometry relaxation on compliance can be explored should changes impact on the identified land boundary	St. Helens Council	2	4	8	Changes to alignment routing may impact land boundary identified	Implications to be advised at a later stage. Scheme viability impacts.	14/10/2016
21	Formation width derived from assumptions on ground conditions and topography	Open	Rail	Risk	St. Helens Council	3	4	12	Alignment needs to be developed to a further level of detail along with specific requirements for earthworks and acoustic mitigation. Risk of change to formation width and land boundary	Implications to be advised at a later stage. Scheme viability impacts.	Land boundary designed to conservative assumptions and allows room for design development and alignment tweaks. Alignment is compliant with desirable standards, geometry relaxation on compliance can be explored should changes impact on the identified land boundary	St. Helens Council	2	4	8	Changes to alignment routing may impact land boundary identified	Implications to be advised at a later stage. Scheme viability impacts.	14/10/2016
22	Scheme costing exclusions	Open	Rail	Risk	St. Helens Council	4	4	16	Costing exclusions such as electrification of the line (will all be clearly stated) will inflate the cost and some costs will not be known until further design development is undertaken and assumptions clarified (such as structure modifications/new structures)	Implications to be advised at a later stage. Scheme viability impacts.	Take cognisance of likely 'big costs' that are not being costed. Early indication of costs can be developed further to the scope of this study to provide indicative order of magnitude.	St. Helens Council	3	4	12	Level of uncertainty will be applied to the scheme costs at this very early stage of design development. Will require refinement.	Implications to be advised at a later stage. Scheme viability impacts.	14/10/2016
23	Turnout From Mainline	Open	Rail	Risk	St. Helens Council	4	5	20	The turnout is flexed as it is located on a 3,333m radius curve on the DSE mainline. This curve will likely have cant on it, along with an associated transition curve. To provide a turnout in this area the radius will need to have 0mm cant applied, and the transition lengths modified so that the rate of change of cant deficiency is reduced to less than 55mm/s. This means that to accommodate any turnout here, works are needed on the mainline, which potentially will impact on the adjacent Parkside Junction.	Implications to be advised at a later stage. Scheme viability impacts.	Early engagement with Network Rail for consultation on existing track geometry and acceptable solutions for implementing a turnout in this location	St. Helens Council	4	5	20	May require mainline realignment which could affect Parkside Junction	Implications to be advised at a later stage. Scheme viability impacts.	24/10/2016
24	Ground profile may be altered from current as a result of the wider development. Rail alignment is based purely on the existing ground profile	Open	Land	Risk	St. Helens Council	4	4	16	Should the ground profile be changed or graded by the wider development, the associated cut and fill, noise characteristics and cost of the designed alignment will be different.	Cost and feasibility impact unknown until the wider development is progressed further.	Early engagement with wider development. Cost sharing of earthworks between the two facets (rail and industrial units)	St. Helens Council	3	4	12	Cost of rail alignment, extent of earthworks and required noise mitigation may be different to that quoted within this study	Increased cost and programme delay implications to be advised at a later stage	24/10/2016
25	Applicability of current baseline noise level data	Open	Environmental	Risk	St. Helens Council	4	4	16	The baseline noise levels were measured in 2004 and over a very limited time period. The noise assessment is partially based on comparison of the noise from the sidings and the baseline noise	Cost and feasibility impact unknown until the wider development is progressed further.	Carry out a new baseline noise survey	St. Helens Council	1	3	3	Cost and time required to carry out the measurements	Increased cost and programme delay implications to be advised at a later stage	25/10/2016
26	Curve squeal noise	Open	Environmental	Risk	St. Helens Council	4	4	16	Curve squeal is likely due to the small radii curves and is currently assumed not to occur in the current noise assessment	Cost and feasibility impact unknown until the wider development is progressed further.	Track-based flange lubrication or top-of-rail friction modifier application will be required	St. Helens Council	2	3	6	Design, capital and maintenance costs will be incurred by the project	Increased cost and programme delay implications to be advised at a later stage	25/10/2016
27	Locomotive noise source levels	Open	Environmental	Risk	St. Helens Council	3	3	9	Inaccurate locomotive source levels will result in an inaccurate noise assessment. This includes maximum and average 'full-power' noise and idling noise.	Cost and feasibility impact unknown until the wider development is progressed further.	Noise survey of a selection of Class 66 locomotives	St. Helens Council	2	2	4	Cost and time required to carry out the measurements	Increased cost and programme delay implications to be advised at a later stage	25/10/2016

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8.2 B | 60494608-AEC-PARK-REG-101 - Assumptions Log

Please see following page.

