



McNulty's Yard

Contaminated Land Assessment

Ethical Planning LLP

August 2016



Responsibility Notice

We accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known.

This Statement has been prepared by Ethical partnership with all reasonable skill, care and diligence within the terms of the contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the client.

Any such party relies on the report at its own risk.

Copyright Notice

This document is the property of ethical partnership and may not be reproduced or used without permission of ethical partnership

Client: POTA

Author: Nicola Watson

Approved for issue by: Allen Creedy

Revision History

Version	Title	Date
V1	For Client	050816

Ethical Planning LLP is a limited liability partnership registered in England and Wales under OC352734 and trading as ethical partnership. VAT No: 937 5641 93
A list of partners is available on request or at www.ethicalpartnership.co.uk

Registered Office: 32 Portland Terrace, Newcastle upon Tyne, NE2 1QP
© Ethical Planning LLP 2016 All Rights Reserved.

Commission Notice

We have been appointed by POTA

Contact for further information

T;00 44 191 2846675

M; 00 447845 709600

E: enquiries@ethicalpartnership.co.uk

All plans within this document produced by Ethical Partnership are based upon Ordnance Survey mapping with the permission of Her Majesty's Stationery Office.

© Crown Copyright reserved.

Licence number 100051018



Executive Summary

Land Use	<ul style="list-style-type: none"> The North and South Yards have been historically used for industrial purposes, with the area of the proposed engineering shed occupied by a former fabricating facility building. The area of land to the east of the docks is used for car parking and storage.
Site history	<ul style="list-style-type: none"> The North and South Yard have been extensively used for industrial development, including graving docks, iron and brass works, glass works, railway lines, engine and boiler works, colliery staiths, ballast yard, cranes, slipways. From available data, evidence suggests that infrastructure (concrete sides and base) associated with a number of the former docks remains below the former North and South Yard areas, with a former graving dock extending below the location of the proposed engineering shed. The Car Park and Stockyard area has formerly been used for railway lines and residential housing. Based on the historical industrial use, both the site and surrounding area have been subjected to activities that have the potential to contaminate the land.
Geology	<ul style="list-style-type: none"> The site is underlain by variable thicknesses of made ground overlying Glaciolacustrine drift deposits and bedrock. Alluvium should be anticipated near to the river. Very deep made ground is present within the backfilled graving docks. Shallow coal seams are anticipated at the southern end of the site.
Environmental setting	<ul style="list-style-type: none"> 2 landfill licences recorded on site. 1 historical landfill licence located at the Tyne Dock to the south. 1 waste management facility recorded on site which is likely associated with infilling of former dock/s. 1 licence is also recorded 160m south relating to metal recycling. The nearest watercourse is the River Tyne, adjacent to the northern/western boundary. Parts of the South and North Yard are recorded to be at risk from flooding or extreme flooding from rivers or sea. The Car Park area is not indicated to be at risk from flooding. The underlying strata are classed as a Secondary A Aquifer. There are no licensed water abstractions within 1km. There are 47 discharge consents within 250m, 30 located on site. No radon protection measures are required for future developments. There are 12 Integrated Pollution Controls within 250m, none located on site. There is 1 Pollution and Prevention Controls recorded on site associated with the permitted coating of metal and plastic by McNulty Offshore Construction Ltd. There are 69 Contemporary Trade Directory entries within 250m, 1 recorded on site.
Contamination	<ul style="list-style-type: none"> Based on the site history and continued use as industrial/commercial, it is considered that the site presents a medium environmental risk with respect to contamination. Based on currently available information the risk can be managed through conventional construction techniques, practices and procedures.
Mining	<ul style="list-style-type: none"> Coal seams are likely to exist close to the surface. These are likely to be a material influence on the development of the car park and may need to be taken into account elsewhere on the site. No mine entries are recorded on or adjacent to the site. Based on the available information, further investigations are considered necessary.



Ground Gas	<ul style="list-style-type: none">▪ Ground gas risk is considered to be a medium risk in view of the presence of deep made ground and shallow coal seams. This risk can be managed through conventional construction techniques, practices and procedures.
Foundations	<ul style="list-style-type: none">▪ Piled foundations are likely in the dock areas. Conventional pad/strip may be possible in the car park and stockyard area.
Ground Investigation	<ul style="list-style-type: none">▪ A ground investigation is required to confirm the site conditions. This should include as a minimum: cable percussion boreholes, trial pits, rotary drilling for mine workings, geotechnical and chemical laboratory analysis.



