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# WIRRAL LOCAL PLAN 2021 - 2037 SUBMISSION DRAFT

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## LAND CONTAMINATION PHASE 1 DESK TOP STUDIES AND REVIEWS



<b>Site Reference</b>	SHLAA 5000 (RES-RA2.1)
<b>Site Address</b>	Scott's Quay
<b>Grid Reference</b>	332311 390396
<b>Site Area</b>	3.6ha
<b>Current Site Use/Site description</b>	<p>In 2019 MEAS undertook a review of over 400 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan. In 2020 a number of employment sites were reassessed for housing.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>Following an initial assessment, SHLAA 5000 Scott's Quay was classified as Amber (Phase I Desk Study is required <b>prior to allocation</b>).</p>
<b>Aims:</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary).</li> </ul>
<b>Proposed Development Allocation</b>	Housing
<b>Information reviewed</b>	Envirocheck Report Order No. 276037862_1_1 dated 1 <sup>st</sup> April 2021
<b>Current Site Use/Site description</b>	<p>Owing to current Covid restrictions no site visit has been undertaken. However, site images have been reviewed using google earth imagery dated 25/06/2020.</p> <p>The site is roughly triangular in shapes and lies to the south east of Birkenhead Road(A564). The majority of the site is covered</p>

	<p>with a very large industrial building, with a two-storey office building in the north and a storage/service yard to the south west. The signage suggests the site is occupied by CETCO, a waterproof material manufacture company. Further to the south west is an area of shrubland/trees with the very south west corner a vacant parcel of land predominantly covered in hardstanding and marketed by Peel Holdings.</p> <p>In the surrounding area:</p> <ul style="list-style-type: none"> <li>• to the east lies East Street and a commercial/industrial area with the River Mersey beyond.</li> <li>• to the south of the large building and storage yard is a large oil storage area, beyond which is the Alfred Dock and West Float.</li> <li>• to the north and west lies mixed housing/commercial and industrial units.</li> </ul>
<b>Geology</b>	<p>Drift Geology- Tidal Flat Deposits Solid Geology – Chester Formation - Sandstone</p> <p>The geological maps identify made ground to also be present on site.</p>
<b>Controlled Waters</b>	<p><u>Hydrogeology</u> The drift deposits are a Secondary Superficial Aquifer whereas the sandstone bedrock is a Principal Aquifer.</p> <p>The site does not lie in a Source Protection Zone.</p> <p><u>Hydrology</u> The nearest surface water feature is the Alfred Dock which lies 25m to the south (at its closest point). The River Mersey lies approximately 190m to the east.</p> <p><u>Flood Risk</u> The south west corner of the site is at risk from Extreme Flooding from Rivers or Seas Without Defences (Zone 2) as well as Flooding from Rivers or Seas Without Defences (Zone 3).</p>
<b>Planning History</b>	None located
<b>Site History</b>	<p>The site is shown on the 1874-6 map with Birkenhead Road and East Street present. There are several railway tracks extending on site from the south west corner in an east and northeast direction. In the northern corner are two buildings one along Birkenhead Road the other East street. A rail track runs between</p>

the two buildings in a south eastern direction. To the east is a shipbuilding yard, to the south further railway lines and moorings associated with the Alfred Dock. A Phospho-Guano Works lies to the north and west with an excavation shown. Residential streets are shown to the very north and west of the site.

The 1899 map shows several travelling cranes to be present on site. But the site still largely remains undeveloped. A brick field is marked to the west (north of the Phospho-Guano Works) and a Magnetic Filter Works to the west (south of the Phospho -Guano Works). The Shipbuilding Yard is no longer shown but several unknown buildings are still present.

The 1911 shows the site to predominantly remain the same with minor changes to the railway tracks and cattle pens now marked in the south west corner. The Phospho-Guano Works and brickfield is no longer marked. The area to the east of East Street is shown as marsh although buildings are still present.

In 1935-6 the site is shown to be the North Reserve Storage Yard; the travelling cranes and cattle sheds are no longer shown but an engineering shed is shown in the south west corner. There has been further expansion of the housing to the west with a Plaster Board Works shown beyond which lies a Steel Foundry and Engineering works. The Magnetic Filter works appears to have been replaced with a bowling green and a new warehouse lies to the south between the site and the Alfred Dock.

The 1955-6 map shows the building in the north of the site fronting onto East Street to be marked as a Fire Lighter Factory. In the surrounding area the warehouse to the south is no longer shown, the plaster board factory is now shown as Goodyear Works. Several buildings to the east are no longer shown.

By 1969 most of the railway lines have been removed with only one running a short section shown along the southern boundary. The site is largely vacant with a few small buildings in the south (one marked as depot) and a mineral processing works in the north. In the surrounding area the Goodyear works has been expanded and is now recorded as a Toy Factory. To the south and south east between the site and the lock is a vegetable oil refinery with over 30 tanks present.

The 1977-1991 maps show further buildings on site all shown as works. The railway line is no longer shown. The land to the east remains mostly undeveloped with some housing to the west being removed.

The 1991 map no longer shows any buildings in the south west of the site. The factory to the west of the site has been broken down

	<p>into smaller plots and now contains a builder's yard and works with further expansion of the tank farm to the south (now marked as works).</p> <p>The 1993 map shows a warehouse present in the southwest of the site.</p> <p>The 1:10,000 scale map shows large buildings present in the northern half of the site in 1982-4 which were further expanded in 1999 and 2006 to their current configuration. The land to the East of East Street was extensively developed between 1982/4 and 1999 and included a sewage works and works.</p> <p>The Envirocheck report also contains some miscellaneous plans which appear to be associated with Insurance Plans the exact source of which is unknown. It includes an annotated drawing of the site showing a raw material warehouse (chemical works) in the north just below that a coal reserve.</p>
<p><b>Other Relevant information</b></p>	<p>The site has a Local Authority Pollution and Prevention Control permit licensed to Cetco on 11<sup>th</sup> January 2002 for Mineral drying and roadstone coating processes (PG3/15).</p>
<p><b>Aerial Photography</b></p>	<p>Google Earth Pro (accessed Apr 2021) shows the main building present in the northern half of the site in 2000 in the same configuration as it is today. A building shown along East Street has been demolished by 2012. There is the potential for the extensive cladding surrounding the main building on site to contain asbestos. A survey of the building should have been undertaken as part of the company's duties under the Control of Asbestos Regulations 2012.</p> <p>The south west corner of the site was used for storage with a building present, however the site was cleared by 2015.</p>
<p><b>Landfill sites &amp; ground gases</b></p>	<p>There is 1 historical landfill within 250m and a further 2 within 500m of the site.</p> <p>The nearest landfill is the Morgan Plant Hire, Alfred Dock Entrance which lies 141m to the southeast. It was licensed to accept waste from 01/01/1985 to 01/01/1986 and included the deposition of industrial waste.</p> <p>The next closest landfill lies 293metres to the west, it was licensed to the Mersey Docks and Harbour Company and was licensed from August 1983 to August 1987 and included the deposition of inert and industrial waste.</p>