Project	Parkside LRFI - Addendum	Version: 02 Date : 12/04/2017	
Document Number	60494608-AEC-PARK-REG-101		
Document Title	Parkside LRFI Design Assumptions Log		St.Helens Council

ID	Category	Assumption	Source/Standard	Justification
001	Alignment Design	General alignment design principles	Track Design Handbook: NR/L3/TRK/2049	Industry standard
002	Alignment Design	Gradient of rail siding to be a maximum fall of 1:500. Assume flat at connection point to mainline and at buffer end.	Track Design Handbook: NR/L3/TRK/2049 - Section A.6.5 | Sidings - Layouts and Geometry Requirements	The site slopes to the south, meaning that to minimise earthworks, the alignment should also fall - but it can only do so at a maximum rate of change of 1:500. It should also not fall towards the running line connections. Headshunt to be a flat grade to mitigate 'run-away' past the buffer.
003	Alignment Design	Minimum radius of curvature on siding is to be 150m	Track Design Handbook: NR/L3/TRK/2049 - Section A.6.5 | Sidings - Layouts and Geometry Requirements	"Normal minimum radius on sidings shall be 150m. Exceptional minimum radius on sidings shall be 125m (TSI MIN 150M - CNN)"
004	Alignment Design	No cant to be applied on horizontal curves	Track Design Handbook: NR/L3/TRK/2049 - Section A.6.5 | Sidings - Layouts and Geometry Requirements	"All new sidings... shall be designed without cant"
005	Alignment Design	Distance between track centrelines taken as 5m	Track Design Handbook: NR/L3/TRK/2049 - Section A.6.5 | Sidings - Layouts and Geometry Requirements | Table 3	Assuming straight track, to allow for maintenance activities between tracks, standard specifies a track spacing of 4005mm. As some of the track is curved, value has been conservatively taken as 5m.
006	Alignment Design	Principle of virtual transitions used	Track Design Handbook: NR/L3/TRK/2049 - Section A.6.3 | Curving Design Values - Guidance on Transitions	At max operating speed (15mph) the rate of change of cant deficiency over a 12.2m virtual transition is compliant (i.e. <35mm/s). This comes from the historic MK1 coach bogie centre distance of 12.2m.
007	Earthworks	Embankment slope conservatively assumed as 1:2.5	Conservative assumption	Experience
008	Formation Width	Allowance for unexpected maintenance made in overall formation width. Access road of 3m to cess side of siding and loop	Engineering Judgement	Land Boundary outline is the key deliverable which will inform the development of the site around it. Conservative assumptions should be made at this stage to mitigate the need to extend the boundary later. Although no routine maintenance scheduled to be undertaken, need to provide means of vehicular access to both loop and siding for unscheduled maintenance and repairs to track etc.
009	Rail Infrastructure	Fishplated rails to be used. Continuously Welded Rail not suitable for use within the sidings due to tight curvature required	NR/L2/TRK/2102 "Design and Construction of Track" pg. 76	CWR not to be used on curves with radii less than 250m.
010	Acoustic Barrier	2m allowance made within formation width for acoustic barrier and associated earthworks	Engineering Judgement	To mitigate noise, it is likely that a barrier will be required along some points of the siding. 2m allowance on recommendation of Acoustics team
011	Alignment Design	Approach taken in 'routing' the alignment is to minimise cut/fill and follow the site topography as far as is reasonably practicable.	Best Practice	Minimising earthworks is key to simplifying construction and reducing cost.
012	Operation	Design Speed for the alignment based on curvature and turnout type is 15mph	Alignment Design calculations as per Track Design Handbook: NR/L3/TRK/2049 Module 02 (Mathematics).	No cant application so measuring the rate of change of cant deficiency, which has been kept within standards at less than 35mm/s
013	Alignment Design	Bv8 turnouts used throughout as allows for 15mph operation whilst being a tighter radius than a C9.25.	Network Rail Standard turnout library	Siding operational speed is 15mph so a more relaxed turnout (facilitating higher operating speeds) will take up more land and speed will not be realised due to restrictions within the siding.
014	Alignment Design	Desirable distance between adjacent S&C taken as 25m. Minimum of 15m.	Best Practice	Prevents train bogies (length up to 25m) straddling a curved element and linear at the same time - creating wear on rails and unacceptable changes in cant deficiency.
015	Alignment Design	Minimum desirable linear element length between reverse curves of 25m. Minimum of 3m.	Track Design Handbook: NR/L3/TRK/2049 | Section A.6.5	"a length of straight track not less than 3m long shall be provided between the reverse curves if one of the curves has a radius of less than 160m."
016	Alignment Design	S&C to be located on straight track as far as reasonably practicable.	Best Practice	Reduces maintenance liability and requires a non-standard (pre-fab) turnout to be made.