Contents

Executive Summary..... iii

1. Introduction..... 1

2. The Site..... 3

3. Site History..... 4

4. Previous Ground Investigation Data 7

5. Environmental Setting 10

6. Conceptual Site Model..... 14

7. Environmental Risk Assessment 18

8. Geotechnical Considerations..... 22

9. Further Investigations..... 25

Appendices

- Appendix A Existing Site Layout Plan (Drawing Ref: 3229-C-200)
- Appendix B Existing and Proposed Development Plans specific to proposed Engineering Shed
- Appendix C Historical Maps
- Appendix D Envirocheck Report and Geological Maps
- Appendix E Coal Mining Information
- Appendix F Previous Ground Investigation Data





1. Introduction

1.1.1 Ethical Partnership has been commissioned to carry out a desk based assessment of the potential risks associated with the redevelopment of land at the McNulty Yard and adjacent car park in South Shields. This report outlines the results of the preliminary risk assessment carried out for the purposes of understanding the potential for the land to be contaminated and for the ground conditions to present other risks.

1.1.2 This report uses as its structure the three main components of the basic risk management process from the DEFRA/EA Model Procedures:

Risk assessment – establishing whether unacceptable risks exist and, if so, what further action needs to be taken in relation to the site;

Options appraisal – evaluating feasible remediation options and determining the most appropriate remediation strategy for the site;

Implementation – carrying out the remediation strategy and demonstrating that it is, and will continue to be, effective.

1.1.3 A Phase I Geo-Environmental assessment has been carried out for land at McNulty's yard and adjacent car park. This report highlights ground related environmental and geotechnical considerations in relation to the redevelopment of the site which will include a new quay wall.

1.1.4 This report is a preliminary risk assessment. Its purpose is to develop an initial conceptual model of the site and establish whether or not there are potentially unacceptable risks. The preparation of the report has involved the collection and review of largely desk-based information in order to prepare an initial conceptual model to identify possible pollutant linkages. The report includes and evaluation of the possible linkages, using criteria appropriate to the risk assessment context; namely

- 1) To establish the historical development of the site and surrounding area.
- 2) To establish the environmental setting of the site.
- 3) To assess the potential impact of subsurface mining on the proposed development.
- 4) To determine if historical or current activities could give rise to significant ground contamination.



- 5) To assess the potential for hazardous ground gas.
- 6) To determine the potential risks posed by contamination arising from historical or current activities on or in the vicinity of the site.
- 7) To identify the need for Generic quantitative risk assessment and/or Detailed quantitative risk assessment

- 1.1.5 To this end the study has included an inspection of historical maps, a review of environmental data held on publicly available registers and other sources as indicated within the report.
- 1.1.6 This report presents the factual information available during this assessment together with the interpretation of the data obtained and recommendations relevant to the scope of works outlined above.
- 1.1.7 Information provided by the client indicates that future development includes the construction of an engineering shed building within the South Yard area of the existing site. A site specific assessment of this area is included within this report to assess potential environmental constraints in relation to this development area.
- 1.1.8 It is understood that likely future uses for the remainder of the site will be for commercial, industrial uses and in particular those that may be associated with marine logistics.



2. The Site

2.1 Location and Description

2.1.1 The approximate centre of the site is located at National Grid Reference 435520, 566080. The general layout and site boundaries are shown on Drawing 3229-C-200 included in Appendix A. The site consists of three distinct areas:

2.2 North Yard

2.2.1 Bounded by the River Tyne to the west and Corstophine Town / West Holborn roads to the east. Approximate area 3.6 ha. To the east of the site lies a mixture of public open space, residential and commercial properties.

2.2.2 Only a small number of buildings are present on site, generally comprising offices and storage. The majority of the site area consists of hard standing. The site lies at a lower elevation than the land to the east, with the boundary consisting of a retaining wall.

2.3 South Yard

2.3.1 Bounded by the River Tyne to the west and Corstophine Town road to the east. Approximate area 3.8 ha. Adjacent properties are all commercial/industrial.

2.3.2 Several buildings are present including a large fabricating facility, pipe shop, workshops, offices, canteen and a gate house. The remainder of the site surfacing is all hard standing.

2.3.3 From information provided by the client, the proposed engineering shed is to be constructed across the general footprint of the former fabricating facility building located along the northern boundary of the South Yard area. Copies of the existing and proposed layout plans relating to the proposed engineering shed are included in Appendix B.

2.4 Car Park and Stockyard

2.4.1 Located on the south side of Smith Street, between Corstophine Town and Garwood Street. Approximate area 1.6 ha. Surrounding properties are commercial / industrial / residential.



3. Site History

3.1.1 In order to establish the site's history an inspection of historical maps and town plans, dating between 1857 and 2016, and obtained as part of an Envirocheck report has been made (Ref. 92596393_1_1 dated 5th August 2016). A summary of the information is provided below and a copy of the maps is included as Appendix C.