	<p>The Liverpool Grain Storage and Transit Company held a license for a landfill 416m to the west which inputted waste from September 1980 to June 1981 which included industrial waste.</p>
<b>Sensitive Area</b>	<p>The Mersey Estuary is a Ramsar site and a Site of Special Scientific Interest (SSSI).</p>
<b>Ground Investigation</b>	<p>We are not aware of any site investigation being undertaken on this site itself.</p> <p>Information has been obtained on the vegetable oil refinery to the south. Arcadis UK (LTD) Environment undertook a site audit in 2010. This included a brief history of the site. The tanks were constructed on site in 1961, there were 43 tanks in total with a total capacity of 19,952m<sup>3</sup>. 7 of the tanks were used for the storage of oil used in the processes at West Float.</p> <p>The site was acquired in 1994 from PL Transtore who ran an edible oil storage blending and processing, fractionation and transport business. In 2005 the processing aspect of the terminal was decommissioned with associated tanks removed. Since 2009 the site has been used for oil storage and distribution. An above ground fuel tank and pump was removed in 2005.</p> <p>Arcadis state that an intrusive investigation in 2003 did not record significant contamination of either the soil or the groundwater. However, there may be localised areas of contamination present. A copy of this report was not included with the information.</p> <p>CCG undertook intrusive works at the site in 2011 (Ground Investigation Report for Site at East Street, Birkenhead, May 2011, CCG-C-11/6283) to determine ground conditions in relation to the proposed construction of bulk liquid storage tanks on site. The works included the drilling of 3 cable percussion boreholes to a maximum depth of 9.2mbgl. No samples were analysed for organic contamination; however, no visual or olfactory evidence of contamination was noted in the borehole logs.</p>
<b>CONCLUSION</b>	<p>Having reviewed the available information and produced a preliminary conceptual site model (included within Appendix 2) we conclude that the potential contamination risk onsite is <b>medium</b>. There are potential on-site sources of contamination which are likely to be dealt with through the normal planning application process.</p> <p>There is also the potential onsite migration of contamination (particularly organic contamination) from the vegetable oil refinery</p>



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	<p>to the south and the former Phospho-Guano factory to the north/west. Part of the former Phospho-Guano site was developed for a Soccer Dome in the mid 2000's. As no condition was attached to the planning application it is assumed that contamination was not deemed to be significant. The oil refinery has had limited investigation undertaken which has yet to record any significant contamination. As such given the extensive development of the land to the north and the limited investigation undertaken to the land in the south the potential risk from offsite contamination is also considered to be medium.</p>
<b>Anticipated remediation costs</b>	Medium/High, the possible presence of asbestos within the walls and roof of the main building on site could lead to significant costs in terms of asbestos removal and disposal.
<b>Limitations</b>	MEAS are not able to provide advice on geotechnical issues which are likely to significant on this site.
<b>Author</b>	Nicola Hayes
<b>Reviewer</b>	Laura Roberts
<b>Date</b>	April 2021

## Appendix 2

### Preliminary Site Conceptual Model

<p><b>Potential sources of contamination</b></p>	<p>Information collected from publicly available sources and the Envirocheck Report identifies the following potential sources of contamination:</p> <ul style="list-style-type: none"> <li>• Inorganic contamination within the made ground and soil associated with the former and current use of the site.</li> <li>• Organic contamination within the made ground and soil associated with the former and current use of the site.</li> <li>• Inorganic and organic contamination within any groundwater.</li> <li>• Asbestos associated with the demolition of any buildings.</li> <li>• Ground gas and vapours arising from the made ground on site well as any natural organic material.</li> <li>• Ground gas arising from the surrounding landfills and infilled land.</li> <li>• Organic contamination from off site sources including the vegetable oil refinery to the south and the Phospho-Guano works to the north.</li> </ul>
<p><b>Potential Pathways</b></p>	<ul style="list-style-type: none"> <li>• Ingestion, inhalation, dermal contact for human health receptors</li> <li>• Infiltration and contaminant migration via permeable strata or the unsaturated zone</li> <li>• Migration of volatile contaminants into buildings</li> <li>• Gas migration into buildings</li> <li>• Direct contact and uptake by plants</li> <li>• Permeation of water supply pipes</li> </ul>
<p><b>Potential Receptors</b></p>	<ul style="list-style-type: none"> <li>• Construction workers</li> <li>• Future residents</li> <li>• Buildings and Services</li> <li>• Alfred Dock</li> <li>• Mersey Estuary</li> <li>• Underlying Principal Aquifer</li> <li>• Offsite users</li> </ul>
<p><b>Preliminary Risk Assessment</b></p>	<p>There are several significant potential sources of contamination on site. The site has been used as a</p>

storage yard with extensive railway lines present. More recently it has been used as a works, however the exact nature/process and materials used by the current occupier is not known.

There is also the potential for migration of organic contamination from off sites sources including the vegetable oil processing facility to the south and the former Phospho-Guano works and other works/factories to the north, west and east.

It is not known if any ground investigation has been undertaken on any part of the proposed development site.

This site has been proposed as a potential residential development, which is classified as a sensitive end use and as such would require an extensive site investigation to determine the level of contamination present and obtain sufficient information to determine what remediation measures are required to ensure the safe development of the site.

The underlying Chester Formation is classified as a Principal Aquifer and the site is located within 25m of Alfred Dock. The site is located within an industrial area and the Tidal Deposits may offer some protection to the underlying Aquifer. Groundwater monitoring will be required to assess the risk and determine what (if any) remediation is required.

It is likely that any contamination remaining on site can be dealt with through commonly used remedial techniques. Therefore, following a review of available information any future risk to noted receptors, following remediation, would be low.

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## **DEVELOPMENT MANAGEMENT ADVICE**

To: Emma Hopkins  
Organisation: Principal Planning Officer, Wirral Council

Your Ref: RES-RA3.4  
File Ref: Rose Brae  
W/P Ref: \\smbc-file-11\eam\ MerseysideEAS\ Wirral Core Strategy\Wirral Plan Contaminated Land Work\Rosebrae\_NH  
Date: 18<sup>th</sup> June 2021

From: Nicola Hayes  
Contaminated Land Principal Officer

### **Technical Review of the land contamination information supplied in relation to Rosebrae, Church Street, Birkenhead**

1. Thank you for consulting Merseyside Environmental Advisory Service in respect of the above project.
2. I have reviewed the following document and provide my comments and observations below:
  - Curtins Consulting Limited (November 2014) Phase 2 Intrusive Investigation, Rosebrae, Birkenhead, Ref: EB1376/KR/4034 Rev 00
3. The intrusive works undertaken to date do not demonstrate that the site is grossly contaminated. Whilst some of the soil samples have recorded elevated concentrations of lead, copper and nickel as well as certain PAHs and asbestos this is not unusual for a brownfield site. Mitigation measures will be required most likely comprising a suitable cover system and potentially gas protection measures. **From the information provided I would have no concerns allocating the site for housing under the Local Plan from a land contamination perspective.**
4. If a planning application were to be submitted for the site, I would expect all relevant reports to be submitted as well as an updated risk assessment based on the development specific proposals for the site.
5. Although Merseyside EAS does not provide geotechnical advice the presence of underground structures including the former dock walls and base may be problematic and I would recommend that Wirral Council seek specialist advice on these matters.