Project	Parkside LRFI - Addendum	Version: 02 Date : 12/04/2017	AECOM St.Helens Council
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ID	Category	Assumption	Source/Standard	Justification
017	Operation	Headshunt allowed for is 50m, allowing for two locomotives	Allows for more operational flexibility	2 train lengths (not more than 25m each)
018	Alignment Design	Overall siding length is 820m. This is made up of: - 750m train - 2x 25m locomotives - 20m stopping allowance	Track Design Handbook: NR/L3/TRK/2049 - Section A.6.5 | Sidings - Layouts and Geometry Requirements	"Sidings shall be of sufficient length to accommodate the train intended to use them... plus an allowance for stopping accuracy (...normally length of train plus 20m)"
019	Operation	Signal standback of 25m allowed for before start of siding	Railway Group Standard | GE/RT8037 | C6.4 Train stopping positions	Similar situation to platform scenario (train at standstill, facing signal) "No car stop marker or DOO monitor unit shall be positioned such that a train is required to stop within 25 m of the platform starting signal". This can be risk assessed down, but not undertaken at this stage of design development
020	Operation	Assumed no signal overlaps required. Recommend 'trap points' be installed to prevent unauthorised movements onto the mainline network	NR/L2/SIG/11201/ModB7 Signalling Design: Module B7 - Interlockings - General | Section 3.4.5 TRAP POINTS	Trap points may be provided in lieu of overlaps, flank point setting and enhanced overrun protection, to protect authorised routes from unauthorised movements. The following features should be considered: a) Provision Trap points (or derailers where speeds are extremely low) should generally be provided, unless other connections serve the same purpose (see Section 3.4.4), in the following circumstances: I. where sidings and terminal platform lines join passenger running lines, particularly where there is shunting not under the signaller's control
021	Operation	10m buffer stop allowance	GCRT5033 states a buffer stop is required in sidings. The type of buffer will be subject to further assessment based on Risk Assessment in accordance with GC/RC5633	Headshunt of 50m means any train impacting the buffers will do so at right angles (train length less than this value). 10m nominal allowance for sliding buffer. Would be subject to a risk assessment in accordance with GC/RC5633
022	Alignment Design	Geometry of Mainline	5 mile diagram "DSE-04" 16-04-10	Siding entry point is located on a 3333m radius curve, meaning the associated S&C into the siding will be non-standard.
023	Rail - Costing	Cut / Fill Calculation	Contour data supplied by Greenhatch (2005) through St Helens Council	Supplied contour data used to calculate the relative differences between existing ground level and the proposed vertical alignment at intervals along the route. This is multiplied by the total formation width at each point to calculate material volumes.
024	Rail - Costing	The following are excluded from costing	Overhead Line Electrification and Infrastructure Acoustic Fence Signalling Power Connection to Mainline Track to be taken up Structures Service ducts / lighting	Not enough information
025	Highway Alignment Design	General alignment design principles	DMRB	Industry standard
026	Highway Alignment Design	Vehicle design size assumed to be no less than 18.55m (overall vehicle length) - Alignment to be compatable with the current DfT Longer Semi Trailer Trial.	*Michael Whittaker*	Future proof design with the inclusion of larger vehicles.
027	Highway Alignment Design	7.3 metre carriageway and the inclusion on 3m footway	Client Inception meeting	-