Map Dates	On-Site Features	Relevant Off-Site Features
1857 - 1862	<p><u>North Yard</u>: Site is heavily developed including a sawmill, High Dock, West Holborn Iron Works, Tyne Foundry – Iron and Brass, Glass Works, railway lines with colliery staiths, ballast yard, cranes and slipway.</p> <p><u>South Yard</u>: 3 small docks (West Docks), slipway, smithy, ballast hills, saw pits and 'South Shields Colour Works'.</p> <p>The area of the proposed engineering shed spans the dockyard area, a number of buildings associated with 'South Shields Colour Works' and part of a ballast hill.</p> <p><u>Car Park</u>: Railway lines (embankment), residential housing and undeveloped land.</p>	<p>Mixed residential and commercial properties to the east. The Jarrow Chemical Works to the south. Middle Docks and varied industrial buildings to the north.</p> <p>Several railway lines and 'ballast hills' recorded in the surrounding area.</p>
1896 – 1899	<p><u>North Yard</u>: 'High Docks' graving docks constructed at southern end of yard. 'High Docks Engine & Boiler Works' and a sawmill constructed in the central part of the yard.</p> <p><u>South Yard</u>: Ballast Hills cleared. Redhead's Shipbuilding and Engineering Works constructed which includes several new buildings and docks.</p> <p>The buildings across the area of the proposed engineering shed have been demolished with the ballast hill no longer shown. Two docks partially extend below this area with a central works building.</p> <p><u>Car Park</u>: no significant changes.</p>	<p>Expansion of residential housing to east.</p> <p>Jarrow Chemical Works demolished. Tyne Dock constructed to south.</p>



Map Dates	On-Site Features	Relevant Off-Site Features
1915 – 1938	<p><u>North Yard</u>: ‘West Docks’ graving dock constructed over the site of the former engine and boiler works and sawmill.</p> <p><u>South Yard</u>: No significant changes. From 1938, the works building is no longer shown.</p> <p><u>Car Park</u>: Expansion of residential housing to the east, with a church and hall also shown by 1938.</p>	Expansion of Middle Docks to the north.
1952 – 1986	<p><u>North Yard</u>: South Shields Power Station constructed in the northern part of the yard but partially demolished by 1968. By 1970, a scrap yard is shown to the south of the power station.</p> <p><u>South Yard</u>: 3 slipways constructed. The central slipway is replaced by travelling cranes by the 1970s.</p> <p>The area of the proposed engineering shed is occupied by a large shipbuilding and engineering works, with the former docks no longer shown. From 1984, extensions to the south of the engineering works have been demolished.</p> <p><u>Car Park</u>: The western area is occupied by a series of works, including an iron and steel store, and iron foundry. By 1982, the residential housing and church have been demolished and railway line dismantled.</p>	Some redevelopment takes place to the eastern side of the North Yard. By the late 1980s, much of the residential housing stock to the east of the site is undergoing replacement.
1989 – 1995	<p><u>North Yard</u>: The buildings to the north of West Dock graving dock have been demolished.</p> <p><u>South Yard</u>: No significant changes.</p> <p><u>Car Park</u>: All buildings and remnant infrastructure removed by the late 1980’s.</p>	No significant changes.
2006 – present	<p><u>North Yard</u>: All graving docks in filled.</p> <p><u>South Yard</u>: All slipways in filled.</p> <p><u>Car Park</u>: A ‘Depot’ recorded on site.</p>	No significant changes.



3.2 General Site History

- 3.2.1 In summary, it can be seen that the site as a whole has undergone extensive redevelopment, with historical usages including; docks, slipways, various works and foundries, railway lines, ballast hills, saw pits, saw mill, residential housing, South Shields power station, shipbuilding and engineering works.
- 3.2.2 Numerous docks and slipways also historically occupied the site the majority of which have now been infilled. From available data, evidence suggests that infrastructure (i.e. concrete sides and base) associated with a number of the former docks remains below areas of the site, with a former graving dock extending below the location of the proposed engineering shed.
- 3.2.3 Based on the extensive historical industrial use, all areas of the site are considered to have been subject to potentially contaminative activities

3.3 Proposed Engineering Shed

- 3.3.1 A specific assessment has been made for the area of the proposed engineering shed, the location of which forms the northern boundary of the South Yard area.
- 3.3.2 From earliest OS plans, this area is shown to span the dockyard area, part of a ballast hill and includes numerous buildings associated with the former 'South Shields Colour Works'. From 1896, these features are no longer recorded with two docks extending below this location, separated by a central works building which has been demolished by 1938.
- 3.3.3 From 1952, the docks are no longer recorded and have been backfilled with a large shipbuilding and engineering works occupying this area. A series of extensions are also shown to the works building which are no longer present by 1984. From available data the engineering works building has been more recently recorded as a steel fabricating facility.