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## Comments and Observations

### Conceptual Site Model

6. The Phase 2 report makes reference to an earlier Phase 1 Desk Top Report being available (dated July 2014). I have not reviewed this document, but the above report does provide a summary of the findings and a preliminary conceptual site model which are broadly consistent with what I would expect for the site. The site was predominantly occupied by Graving Docks prior to 1874 until they were infilled between 1981 and 1992.

### Intrusive Works

7. The intrusive works were undertaken in August 2014 and comprised:
- 15 light cable percussive boreholes
  - 27 window sample boreholes
  - Chemical analysis of made ground and natural strata
  - Groundwater/Gas monitoring wells installed in 10 window samples and 2 of the rotary follow on boreholes.

Made ground was encountered in all locations with all window samples and 9 boreholes terminated within this stratum owing to underground obstructions. The base of the made ground was encountered in 6 boreholes ranging in depths from 5.2mbgl to 18.6mbgl. The made ground was variable in composition. The majority of the material was described as clay or sand with localised horizons of gravel. The materials contained variable secondary proportions of gravel including brick, concrete, sandstone, coal, ash and clinker, glass, ceramic, plastic and timber were locally noted. Cobbles and boulders of sandstone, concrete and brick were noted within the made ground. Underlying the made ground was red sandstone.

8. The report states that representative samples of the site soils were taken from each of the borehole locations and provides a summary of any exceedences above the relevant Generic Assessment Criteria. Soil samples from 23 locations exceeded at least one of the criteria. A summary is provided:
- Lead (maximum concentration 1800mg/kg, GAC 450mg/kg) was recorded in 6 samples.
  - Copper and nickel (maximum concentration 4200mg/kg and 330mg/kg, GAC 3970mg/g and 130mg/kg) in 1 sample.
  - Napthalene (maximum concentration 8.4mg/kg, GAC 0.58mg/kg) in 2 samples
  - Benzo(a)pyrene (maximum concentration 7.3mg/kg, GAC 0.81mg/kg) in 14 samples
  - Aromatic TPH C12-35 in one sample
  - Chrysotile asbestos identified at 8 locations and Amosite asbestos identified at one location. Surficial deposits of asbestos were also observed across the northern area of the site
  - Sulphate was also elevated at 8 locations
9. Ground gas monitoring was undertaken on 2 occasions (out of 6 scheduled). No methane was recorded with a maximum carbon dioxide concentration of 2.3%v/v and

hydrogen sulphide (1ppm) and no flow. The report suggests that based on the provided information no gas protection measures would be required (subject to an additional 4 visits being undertaken).

10. There are various limitations associated with the data including:

*Soil sampling*

- The Appendices do not contain all the relevant Laboratory Certificate of Analysis, so it is not possible to fully interrogate the data.
- No quantification of the asbestos.
- A better quality exploratory location plan would allow the features of the site (past and present) to be identified,

*Risk Assessment*

- The Generic Assessment Criteria for lead is cited as being generally accepted rather than based on current best guidance.

*Groundwater*

- No groundwater samples have been collected and analysed, although the risk to controlled waters is considered Moderate/Low this needs to be supported by a suitable monitoring programme and risk assessment.

*Gas*

- Only data for 2 out of a proposed 6 monitoring visits has been reported. Atmospheric pressure at the time of the visits was between 1013mb and 1016mb. It is unclear if the pressure was rising, steady or falling which may have an impact on gas generation. Any gas monitoring should (where possible) include the worst temporal conditions (low and falling pressure) to ensure a robust dataset.
- The response zones for both BH1 and BH5 target both the shallow and deeper areas of made ground as well as the sandstone. The implications of this would need to be considered when analysing the monitoring data and producing a ground gas risk assessment.
- The relevant Appendix does not include any gas monitoring data from the 2 borehole wells installations (BH1 and BH5).

*Invasive Species*

- Two areas of suspected stands of Japanese knotweed were recorded which will need to be eradicated.

Remediation Measures

11. Curtins propose the following mitigation measures:

- A Cover System: 300mm in areas of soft landscaping and 600mm in private garden areas.
- Delineation of naphthalene hotpot in WS13
- Surface picking of asbestos and asbestos containing material.
- Delineation of asbestos where identified.

The broad mitigation measures appear reasonable but would need to be refined based on the limitations detailed above being addressed including groundwater analysis and additional gas monitoring. These measures are well established and used across the region.

I would be pleased to discuss these issues further and to provide additional information in respect of any of the matters raised.

Nicola Hayes  
Contaminated Land Principal Officer

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<b>Site Reference</b>	RES-SA4.2 - Former MOD, Wirral International Business Park
<b>Site Address</b>	Old Hall Road, Bromborough
<b>Grid Reference</b>	335592 381973
<b>Site Area</b>	8 Ha
<b>Introduction</b>	<p>In January 2021 MEAS undertook a review of additional 70 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>Following an initial assessment RES-SA4.2 Former MOD was classified as Amber (additional information required <b>prior to allocation</b>).</p>
<b>Aim</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary)</li> </ul>
<b>Proposed Development Allocation</b>	Housing
<b>Information Reviewed</b>	<p>The following information has been provided by Wirral MBC for review:</p> <ul style="list-style-type: none"> <li>• Faber Maunsell AECOM (June 2007) Demolition Validation Report, Long Plantation Depot, Bromborough. For Wirral BC (Appendices not included)</li> <li>• REC Ltd (January 2007) Remediation Validation Report. Long Plantation Depot, Bromborough. Ref: 42120p1r0</li> </ul>