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028	Highway Alignment Design	Roundabouts to be used at the junctions and bell mouth access to be used for development plot access' No. 4 to be indicatively shown along the route.	Client Inception meeting	-
029	Highway Alignment Design	Proposed speed limit 40mph (design speed of 70kph)	Surrounding area speed limits, Client to confirm the use of 40mph speed limit.	-
030	Highway Alignment Design	Character of the road is asphalt and kerbs, public realm.	Client Inception meeting	-
031	Costing	Design costings. Preliminaries has been assumed at 15% of total construction cost. Cost of design is assumed to be 5% of total construction cost. Cost will exclude optimism bias and risk typically 44% and 15% respectively.	SPONS is to be used to produce construction cost estimates for the highway design	Industry standard and experience
032	Highway Alignment Design	Tie into Junction 22, to be costed only no design work.	SPONS is to be used to produce construction cost estimates for the highway design	Industry standard / Client inception meeting
033	Cripple Siding	Cripple Siding to be included on the eastern side of the M6 as part of design for the intermodal freight terminal	Discussions with David Hunter SRFM LNWR	Discussions with David Hunter SRFM LNWR
034	Operation	Trains will arrive and depart evenly throughout the day and night		The exact timetabling of train movements is not currently known
035	Rolling stock	Locomotives are assumed to be Class 66		Older locomotives are not likely to be used when the LFRI is operational
036	Rolling stock	Trains will comprise of 35 container wagon flats with 4 axles and disc or composite tread brakes.		All future wagons are likely to be disc or composite tread braked (compared to cast iron tread brakes which produce higher wheel-rail rolling noise levels)
037	Operation	As a worst-case all of the wagons will be loaded with an operational refrigerated container		A worst-case assumption for noise modelling purposes
038	Rolling stock	Noise from the refrigerated containers will be no noisier than that specified in the EU Technical Specification for Interoperability for stationary freight wagons	EU Commission Regulation Number 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem 'rolling stock — noise'	An estimate of the likely noise from such wagons in the future
039	Operation	Locomotives will only be on 'full power' when hauling the train out of the sidings onto the main line or the eastern side of the LRFI		Rail alignment gradient is generally downhill to the south
040	Rail Infrastructure	Track-based curve squeal mitigation will be implemented in the sidings		Curve squeal noise will need to be mitigated due to the small radii curves.

8.3 C | Noise Terminology

Please see following page.

Technical Note

Project:	**Parkside Logistics and Rail Freight Interchange**	Job No:	**60494608**
Subject:	**Acoustic Terminology**		
Prepared by:	**James Block**	Date:	**30-Sep-2016**
Checked by:	**Steve Cawser**	Date:	**30-Sep-2016**

Sound Pressure

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascals, Pa). Because of this wide range, a sound level scale based on logarithms is used in sound measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB. The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure sound is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB(A). Table 1 lists the sound pressure level in dB(A) for common situations.

Table 1: Sound levels for common situations

Typical Sound Level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library, refrigerator humming at 2m
50	Quiet office, no machinery
60	Normal conversation
70	Telephone ringing at 2m
80	General factory sound level
90	Heavy goods vehicle from pavement
100	Pneumatic Drill at 5m
120	Discotheque – 1m in front of loud speaker
140	Threshold of pain

The sound level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local sound sources. Close to a busy motorway, the sound level may vary over a range of 5 dB(A), whereas in a suburban area this variation may be up to 40 dB(A) and more due to the multitude of sound sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time sound levels will often be smaller and the levels significantly reduced compared to daytime levels. When considering environmental sound, it is necessary to consider how to quantify the existing sound (the ambient sound) to account for these second to second variations.

Background Sound Levels

A parameter that is widely accepted as reflecting human perception of the ambient sound is the background sound level, L_{90}, this is usually A weighted and can be displaced as L_{90} dB(A) or L_{A90} (dB). This is the sound level exceeded for 90% of the measurement period and generally reflects the sound level in the lulls between individual sound events. Over a one hour period, the LA90 will be the sound level exceeded for 54 minutes.