4. Previous Ground Investigation Data

4.1.1 Several previous ground investigation reports have been produced for the site, as referenced below:

- Solmek Ltd, 'Site Investigation Report of land at AUK Project, McNulty Offshore, South Shields', Ref. M0754 Phase 1, dated January 2011.
- Solmek Ltd, 'Site Investigation Report of land at Allseas Project, McNulty Offshore, South Shields', Ref. M0754 Phase 2, dated February 2011.
- Solmek Ltd, 'Site Investigation Report of land at Devenick Project, McNulty Offshore, South Shields', Ref. M0754 Phase 3, dated March 2011.
- Solmek Ltd, 'Geoenvironmental Appraisal of land at McNulty Offshore, South Shields', Ref. M0696, dated May 2009.
- Allied Exploration & Geotechnics Ltd, 'Ground Investigation, McNulty Yard, South Shields', Ref. 3676, and dated August 2008.
- Dunelm Drilling Co., 'Site Investigation, Proposed Foundation for New Module, McNulty Yard, Commercial Road, South Shields', Report Ref. 8141, dated November 1995.

4.1.2 To aid in assessing potential environmental constraints and ground conditions below the site, a review has been made of each of the above mentioned reports with relevant data included in the following summaries.

4.1.3 With the exception of the previous ground investigation completed by AEG, the previous works carried out by Solmek and Dunelm were generally undertaken in order to specifically target the locations of proposed new buildings and/or operations on site.



4.2 Summary of Ground Conditions:

- 4.2.1 The investigation by Dunelm targeted the location of a proposed new offshore module located within the former dock yard area, whilst the investigations completed by Solmek Ltd targeted the infilled former dry dock and former storage yard within the North Yard area (AUK Project and Allseas Project) and the storage yard area within the South Yard area (Devenick Project).
- 4.2.2 The Geo-environmental Appraisal completed by Solmek also targeted the location of the former No 1 Dry Dock within the North Yard area, whilst the investigation completed by AEG targeted the whole of the North Yard area to provide a general section of ground conditions below this area.
- 4.2.3 During the previous investigation works, generally variable made ground comprising loose to medium dense gravel with brick, concrete, slag, flint and timber; very loose to loose ash, brick and concrete fill; very loose to medium dense gravel (ships ballast?); saturated white ash/mineral powder and soft to firm clay with frequent timber, was identified below both the North and South Yards areas to depths of between 1.40m and 14.00m.
- 4.2.4 During the works undertaken as part of the Allseas Project, a single borehole was sunk within the infilled former No 2 Dock within the North Yard, which identified fill materials comprising gravel with brick, concrete, clinker, sandstone and flint, with occasional timber. A layer of cohesive made ground was also identified between 3.90m and 4.30m, which is likely associated with a clay liner immediately overlying the concrete former dock base.
- 4.2.5 As part of the previous appraisal completed by Solmek, a borehole was also sunk within the infilled No 1 Dry Dock within the North Yard which identified made ground to a depth of 10m where the borehole was terminated on a concrete obstruction considered to represent the base of the former dock.
- 4.2.6 Similar ground conditions were also identified within BH08/07, BH08/12, BH08/14, BH08/15 and BH08/19 sunk across the North Yard area during the investigation completed by AEG, which recorded made ground to a depths of between 7.50m and 9.00m overlying obstructions and/or a definitive concrete base.
- 4.2.7 Drift deposits generally comprising loose silt, firm silty clay and firm to stiff sandy gravelly clay (Glacial Till) were identified to depths of between 6.00m and 18.50m, which were noted to generally increase in thickness towards the River Tyne. Drift deposits were noted as absent within one of the rotary holes sunk during the Dunelm investigation (RBH3) with made ground immediately overlying bedrock at this location.



4.2.8 Bedrock deposits comprising moderately strong to strong sandstone and moderately weak mudstone were identified to a maximum recorded depth of 22.60m. A generally thin and intact coal band (up to 0.40m thick) was also identified contained within the upper bedrock deposits. During the Solmek 'Devenick Project' and 'Allseas Project' investigations, dense sandstone gravel deposits were also noted at depths of between 5.20m and 11.50m which were considered to be potentially attributable to weathered bedrock.

4.3 Groundwater

4.3.1 Groundwater was noted within a number of previous exploratory positions at depths ranging from 1.30m to 13.20m, generally contained within the granular made ground materials. When considering the existing site setting it is considered likely that groundwater below this site is in hydraulic continuity with the adjacent River Tyne.

4.4 Additional Information

4.4.1 No visual and/or olfactory evidence of potentially significant contamination was noted during the previous ground investigations. However, the presence of ash and slag was noted contained within the made ground materials. In addition, a band of white ash/mineral powder was also noted within one of the previous boreholes sunk by Dunelm.

4.4.2 During the previous investigation by AEG, an insitu PID survey was also undertaken which also identified no potentially volatile contamination within the made ground and/or drift deposits encountered across the North Yard area.

4.4.3 From a review of the contamination screening completed as part of the AEG investigation, generally low level of contaminants were identified within the soil samples screened from across the North Yard area, based upon a future commercial end use. In addition, generally low levels of Total Petroleum Hydrocarbon (TPH) and Polycyclic Aromatic Hydrocarbon (PAH) were identified within samples of groundwater screened from selected boreholes.