<b>Current Site Use/Site Description</b>	<p>No site visit was undertaken by MEAS, but a review of the aerial photographs on Google Earth shows the site to be vacant and vegetated. The site is fenced and there are vegetated earth bunds surrounding the site. There is some evidence of fly tipping onsite and there are tracks which have been used for scramble bikes.</p> <p>To the north and west of the site are commercial units and Eastham Country Park is located to the south. There is an office block and associated carpark (Riverside Park) to the east, which is also being considered for housing.</p> <p>There is an oil pipeline that runs just inside the eastern site boundary. It enters the site approximately 70m from the south eastern corner of the site and runs to the northeast corner of the site.</p>
<b>Geology</b>	<p>British Geological Survey information as follows:          Superficial Deposits: None recorded.          Bedrock: Chester Formation, Sandstone</p>
<b>Controlled Waters</b>	<p><u>Hydrogeology</u>          The underlying Sandstone Formation is classified as Principal Aquifer. The 2007 report states that there were 8 licensed abstractions within 1km of the site, all for industrial purposes.</p> <p><u>Hydrology</u>          The nearest surface watercourse is the River Mersey 600m to the north east of the site.</p>
<b>Site History</b>	<p>The site was occupied by a former Ministry of Defence tank farm (constructed 1955), comprising nine large circular partially buried tanks, which remained operational until 1990. Each tank had a capacity of 8,000 to 10,000 tonnes, they were constructed in concrete with steel plate liners to the base and the sides and were surrounded by steep earth mounds. Spill containment bunds surrounded all of the tanks. Other structures onsite included large valve pit, small valve pit, subsurface pump and engine rooms, 2 fire water storage lagoons, drain water interceptor, fire equipment store and office.</p>
<b>Landfill sites &amp; ground gases</b>	<p>There are two landfill sites approximately 500m east of the site. There are no other historical landfill sites within 1km.</p>
<b>Ground Investigation</b>	<p><u>Geology</u>          Topsoil was identified from 0.10 to 0.3m in depth typically comprising dark brown, silty, sandy topsoil. Made ground was present across the majority of the site at a thickness of between 0.5 and 0.75m, typically comprising red brown silty fine to coarse sand with some gravel of weak sandstone; superficial drift deposits of Glacial Till were encountered on the northern site boundary, typically a thin layer (0.7m) of slightly gravelly clay.</p>

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Weathered Sandstone up to 1.1m thick was encountered in all areas that had not previously been excavated during the site development. Sandstone bedrock was encountered beneath the weathered sandstone to a maximum proven depth of 42mbgl.

#### Intrusive Investigation

A site investigation was undertaken by Ian Farmer Associates in November 2003 involving 27 trial pits, 4 boreholes to depth of 43m and 5 boreholes to depth of 4m. Soil samples were taken at regular intervals from the trial pits and boreholes. Soil samples were tested for metals, non metals, PAH, Asbestos, PCBs and DRO.

#### Risk Assessment

Results were compared to generic assessment criteria (SGVs) for commercial/industrial end use. There were no exceedances of the generic assessment criteria.

#### Gas monitoring

Ground gas monitoring was undertaken on 2 occasions in November and December 2003. The monitoring undertaken did not record elevated levels of methane or carbon dioxide.

#### Controlled waters

Groundwater monitoring was undertaken on 2 occasions in November and December 2003. Further groundwater monitoring was undertaken by Alcontrol, on behalf of Faber Maunsell, in November 2005 at the request of the Environment Agency. The additional groundwater monitoring included TPHCWG, VOC and SVOC testing. The Sandstone at the site is classified as Major Aquifer, elevated levels of phenol at a maximum concentration of 3.3mg/l were recorded in the groundwater concentrations above the DWS (0.5µg/l) in the initial monitoring round. In 2005 elevated levels of EPH (DRO) C10-C40, GRO (C4-C10) several VOCs and SVOCs were encountered in the groundwater concentrations above generic guideline values. No known source for the phenol, hydrocarbons VOCs and SVOCs were onsite. P20 Analysis was undertaken and it was concluded that the concentrations of TPH, phenols, PAH and benzo(a)pyrene remaining at the site were sufficiently low and did not pose a significant risk to controlled waters. Faber Maunsell state that the Environment Agency agreed with this conclusion.

#### Remediation

All known structures, infrastructure and services on and below the site were demolished between February 2006 and February 2007. Works were undertaken under planning consent DPP/2005/6929E. One live oil pipe remains along the north-eastern boundary of the site. Demolition works comprised:

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	<ul style="list-style-type: none"> <li>• Asbestos removal,</li> <li>• Service disconnection,</li> <li>• Removal and stockpiling of topsoil and subsoil overlying and surrounding the tanks,</li> <li>• Demolition or excavation and removal of tanks and pipes and other infrastructure,</li> <li>• On site crushing and removal of concrete,</li> <li>• Validation sampling and testing,</li> <li>• Removal of any encountered contaminated hotspots,</li> <li>• Re-grading of the site to form a development platform,</li> <li>• Bunding of topsoil around the site boundary.</li> </ul> <p>Asbestos in the form of asbestos cement, insulation and compressed fibre gaskets was identified widely across the site in tanks, pipes, buildings and other infrastructure. Asbestos was identified and removed offsite by APEC Environmental Services to a suitably licensed facility.</p> <p>The oil pipelines were also disconnected in March 2006 by AMCO. No demolition works were undertaken until the oil supply pipes had been severed, redundant pipes removed, and blanking plates fitted.</p> <p>Contamination and geotechnical validation testing was undertaken on the sides and bases of the tank excavations and on topsoil, subsoil and crushed concrete stockpiles. Any material not considered suitable was taken offsite for disposal at a suitably licensed facility. Excavations were infilled with the stockpiled arisings and the site was regraded to match the levels of the surrounding area. Site won topsoil was stockpiled around the edge of the site and re-worked to form a bund around the site boundary. Faber Maunsell state that validation testing confirmed that the remaining concentrations of contaminants at the site are below the agreed assessment criteria. Should the proposed end use change further monitoring may be required.</p>
<b>CONCLUSION</b>	<p>Based on the information reviewed we conclude that the contamination risk identified onsite could be adequately addressed through standard remedial actions. The information contained within the reports suggests that the site has been remediated to commercial/industrial landuse and Faber Maunsell state that the Environment Agency were satisfied.</p> <p>We recommend that it is possible to allocate RES-SA4.2 Former MOD as potential Housing Land within Wirral MBC Local Plan.</p> <p>A review of all available information would be required at the planning application stage in relation to the proposed development. This review would then form the basis of further site investigation to</p>

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	quantify the risks and inform the necessary remediation and mitigation measures.
<b>Anticipated remediation costs</b>	Medium
<b>Limitations</b>	The appendices for the Faber Maunsell Report have not been available for review.  MEAS are not able to provide advice on geotechnical issues.
<b>Author:</b>	Laura Roberts
<b>Reviewer:</b>	Nicola Hayes
<b>Date:</b>	March 2021

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<b>Site Reference</b>	<b>RES-SA4.6 Former Croda, Prices Way, Bromborough Pool</b>
<b>Site Address</b>	Prices Way, Bromborough
<b>Grid Reference</b>	34616 84445
<b>Site Area</b>	4.4ha
<b>Introduction</b>	<p>In 2019 MEAS undertook a review of over 400 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>Following an initial assessment Former Croda was classified as Amber (Phase I Desk Study required prior to <b>allocation</b>).</p>
<b>Aim</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary)</li> </ul>
<b>Proposed Development Allocation</b>	Housing
<b>Information Reviewed</b>	<p>The following information has been provided by Wirral MBC for review:</p> <ul style="list-style-type: none"> <li>• URS (January 2012) Geo-Environmental Assessment of Land at Pool Lane, Bromborough Ref: Issue No 3 46398255/MARP0001/ 46398255/3053/AR/RHP</li> </ul>