Ambient or Activity Sound Levels

The equivalent continuous A-weighted sound pressure level, L_{Aeq} (or L_{eq} dB(A)) is the single number that represents the total sound energy measured over that period. L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. It is commonly used to express the energy level from individual sources that vary in level over their operational cycle.

Maximum sound levels are used in various assessments as an alternative to the equivalent sound pressure level. These maximum levels are typically measured over 1 second (a 'slow' time constant) or 0.125 seconds (1/8 of a second, a 'fast' time constant). These are annotated by L_{ASmax} and L_{AFmax} respectively.

Free-field and façade levels

When measuring sound near to buildings, the levels can increase due to reflections from the outside surfaces of the structure. Hence it is important to distinguish between free-field (no reflections) or façade levels (with reflections). Façade measurements are usually made at 1.0 metre from the building and are nominally taken as being 2.5 or 3.0 dB higher than the free-field level.

Sound Changes

Human subjects are generally only capable of noticing changes in sound levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady sound level is perceived to the human ear as a doubling (or halving) of the sound level. (These findings do not necessarily apply to transient or non-steady sound sources such as changes in sound due to changes in road traffic flow, or intermittent sound sources)

Sound Power Level

Sound power is the rate per unit time at which airborne sound energy is radiated by a source. It is expressed it watts (W). Sound power level or acoustic power level is a logarithmic measure of the sound power in comparison to the reference level of 1 pW (picowatt). The sound power level is given the letter "L_w" or SWL. It is not the same thing as sound pressure (L_p). Any L_p value is dependent of the distance from the sound source and the environment in which it was measured. L_w values are preferred for sound prediction purposed as their value is independent of distance or environment. There are recognised formulas for converting Lw to Lp. A-weighted sound power levels are usually denoted L_{wA} (dB) or sometimes L_w (dBA) or SWL (dBA).

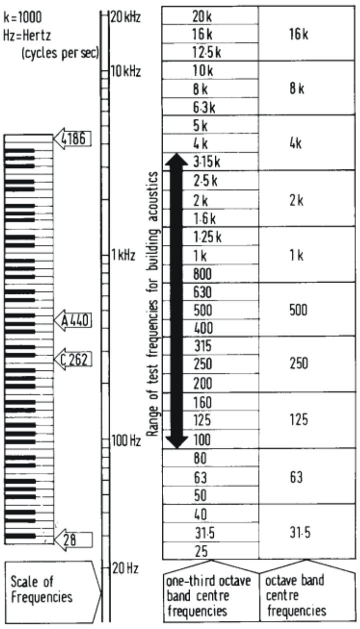
Frequency Spectrum

Frequency is the rate at which the air particles vibrate. The more rapid the vibrations, the higher the frequency and perceived pitch. Frequency is measured in Hertz (Hz).

A young person with average hearing can generally detect sounds in the range 20 Hz to 20,000 Hz (20 kHz). Figure A.1 below illustrates the range of frequencies, for example, the lowest note on a full scale piano, 'A', has a fundamental at 28 Hz, and the highest, 'G', a fundamental at 4186 Hz (there will be higher order harmonics). Human speech is predominantly in the range 250 Hz - 3000 Hz.