4.4.4 However, when considering the time period elapsed and absence of a definitive ground contamination risk assessment, it is recommended further screening be completed for this site to more accurately assess the level of potential risk with regards both Human Health and Controlled Waters.



5. Environmental Setting

5.1.1 This section is based principally upon a search of information available on public registers through an Envirocheck search (Reference 92596393_1_1) included as Appendix C, together with other sources as indicated.

5.2 Geology and Mining

5.2.1 A summary of the site geology, based on available published information, is provided below.

Sources of Information	<p>British Geological Survey (BGS) Sheet 21 Sunderland, 1:50 000 scale, Solid and Drift Edition.</p> <p>BGS 1:10,000 Geological Maps, obtained from Envirocheck (Appendix D).</p>
Made Ground	<p>BGS plans record the majority of the North and South Yards to be underlain by made ground, likely associated with reclamation of the site from the River Tyne and infilling of former docks and slipways. It is anticipated that made ground will increase in thickness towards to the river and be locally very deep in the areas of the backfilled graving docks.</p> <p>Previous ground investigation data indicates made ground generally varying between approximately 1.4m and 14m in thickness.</p>
Superficial Deposits (drift)	<p>BGS plans record Glaciolacustrine drift deposits (sand and gravel) below the majority of the site. Near to the river edge, it is likely that some Alluvium will be encountered.</p> <p>Previous ground investigation data from the South and North Yards indicated drift deposits comprising loose silt, firm silty clay and firm to stiff sandy gravelly clay to depths between 6m and 18.5m.</p>
Solid Geology	<p>Carboniferous Middle Coal Measures. Previous boreholes within the River Tyne adjacent to the South Yard recorded bedrock at a depth of around 10m below O.D. Boreholes within the South and North Yard record bedrock between around 6m and 18.5m depth.</p>



Mining	<p>The Coal Authority record workings beneath the site in 3 seams of coal at 100m to 340m depth, and last worked in 1947. Any ground movement from these workings should have stopped by now.</p> <p>From geological plans, the Usworth coal seam crops through the South Yard, dipping towards the north. The Bottom Hebburn Fell coal seam crops to the south of the site and may underlie the Car Park area and South Yard at shallow depth. These coal seams may have been worked historically. The Coal Authority mapping data indicates that the southern part of the South Yard and the Car Park area may be underlain by shallow coal workings.</p> <p>No mine entries are recorded on or within 20m of the site boundary. A Coal Authority mining report is included in Appendix E.</p>
Quarrying	<p>None recorded on or adjacent to the site. Some quarries operated historically in the wider area.</p>

5.3 Hydrology and Hydrogeology

5.3.1 A summary of available information pertaining to hydrology, hydrogeology, and flood risk potential, water abstractions, discharge consents and pollution incidents to controlled waters is provided below.

Watercourses	<p>River Tyne flows adjacent to the western boundary.</p>
Flood Risk	<p>Parts of the South and North Yard are recorded to be at risk from flooding or extreme flooding from rivers or sea. The Car Park area is not indicated to be at risk from flooding.</p>
Groundwater Classification	<p>Solid Geology: Secondary A Aquifer.</p> <p>Superficial Geology: designated as 'Unproductive' or 'Unknown'.</p>
Source Protection Zones	<p>NR within 1km.</p>
Springs	<p>NR within 250m.</p>



Wells	NR within 250m.
Licensed Surface Water Abstractions	NR within 250m.
Licensed Groundwater Abstractions	NR within 250m.
Discharge Consents	47 within 250m of which 30 are recorded on site. These generally relate to sewage or storm overflow discharges into the River Tyne.
Pollution Incidents	4 within 250m, none on site. All relate to Category 3 – minor incidents in the 1990s.

NR – None recorded

5.4 Landfill Sites and Waste Management

5.4.1 A summary of information regarding landfill sites (historical or current) and waste management facilities is provided below.

Recorded Landfills	2 recorded on site: Aber McNulty Ltd - West Dock, inert waste and South Tyneside Borough Council - Old Electricity Works, no known waste restrictions. 1 historic landfill recorded within 250m: Port of Tyne: Tyne Dock, inert waste.
BGS / EA Recorded Landfills	NR within 250m.
Other Waste Management Facilities	1 recorded on site, dated 1997 (now expired) and registered to Aker McNulty Ltd associated with landfills taking non-biodegradable waste - likely associated with infilling of former dock/s. 1 metal recycling/scrapyard site located approximately 160m south.