	<ul style="list-style-type: none"> <li>• URS (August 2013) Remedial Statement for the Redevelopment of Phase1, Pool Lane, Bromborough Ref: 47066103</li> <li>• Hydrock (April 2014) Remediation and Verification Plan for Former Croda Chemical Works, Bromborough ref: HC14013/001</li> <li>• Letter Report from Hydrock to Dibbin Estate and Equipment entitled RE: Verification of Phase 2 Commercial, Former Unichema/ Croda Site, Bromborough, dated 05 February 2015 and referenced HC14013/003</li> </ul>
<b>Current Site Use/Site Description</b>	The site is currently vacant.
<b>Geology</b>	<p>Made Ground.  Drift Deposits: Intertidal deposits in the north west and glacial till across the remainder of the site  Bedrock: Sandstone  A fault traverses the site in the north west, with deeper drift deposits in the west.</p>
<b>Controlled Waters</b>	<p><u>Hydrogeology</u>  The sandstone is a principal aquifer  Shallow groundwater may be in hydraulic continuity with the river and may also be tidally influenced.  <u>Hydrology</u>  The River Dibbin surrounds the property to the west, north west, north and east. It flows into the River Mersey 375m to the north east.</p>
<b>Site History</b>	<p>The site was developed as a candle works from before 1874 (reportedly the Price's Patent Candle Works which specialised in the manufacturing of candles from tallow fatty acids was present in 1853). Coal fire boilers and a gasometer (located in the northwest) were recorded on site as well as a reservoir.</p> <p>The site layout has changed over time with the demolition and construction of buildings, tramways, landing stages, tanks and tank farms etc. Post war the site was marked as the Bromborough Pool Works and in 1972 it was identified as a chemical works.</p> <p>Uniqema installation manufactured fatty acids, glycerine and esters from tallow and other natural fats and oils. Raw materials were stored in bulk tanks on the Dock Tank Farm. The site also comprised engineering workshops, garages, stores, warehousing, laboratory, pump house and diesel storage in underground tanks.</p> <p>Two fires have been recorded on site the first in 1991 when the spraying tower and adjacent warehouse was destroyed and the second in 1993 when the batch ester plant was damaged.</p>

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	<p>In 2009 all process plants were shut down and the tanks containing liquid residues cleared and inspected. The site was closed in 2010 with the PPC permit successfully surrendered.</p> <p>Outline planning permission was granted in March 2014 (OUT/12/00177) for a mixed-use development comprising housing and 4 phases of commercial development. The residential scheme has been built with the potential for changing the commercial phases to housing now being assessed.</p>
<b>Landfill sites &amp; ground gases</b>	The Bright Side Area to the north adjacent to the river was reportedly a dock which was infilled with building rubble in the 1980's.
<b>Ground Investigation</b>	<p>Four Phases of investigation were carried out by URS in:</p> <ul style="list-style-type: none"> <li>- 2003 to establish baseline for the PPC permit</li> <li>- 2009 trial pitting following removal of 2 diesel Underground Storage Tanks</li> <li>- 2010 to support closure of Environmental Permit</li> <li>- 2011 to support the planning process</li> </ul> <p>Elevated levels of metals, PAH and TPH were identified but not widespread.</p>
Phase 1 Area Commercial	<p>URS produced a Remediation Statement (dated August 2013) for a commercial/industrial end use. The intention was to raise site levels by 1m owing to flooding issues.</p> <p>The intrusive works on this part of the site comprises 3 boreholes and 8 trial pits. TP15 situated by an area used for the deposition of solid waste and TP19 is understood to be close to a leak of palm oil. No free phase contamination was noted during the investigation.</p> <p>Hydrocarbon odour was noted in 2 of the boreholes at 1.5-2.5m which coincides with the shallow groundwater level.</p> <p>An elevated sample of TPH (predominantly C12-C35) was identified during the works in 2003 (28,448mg/kg), the same area was sampled in 2010 but no such levels were recorded.</p> <p>BH111 which was situated down hydraulic gradient of the process and towards the River Dibbin did not record any elevated PAHs or TPH in either 2003 and 2010.</p> <p>Gas monitoring was undertaken in 2011 suggesting that the site would require Characteristic Situation 2 protection measures.</p> <p>Remedial actions included ensuring appropriate sampling and testing of material used to raise site levels and limited excavation of TPH contamination.</p> <p>The Phase 2 Verification Report makes reference to a Verification Report for this phase (Hydrock, dated October 2014 and referenced HC14013/002). However, this was unavailable at the time of review.</p>
Phase 2 Area Commercial	Hydrock have produced a letter report for the partial verification of Phase 2 (commercial development). Some original buildings remain on site and require remediation.

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	<p>The remedial actions included:</p> <ul style="list-style-type: none"> <li>• Removal and breaking out of hardstanding which covers the site, this was crushed with 7 samples tested and found to contain no asbestos.</li> <li>• Segregation of potentially contaminated soils. 250m<sup>3</sup> of material was excavated and found to contain elevated levels of TPH, PAH, VOCs and alcohol.</li> <li>• Material was placed in a treatment bay to undergo bioremediation (windrows). This material has not been reused within this phase.</li> <li>• Soil samples were collected on a 30m x 30m grid system. This material is to be situated below break layer as well as a final 600mm of cover which will be placed during redevelopment.</li> <li>• The movement of material across all phases will be controlled by a Materials Management Plan.</li> <li>• To achieve site levels, material from the River Restoration Scheme was used as fill material.</li> </ul> <p>Concerns: There is no screening of asbestos of the fill from the River Restoration Scheme. There are elevated levels of metals (when compared against screening criteria for a residential end use) in the material beneath the break layer and final 600mm including arsenic and lead.</p>
<p><b>CONCLUSION</b></p>	<p>The information contained within the reports reviewed suggests that the site is not widely or grossly contaminated as might be expected given the site history and any contamination is spatially isolated. The whole former chemical works site was granted planning permission for a mixed residential and commercial development. The residential phase has already been built and the latest reports detail the groundworks which have been undertaken to facilitate 2 phases of commercial development. There are additional relevant reports available which we have not has sight of, however based on the information reviewed to date, we conclude that contamination would not preclude a residential development on this site.</p> <p>If the site were to come forward for housing development a detailed review of all available information would be required at the planning application stage to assess and address any data gaps and the risks associated with a change of use.</p> <p>The reports refer to site levels needing to be raised to facilitate development. This would further reduce any risk to any future residents; any material used within this is layer would have to be demonstrated to suitable for its intended use. Alternatively, if site levels remain as current then a suitable cover system would be needed in areas of high sensitivity such as gardens and landscaping.</p>