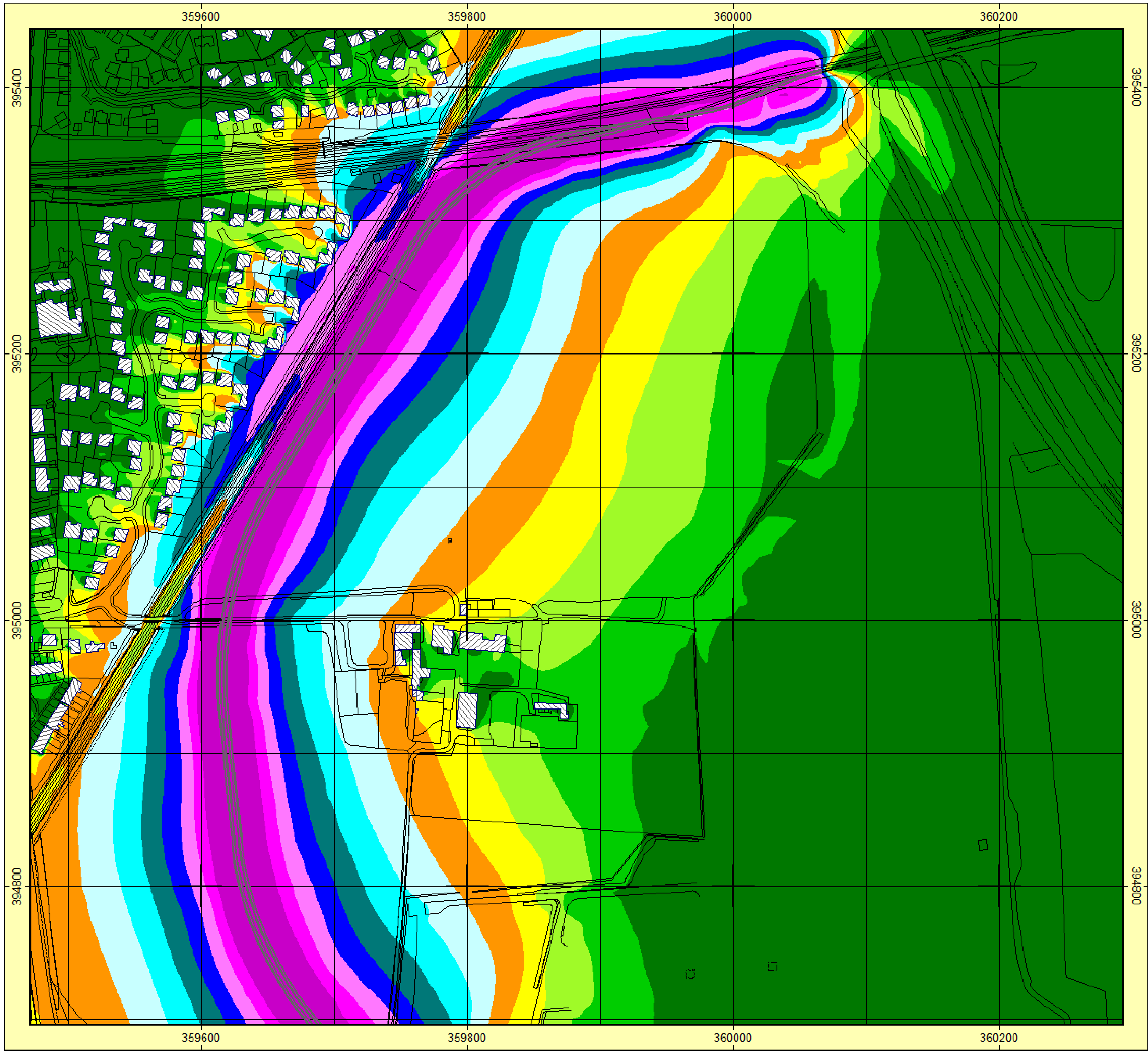
The musical term 'octave' is the interval between the first and eighth note in a scale and represents a doubling of frequency. A series of octave and one-third octave bands have been derived, as shown on Figure A.1 and these are commonly used in acoustic measurements where it is necessary to describe not only the level of the source but also the frequency content. The frequency content of a source can be useful for identifying acoustic features such as a whine, hiss or screech. One-third octave bands can be further subdivided into smaller intervals, such as one-sixth octave, one-twelfth octave or one-twenty-fourth octave bands, etc. One-twenty-fourth octave bands are often utilised for spectral analysis to identify tonal components in a signal.

Figure A.1: octave and 1/3 octave frequency bands



8.4 D | Noise Contour Maps

Please see following page.