NR – None recorded



5.5 Pollution Controls and Industrial Land Use

5.5.1 A summary of Pollution Control records and potentially polluting activities (fuel stations) is provided below.

Integrated Pollution Controls (IPC)	12 within 250m, none of which are recorded on site.
Integrated Pollution Prevention and Control (IPPC)	NR within 250m.
Pollution Prevention and Controls (PPC)	1 recorded on site, dated 1994 and registered to McNulty Offshore Construction Limited, associated with the permitted coating of metal and plastic. 7 within 250m, none of which are recorded on site.
Petrol Filling Stations	NR within 250m.

NR – None recorded

5.6 Radon

5.6.1 Inspection of the BRE publication BR211 (2007), "Radon: Guidance on protective measures for new buildings" indicates that the site lies in an area where radon protection measures are not required.

5.6.2 The site specific assessment contained within the Envirocheck report also states that no radon protection measures are required.



6. Conceptual Site Model

- 6.1.1 Based on the available desk study information, a combined conceptual site model (CSM) for the entire site (North and South yards together with the Car Park) has been developed for the proposed future land use (commercial / industrial). The CSM summarises the understanding of the existing site and its historical development, the site geology, the potential contaminant sources, transport pathways and receptors in order to assess potential pollutant linkages.
- 6.1.2 In assessing the potential contaminants present at the site, reference has also been made to the relevant sections of CLR 8, the Department of the Environment Industry Profile reports and any other relevant supporting documentation. The CSM model is based on the available information. It includes a summary of the potential contamination sources, pathways and receptors as set out below.
- 6.1.3 Information provided by the client indicates that future development includes the construction of an engineering shed building within the South Yard area of the existing site, with likely future uses for the remainder of the site being for commercial, industrial uses and in particular those that may be associated with marine logistics. Based on the available information, a summary of the potential contamination sources, pathways and receptors is provided below.

6.2 Sources of Contamination

- 6.2.1 The potential sources of contamination arise from the following;
1. Contamination associated with current and historic activities on site:
 - a. Unknown 'made ground' conditions arising from the importation of waste materials to 'infill dock' areas (North and South Yard, including proposed engineering shed).
 - b. Potentially unknown ground contamination arising from current and recent activities that have taken place on the site (e.g. metal manufacturing and fabrication).
 - c. Potentially unknown ground contamination arising from historical land uses on the site which had high propensity for pollution and for metal, organic and inorganic contamination including a sawmill, engineering works, graving docks, power station, railway lines. **Note:** Tributyl Tin (TBT) was frequently used as an anti-fouling agent during ship repairs. It is environmentally toxic and elevated concentrations are known to occur in the River Tyne. (North and South Yard).
 - d. Mixed made ground from previous land reclamation activity.



2. Contamination associated with current and historic activities on adjacent land:
 - a. The adjacent land to the east and south of North and South Yards and surrounding the car park has a long history of industrial uses including shipyards, chemical works, chemical processing, plywood manufacture and construction and operation of railway lines. This may include a wide variety of heavy metal and hydrocarbon contamination of a similar nature to those found on the site. There is historical evidence of underground tunnels from the north and south yards.
3. Ground gas:
 - a. The landfill and ground contamination has the potential to have buried materials with the propensity to produce ground gas both on and adjacent to the site. (e.g. methane and carbon dioxide from made ground and/or alluvium and/or Hydrocarbon vapours from volatile compounds (although the insitu PID survey undertaken as part of the previous AEG investigation noted an absence of volatiles in the ground)).

6.3 Potential Pollution Pathways

6.3.1 The potential pollution pathways are as follows;

1. Human Health
 - a. The potential pollution pathways which present a threat to humans could arise from direct contact, soil ingestion and dust inhalation.
2. Controlled Waters - Leaching (Liquids and solids)
 - a. The vertical and or lateral leaching and migration of contaminants contained within the ground or ground water.
3. Ground Gas Migration
 - a. The vertical and or lateral migration of gases contained within the ground or ground water.



6.4 Receptors

6.4.1 The potential receptors for the contamination are as follows;

1. Construction workers.
2. Site end users.
3. Adjacent and neighbouring site occupiers (residential/transport users).
4. Adjacent watercourse (River Tyne).
5. Underlying Aquifer (Secondary A Aquifer).
6. Adjacent properties/land.

6.5 Generic qualitative risk assessment (Human Health and Controlled Waters)

6.5.1 A generic qualitative human health and controlled waters risk assessment has been carried out. This identifies the likelihood of any pollutant linkage taking place and its potential significance. The table below identifies the extent to which a pathway linkage may be complete and whether this presents risks that are acceptable or can be mitigated;

Contamination Source	Pathway	Hazard	Potential Receptors	Linkage Complete
Contaminants associated with made ground on site or former site usage.	Direct contact, ingestion, dust inhalation	Human health risk	Site construction workers	Yes, can be mitigated by the use of appropriate PPE and limited exposure.
	Direct contact, ingestion, dust inhalation	Human health risk	Site end users	Yes, although any development is likely to consist of hard standing or buildings which will break any pathway to potential contamination.
	Dust inhalation	Human health risk	Adjacent properties	Yes, can be mitigated by appropriate method statements and limited exposure.
	Lateral and vertical migration	Surface water pollution	River Tyne	Yes, although generally low levels of contaminants were identified within groundwater screened during previous investigation works.