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	No free phase contamination has been encountered during any earthworks and the monitoring wells situated between the former process areas and the River Dibbin did not record significantly elevated concentrations of contaminants. The risk to controlled waters is therefore considered to be low.
<b>Anticipated Remediation Costs</b>	Low/Medium
<b>Limitations</b>	<p>There were several reports which were unavailable for review at this time:</p> <ul style="list-style-type: none"> <li>• 49308276/MARP002, November 2009, URS Intrusive Investigations, Uniqema, Bromborough</li> <li>• 49308291/MALT0001, April 2010, URS Soil and Groundwater Investigation to support closure of an Environmental Permit</li> <li>• 46398255/MARP001/3053, January 2012, URS Geo-Environmental Assessment of Land at Pool Lane, Bromborough</li> <li>• HC14013/002 October 2014, Hydrock, Remediation Verification Report for Phase 1 Works, Former Croda Chemical Works, Bromborough</li> </ul> <p>MEAS are not able to provide advice on geotechnical issues</p>
<b>Author:</b>	Nicola Hayes
<b>Reviewer:</b>	Laura Roberts
<b>Date:</b>	March 2020

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<b>Site Reference</b>	<b>RES-SA4.7 Former D1 Oils (Former Lubrizol)</b>
<b>Site Address</b>	Dock Road South, Bromborough
<b>Grid Reference</b>	335232 383885
<b>Site Area</b>	10.4 Ha
<b>Introduction</b>	<p>In 2019 MEAS undertook a review of over 400 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>Following an initial assessment ELPS 3043 Former Lubrizol was classified as Amber (Phase I Desk Study required prior to <b>allocation</b>).</p>
<b>Aim</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary)</li> </ul>
<b>Proposed Development Allocation</b>	Housing
<b>Information Reviewed</b>	<p>The following information has been provided by Wirral MBC for review:</p> <ul style="list-style-type: none"> <li>• Capita (13 August 2018) Phase 1 Geo-Environmental Desk Study Bromborough Areas 3, 4 &amp; 6. Ref: CS/091040-03-P2</li> <li>• Capita (13 August 2018) Phase 1 Geo-Environmental Desk Study Bromborough Areas 2 &amp; 5. Ref: CS/091040-P1-02</li> </ul>

	<ul style="list-style-type: none"> <li>• Capita (12 October 2018) Phase 2 Ground Investigation and Assessment. Bromborough Areas 2 &amp; 5. Ref: CS/091040</li> <li>• Capita (12 October 2018) Phase 2 Ground Investigation and Assessment. Bromborough Areas 2 &amp; 5. Ref: CS/091040-P2-01</li> </ul>
<b>Current Site Use/Site Description</b>	<p>A site visit was undertaken by MEAS on 12<sup>th</sup> March 2020. The site was assessed from public footpaths as access was not possible. From the north at Dock Road South an area of hardstanding/track leading to a former gate house and fencing was visible. There was bagged waste and possible fly tipping in the area. From the south on Riverbank Road, metal gates lead to an area of hardstanding containing a number of skips and large containers, beyond which was a vegetated mound. A company storing scaffolding equipment is in the southern part of the site and a 7-10m mound of demolition material was visible on the boundary.</p> <p>To the north of the site is residential housing, to the east of the site is vacant land (Lubrizol landfill), to the south east of the site is an operational recycling centre and waste transfer site (North West Construction) which contained piles of demolition/household waste. To the south of the site is an asphalt plant and to the west is Great Bear Distribution, 6 new industrial units (Planning ref: APP/16/01641), a steel fabrication business and a metal industrial building of unknown use.</p> <p>During the site walkover undertaken by Capita in 2016 the site was unoccupied and above ground level demolition to slab level had taken place in some areas. Photographs of the site visit show partially demolished buildings, evidence of tank removal, tank bases and the warehouse/factory present in the western part of the site.</p> <p>The current aerial photographs on google earth (dated 2018) show a number of large stockpiles across the site. It is unclear when they were deposited.</p>
<b>Geology</b>	<p>BGS identified made ground deposits across the entire site.  Drift Geology: Glacial Till.  Bedrock: Chester Formation (Sandstone).</p>
<b>Controlled Waters</b>	<p><u>Hydrogeology</u>  The underlying Chester Formation is classified as Principal Aquifer. The Glacial Deposits are classified as Secondary Aquifer. 5 active groundwater abstraction licenses were present within 1km in 2016.</p> <p><u>Hydrology</u>  The River Mersey is approximately 180m to the eastern site boundary.</p>

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<b>Site History</b>	The Capita report reviewed historical maps dated from 1850 to 2014. The site was developed in the 1960's as a chemical works with associated infrastructure including railway lines, pipelines, tanks and chimneys. The 1971-1975 mapping shows a Storage Depot in the northern part of the site. By 2010 the railway line was no longer present and the 2014 map shows some of the infrastructure associated with the chemical works removed. Other development within the area included unspecified works, power stations, pump houses, sewage works, unspecified heaps, infectious diseases hospital, pool works, oil storage depot, chemical works, unspecified ground workings, docks, electrical substations and candle works.
<b>Landfill sites &amp; ground gases</b>	There are 5 no. landfills within 500m of the site. 2 are located adjacent to the east of the site: <ul style="list-style-type: none"> <li>• Lubrizol Ltd Landfill Waste Licence no. 53984 License issued 1987 and surrendered June 2007. Industrial waste landfill &lt;25000 tonnes. Authorised to accept wastes including construction/demolition inert and non combustible, waste permitted by license including oil/water mixtures, oily waste and waste oil) and wetted incinerator residues.</li> <li>• Graving Dock No. 1 Ref. 182/05, GDO M213 Liquid Sludge Located in the north of Area 2.</li> </ul>
<b>Ground Investigation</b>	<p>The Capita Ground Investigation was split into areas, due to the differences in site ownership. Areas 4, 5 and 6 relate to ELPS 3043 Former Lubrizol. Works were undertaken between 17<sup>th</sup> July and 10<sup>th</sup> August 2018. 35no. window sample boreholes were installed in the main part of the site (Area 6) and a total of 10no. window sample boreholes were installation in the square shaped parcel of land in the northern part of the site (Area 4 and Area 5).</p> <p><u>Geology</u>  Made ground topsoil was encountered in localised areas (5no. BH) described as sandy gravel topsoil containing brick, concrete, occasional clinker, asphalt, plastic and wood. Made ground was identified at all locations, however the borehole logs indicate that in a great proportion of the locations made ground was less than 1 m in depth. In localised areas made ground was found to greater depths with the maximum depth recorded 3.6mbgl in WS157 positioned in Area 5 (north western part of the site). Made ground varied in composition and included ashy made ground, granular fill, reworked clay and suspected reworked sand. Visual and olfactory evidence of organic odours and staining were identified at 8 locations.</p> <p>Glacial Till deposits were encountered in 31no. boreholes in Areas 4 and 6 at depths of between 0.15 and 2.3mbgl. Chester Formation (Sandstone) was identified directly underlying the made ground in all other locations.</p>

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Intrusive Investigation

Six no. soil samples of made ground topsoil, 32no. samples of made ground, 4 no. samples of Glacial Till and 4 no. samples of Chester Formation were analysed from Areas 4, 5 and 6. The chemical analysis suite included metals, non-metals, PAH, TPH, BTEX, VOCs, PCBs and asbestos. 3 no. soil samples from the made ground, Glacial Till and Chester Formation Sandstone were subject to leachate analysis.