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Client: St Helens Council

Project: Parkside Logistics and Rail Freight Interchange
Project-No. 60494608

Figure 1: Option B.2 - Daytime

Option B.2
Result number 1
Calculation in 4.5 m above ground

Project engineer: Ruth Sargent
Created: 27/10/2016
Processed with SoundPLAN 7.4, Update 27/05/2015

Levels: Daytime
06:00-24:00
in dB(A)

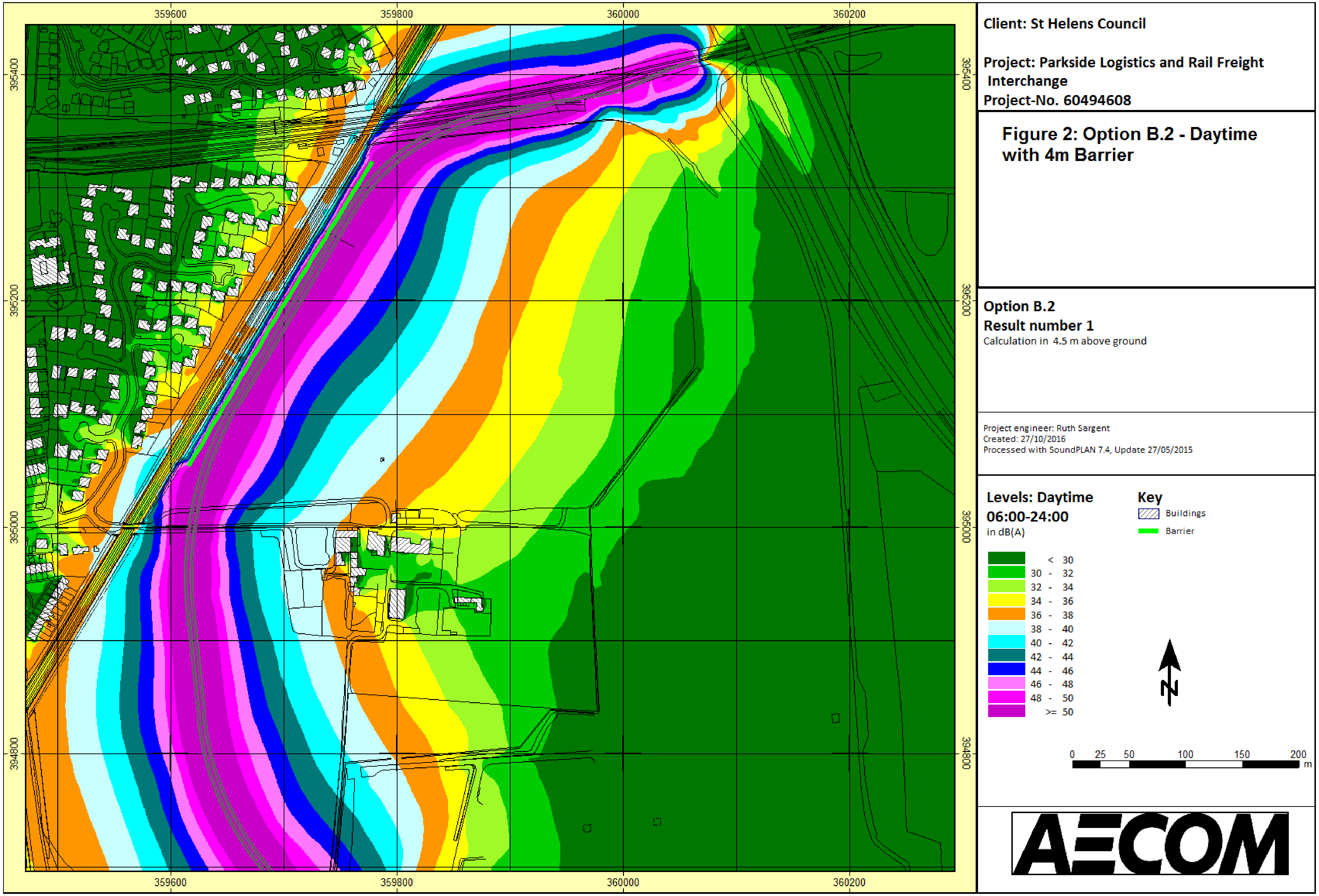
	< 30
	30 - 32
	32 - 34
	34 - 36
	36 - 38
	38 - 40
	40 - 42
	42 - 44
	44 - 46
	46 - 48
	48 - 50
	>= 50

Key
Buildings

N

0 25 50 100 150 200 m

AECOM



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