Contamination Source	Pathway	Hazard	Potential Receptors	Linkage Complete
	Lateral and vertical migration	Groundwater pollution	Secondary (A Aquifer)	Yes, although migration will be prohibited due to the overlying thickness of low permeability clay drift deposits negating potential pathways to the Secondary A Aquifer deposits.
	Lateral and vertical migration	Human health risk	Adjacent property	Yes, but much of the adjacent land has been used for industrial purposes with a similar history of likely contamination. Residential properties lie to the south and east of the site. Where these are at higher elevation they are unlikely to be impacted from contamination on site. Where they are below or at similar elevation site investigations will be required to verify no migration.
Contaminants associated with offsite sources	Lateral and vertical migration	Human health risk	Site construction workers	Yes, can be removed by the use of appropriate PPE and limited exposure.
	Direct contact, ingestion, dust inhalation	Human health risk	Site end users	Yes, although the proposed development will generally consist of hard standing or buildings which will break any pathway to contamination. When considering the proposed engineering shed from provided plans this development is also shown to be 100% hard-standing thereby breaking any available pathways.
Ground Gas / Vapours	Vertical migration into buildings or confined spaces	Human health risk. Fire risk	Human health and property	Yes, although low risk is anticipated in relation to potential volatiles with no detectable levels identified during previous investigation works across the North Yard area.

6.5.2 In summary, although generally low levels of contaminants were identified within soil samples screened from across the North Yard area as part of previous investigation works, it is considered that the site has the potential to be underlain by contaminated soils from the existing and previous industrial site use and the adjacent industrial land.



7. Environmental Risk Assessment

- 7.1.1 The potential environmental risks arising from the redevelopment of the site have been assessed based on the 'source-pathway-target' pollutant linkages identified in the Conceptual Site Model.
- 7.1.2 The assessment of environmental risks involves understanding the risks associated with each stage of the pollutant linkage being present. The classification of risks is made according to the following definitions:
- **Low risk** – it is unlikely that an event will arise with respect to causing significant harm to human health or controlled waters.
 - **Medium risk** – it is possible that an event could arise with respect to causing significant harm to human health or controlled waters.
 - **High risk** – it is likely that an event will arise with respect to causing significant harm to human health or controlled waters
- 7.1.3 A generic qualitative environmental risk assessment has been carried out. This identifies the likelihood of any pollutant linkage taking place and its potential significance.
- 7.1.4 The following table identifies the extent to which a pathway linkage may be complete and whether this presents risks that are acceptable or can be mitigated;



ENVIRONMENTAL RISK ASSESSMENT		
	Risk rating	Reason
Contamination potential for:		
On-site contamination	Medium	<ol style="list-style-type: none"> 1. Site has a long industrial history and therefore some contamination should be anticipated. 2. Method statements can control the excavation and reuse of arisings from the excavation of foundations. 3. Careful control of cut and fill within the site can control release and containment of potential contaminants. 4. Providing the above measures are taken and the site end use remains industrial or commercial then it is unlikely that end users will come into contact with any underlying soil contamination as the land will be covered by buildings or hard standing.
Contaminants migrating off site	Medium	<ol style="list-style-type: none"> 1. River Tyne lies adjacent to the site. 2. The river frontage has been built up with made ground of unknown origin/contamination and the quay wall will not be watertight. 3. Given that the Tyne is tidal at this location, contamination may be drawn out of the site and into the river by tidal flux. As the site formerly contained graving docks, TBT contamination is possible. 4. The South Yard is elevated above the adjacent Middle Docks. As such there is the potential for contaminants to migrate through ground water and surface runoff into and onto Middle Dock. 5. The potential for tunnels into and out of the site presents an unknown risk of contaminants migrating off the site.



ENVIRONMENTAL RISK ASSESSMENT		
Contaminants migrating onto site	Medium	<ol style="list-style-type: none"> 1. The high density of industrial development along this stretch of the Tyne and the tidal influence presents a risk of contaminants migrating into North and South Docks. 2. The potential for migration into the car park site is from adjacent sites which have had a similar history and have a similar contamination potential. 3. The potential for tunnels into and out of the site presents an unknown risk of contaminants migrating onto the site.
Other environmental issues giving rise to concern	Low	None identified.
OVERALL RISK	Medium	



7.2 Ground Gas Risk Assessment

7.2.1 A generic qualitative gas risk assessment has been carried out using the information gained through the Envirocheck report. The table below identifies the extent to which a pathway linkage may be complete and whether this presents risks that are acceptable or can be mitigated;