Risk Assessment

Results were compared to generic assessment criteria for residential with plant uptake end use.

Elevated concentrations were identified in the made ground topsoil and made ground for some metals, banded TPH and PAH compounds. No elevated VOCs were identified. 30 samples were screened for asbestos, positive identification was identified in 5 samples (low level <0.001%), Capita note that it is a possibility that asbestos is more widespread and mitigation measures would be required.

Localised contamination was identified in Glacial Till deposits (lead, mercury and banded TPH). Exceedances of banded TPH were also identified in the Chester Formation Deposits in the south-eastern corner of the site. Limited samples of this strata were analysed therefore contamination may be more widespread.

Stockpiled material on site will require sufficient chemical analysis to ensure it is suitable for reuse on site or for waste disposal purposes.

The results of the leachate analysis were compared to Drinking Water Standards/Environmental Quality Standards. All 3 samples identified exceedance of some TPH bands and the made ground sample also identified elevated arsenic and ethylbenzene.

Gas monitoring

One round of gas monitoring was undertaken on 23<sup>rd</sup> August 2018. Site wide levels were low and the maximum concentrations of methane and carbon dioxide identified was 9.4%v/v and 12.5%v/v respectively. No flow rate above the limit of detection was detected. However, in Area 5 (WS157) high levels of methane and carbon dioxide were identified at 55.1%v/v and 24.3%v/v respectively. Flow rate was also elevated at 7.5l/hr. An additional 2 rounds of gas monitoring were planned but the amendment was not available for review. Capita note that further gas monitoring will be required post planning and gas protection measures will be required within any residential development.



	<p><u>Controlled waters</u> Borehole logs indicate that Glacial Till is not continuous across the site and therefore the potential for contaminants to migrate into the Chester Formation cannot be discounted at this stage. Ground water monitoring was to be undertaken, but the results have not been provided for review. Capita recommend that it may be necessary to delineate hydrocarbon contaminated hotspots and excavate for disposal. This would reduce the potential migration of hydrocarbon contamination into the Principal Aquifer and also any surface water drainage incorporated into the development. This would reduce the potential for contamination to impact the River Mersey.</p>
<b>CONCLUSION</b>	<p>The amended report containing the results of the groundwater monitoring and additional ground gas monitoring was not available for review. However, based on the information reviewed to date we conclude that the contamination risk identified onsite could be adequately addressed through standard remedial actions. The information contained within the reports suggests that the site is not grossly contaminated and contamination appears to be localised.</p> <p>Owing to the lack of groundwater monitoring further intrusive works relating to the potential risk to controlled waters would be required. The site is located within a highly industrialised area and as such monitoring would be required to differentiate between any contamination originating from any onsite sources and those generated from offsite. Some groundwater remediation is considered likely.</p> <p>We recommend that it is possible to allocate ELPS 3043 Former Lubrizol as potential Housing Land within Wirral MBC Local Plan.</p> <p>A review of all available information would be required at the planning application stage in relation to the proposed development. This review would then form the basis of further site investigation to quantify the risks and inform the necessary remediation and mitigation measures.</p>
<b>Anticipated remediation costs</b>	Medium
<b>Limitations</b>	<p>MEAS are not able to provide advice on geotechnical issues.</p> <p>The additional gas monitoring and ground water monitoring results have not been available for review.</p> <p>There has been no testing or quantification of the volume of material in the stockpiles on site.</p>

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	<b>Author:</b>	Laura Roberts
	<b>Reviewer:</b>	Nicola Hayes
	<b>Date:</b>	March 2020

<b>Site Reference</b>	<b>RES-SA4.7 Former D1 Oils (Southern Reclamation Area)</b>
<b>Site Address</b>	Dock Road South, Bromborough
<b>Grid Reference</b>	335417 384026
<b>Site Area</b>	9.2 Ha
<b>Introduction</b>	<p>In 2019 MEAS undertook a review of over 400 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>Following an initial assessment <b>ELPS 100 Southern Reclamation Area</b> was classified as Amber (Phase I Desk Study required prior to allocation).</p>
<b>Aim</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary)</li> </ul>
<b>Proposed Development Allocation</b>	Housing
<b>Information Reviewed</b>	<p>The following information has been provided by Wirral MBC for review:</p> <ul style="list-style-type: none"> <li>• Capita (13 August 2018) Phase 1 Geo-Environmental Desk Study Bromborough Areas 3, 4 &amp; 6. Ref: CS/091040-03-P2</li> <li>• Capita (13 August 2018) Phase 1 Geo-Environmental Desk Study Bromborough Areas 2 &amp; 5. Ref: CS/091040-P1-02</li> </ul>

	<ul style="list-style-type: none"> <li>• Capita (12 October 2018) Phase 2 Ground Investigation and Assessment. Bromborough Areas 3, 4 &amp; 6. Ref: CS/091040-P2-02</li> <li>• Capita (12 October 2018) Phase 2 Ground Investigation and Assessment. Bromborough Areas 2 &amp; 5. Ref: CS/091040-P2-01</li> </ul>
<b>Current Site Use/Site Description</b>	<p>A site visit was attempted by MEAS on 12<sup>th</sup> March 2020. There was no access to the site and the site was not visible from public footpaths.</p> <p>Images from Google Earth (2018) show the site to be heavily vegetated.</p> <p>The eastern site boundary is immediately adjacent to the River Mersey Estuary. To the south of the site is an operational recycling centre and waste transfer site (North West Construction) which contained piles of demolition/household waste. To the west is a vacant site (former Lubrizol Chemical Works). There is a commercial operation to the north (unknown use).</p> <p>During the site walkover undertaken by Capita in 2016 the site was unoccupied and significantly overgrown with semi mature trees noted throughout.</p>
<b>Geology</b>	<p>Drift Geology: Glacial Till in the west and Tidal Flat Deposits in the central area.</p> <p>Bedrock: Chester Formation (Sandstone).</p> <p>An inferred normal fault in an approximate north-south orientation is depicted crossing the site.</p>
<b>Controlled waters</b>	<p><u>Hydrogeology</u></p> <p>The Tidal Flat Deposits are classified as Unproductive Strata. The Glacial Deposits are classified as Secondary Aquifer. The underlying Chester Formation is classified as Principal Aquifer. 5 active groundwater abstraction licenses were present within 1km in 2016.</p> <p><u>Hydrology</u></p> <p>The River Mersey is immediately adjacent to the eastern site boundary.</p>
<b>Site History</b>	<p>The Capita report reviewed historical maps dated from 1850 to 2014. The site was within the River Mersey Estuary High water mark in 1850. By 1870 the western part of the site is shown to be within an agricultural field. The 1936-1938 map shows the site no longer within the River Mersey Estuary and marsh land is present across most of the site, there is a reclamation pond in the south and a railway line to the south western boundary. In the 1976-1978 map a pipeline was present on the north western boundary. The 1989-1991 mapping</p>