Potential Gas Source	Hazard	Risk Rating	Justification
Made ground (CH ₄ , CO ₂)	Humans: health risk Buildings: explosion	Medium	<ol style="list-style-type: none"> The site includes extensive areas of made ground which is particularly deep within the "in filled" docks with few if any reliable records of the quality of the fill that has been used. The site has a long industrial history and therefore contamination with the potential to produce gas should be anticipated. Based on the evidence the following have the potential to be present on site; <ol style="list-style-type: none"> carbon dioxide and methane volatile vapours from hydrocarbon contamination (low risk anticipated).
Coal and historical mining	Humans: health risk Buildings: explosion	Medium	<ol style="list-style-type: none"> The Usworth coal seam crops within the site boundary and although there is no historic evidence of mining it cannot be discounted. There is the potential for backfilled mine workings and they could present a source of ground gas.
Radon	Humans: health risk	N/A	No radon precautions required.
OVERALL RISK	Medium		



8. Geotechnical Considerations

8.1.1 The following geotechnical considerations are based on the available data on the ground conditions and are provided as provisional and indicative only.

8.1.2 A programme of site investigations and testing is required to verify the ground conditions and the absence or otherwise of contaminants. The following should not be taken as design criteria without further geotechnical data obtained from a suitably designed ground investigation.

8.2 Mining

8.2.1 The Usworth and Bottom Hebburn Fell coal seams crop on or adjacent to the site and are likely to underlie the area at shallow depth. These coal seams may have been worked historically. No mine entries are recorded on or adjacent to the site.

8.2.2 Based on the available information, the South Yard and Car Park areas are in particular considered at risk from potential shallow coal workings and as such, intrusive site and ground investigations are considered necessary to prove the ground conditions.

8.3 Foundations

8.3.1 North and South Yard (including Proposed Engineering Shed)

8.3.2 In view of the in filled former graving docks and long industrial history, the ground conditions consist of highly variable depths of made ground overlying river alluvium, glacial till and bedrock.

8.3.3 Made ground is very deep locally, with previous investigations recording thicknesses in the range 1.5m to 14m. Based on the available information it should be generally assumed that the graving docks were in filled without breaking out the concrete structure and therefore that significant obstructions should be anticipated within the made ground. From historical data, an infilled former graving dock is also shown to extent below the location of the proposed engineering shed,



with this feature anticipated to have been infilled with associated concrete base and sides remaining intact below this area.

- 8.3.4 The made ground and alluvium is unlikely to be suitable for the support of conventional shallow foundations in view of the inherent variability in its structure and composition.
- 8.3.5 New foundations will require extending into the underlying glacial deposits or terminating at bedrock. It is anticipated that piled foundations will be required for the majority of the site although pads/strips could be considered where glacial till lies at shallow depth.
- 8.3.6 Car Park and Stockyard Area
- 8.3.7 This area was formerly used for railway purposes including extensive railway lines. It has also been used for housing.
- 8.3.8 The site is underlain with shallow coal measures that may have been mined.
- 8.3.9 The depth of made ground within the site is unknown.
- 8.3.10 As such it is possible that conventional pad or strip foundations could extend through the made ground to found on natural glacial till. However where the thickness of made ground is too deep for conventional foundations or there are undocumented mine working pile or slab foundations may be required.

8.4 **Foundations: managing the risks associated with contamination**

- 8.4.1 Subject to the findings of future site investigations, mitigation /remediation may be required to address the contamination findings. Based on currently available information and predicted SI outcomes the risks can be managed through conventional construction techniques, practices and procedures.



8.5 Gas Protection Measures

- 8.5.1 The preliminary ground gas risk assessment identifies that there is a medium risk to the development from ground gas due to the presence of extensive made ground, potential hydrocarbon contamination and shallow coal seams.
- 8.5.2 This level of risk can be appropriately managed by a programme of gas monitoring and reporting. Subject to the findings mitigation /remediation may be required and based on currently available information the risk can be managed through conventional construction techniques, practices and procedures.
- 8.5.3 Ground gas monitoring /reporting together with any need for remedial works can be the subject of a condition attached to a planning consent should the local planning authority consider it necessary.



9. Further Investigations

9.1.1 An intrusive investigation will be required once development options are known, to address the ground related issues discussed above, and to specifically target the location of the proposed new engineering shed. A summary of the likely scope of works, which should not be taken as an exhaustive list, is provided below.

- Cable percussive drilling to assess the depth and nature of the made ground, allow the recovery of samples for laboratory testing and establish the geological profile within the likely foundation depth.
- Trial pits to assess the variation in made ground thickness.
- Rotary drilling to assess the mining risk, particularly in the South Yard and Car Park areas.
- Installation of gas and groundwater monitoring standpipes.
- Gas monitoring.
- Laboratory geotechnical and chemical testing.

9.1.2 The above investigations are to provide geotechnical and environmental data. Further survey works will be required to structurally assess the existing quay edge.