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	<p>shows the reclamation pond and tank removed. By 2002 the pipeline is no longer shown. By 2010 the railway line was no longer present. Other development within the area included unspecified works, power stations, pump houses, sewage works, unspecified heaps, infectious diseases hospital, pool works, oil storage depot, chemical works, unspecified ground workings, docks, electrical substations and candle works.</p> <p>The origin of the material used to reclaim the site is unknown. Capita state that there is potential that dredged material recovered from the River Mersey Estuary may have been used, so there is potential for impact from dibutyltin (DBT) and tributyltin (TBT) as a result of activities associated with ports and docks.</p>
<p><b>Landfill sites &amp; ground gases</b></p>	<p>There are 5 no. landfills within 500m of the site. 2 are located onsite:</p> <ul style="list-style-type: none"> <li>• Lubrizol Ltd Landfill Waste Licence no. 53984 License issued 1987 and surrendered June 2007. Industrial waste landfill &lt;25000 tonnes. Authorised to accept wastes including construction/demolition inert and non combustible, waste permitted by license including oil/water mixtures, oily waste and waste oil) and wetted incinerator residues (Centre and southern area of Area 2).</li> <li>• Graving Dock No. 1 Ref. 182/05, GDO M213 Liquid Sludge Located in the north of Area 2.</li> </ul>
<p><b>Ground Investigation</b></p>	<p>The Capita Ground Investigation was split into areas due to the differences in site ownership. Area 2 relates to ELPS 100 Southern Reclamation Area. Between 17<sup>th</sup> July and 10<sup>th</sup> August 2018 17no. window sample boreholes were installed in Area 2 to depths of between 1.74m and 4.20mbgl.</p> <p><u>Geology</u>  Made ground topsoil was encountered in 10 locations (maximum depth 0.6m). Made ground was identified at all locations, in localised areas made ground was found to greater depths. The maximum depth recorded 3.25mbgl at WS102 in the south eastern corner of the site. Made ground varied in composition and included ashy made ground, granular fill, reworked clay and suspected reworked sand. Visual and olfactory evidence of organic odours and staining were identified at 3 locations.</p> <p>Tidal Flat deposits were encountered beneath the made ground in the north and north eastern areas of the site. Glacial Till was identified underlying made ground in the north western parts of the site and Chester Formation was located predominantly in the south western area of the site beneath made ground.</p> <p><u>Intrusive Investigation</u>  Four no. soil samples of made ground topsoil, 16no. soil samples of made ground, 8 no. samples of Tidal Flats deposits, 3 no. samples</p>

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from the Glacial Till and 3no. samples from the Chester Formation have been subject to chemical analysis. The chemical analysis suite included metals, non-metals, PAH, TPH, BTEX, VOCs, PCBs and asbestos. 3 no. soil samples from the Tidal Flat deposits were also analysed for DBT and TBT. No leachate analysis was undertaken.

#### Risk Assessment

Results were compared to generic assessment criteria (GAC) for a residential with plant uptake end use.

Slightly elevated concentrations of dibenzo(ah)anthracene was identified in the made ground topsoil in 2no. samples. Made ground samples identified some metals at 4 no. locations and PAH compounds which were slightly elevated above the GAC at 1 location. 5no. samples were analysed for VOCs, there were no recordings above the limit of detection (LOD). 15 samples were screened for asbestos, positive identification was identified in 3 samples (low level <0.001%). Capita note that it is a possibility that asbestos is more widespread and mitigation measures would be required.

Localised contamination was identified at single locations in the Tidal Mud Flats and Glacial Till (dibenzo(ah)anthracene). 3no. samples were analysed for DBT and TBT, concentrations were not detected above the Laboratory LOD.

Capita state that a clean capping layer or hardstanding installed onsite during development should mitigate risks to human health from contamination identified onsite based on current information. It is understood that site levels will be raised to mitigate the risk of flooding to the site and a clean cover system could be incorporated into the design.

Capita also state that superficial deposits in the area may not provide a suitable founding strata and house foundations are likely to require piling.

#### Gas monitoring

One round of gas monitoring was undertaken on 23<sup>rd</sup> August 2018, no concentrations of methane were detected and carbon dioxide was identified at a maximum concentration of 5.1%v/v. No flow rate above the limit of detection was detected in any boreholes. Monitoring took place at 11 of the 17no. monitoring wells due to 6no.s of the wells not being located. An additional 2 rounds of gas monitoring were planned but the amendment report was not available for review. Capita note that further gas monitoring will be required post planning and gas protection measures will be required within any residential development. It is understood that site levels within Area 2 will be raised (using material from the stockpiles on the adjacent site) and ground gas monitoring will be required on completion of these works.



	<p><u>Controlled waters</u>          Capita state that to identify the extent of contamination of the ground water, monitoring and analysis will be required and the results will be submitted within an amendment to the Ground Investigation Report. This has not been provided for review. Capita suggest that it is possible that leaching of contaminants from the made ground may have migrated into the Tidal Flat Deposits below and it is likely that there will be hydraulic continuity between groundwater beneath the site and the adjacent River Mersey.</p>
<b>CONCLUSION</b>	<p>The amended report containing the results of the groundwater monitoring and additional ground gas monitoring was not available for review. However, based on the information reviewed to date we conclude that the contamination risk identified onsite could be adequately addressed through standard remedial actions. The information contained within the reports suggests that the site is not grossly contaminated and contamination appears to be localised.</p> <p>Owing to the lack of groundwater monitoring further intrusive works relating to the potential risk to controlled waters will be required. The site is located within a highly industrialised area and as such monitoring would be required to differentiate between any contamination originating from any onsite sources and those generated from offsite. Some groundwater remediation is considered likely.</p> <p>We recommend that it is possible to allocate ELPS 100 Southern Reclamation Area as potential Housing Land within Wirral MBC Local Plan.</p> <p>A review of all available information would be required at the planning application stage in relation to the proposed development. This review would then form the basis of further site investigation to quantify the risks and inform the necessary remediation and mitigation measures.</p>
<b>Anticipated remediation costs</b>	Medium
<b>Limitations</b>	<p>MEAS are not able to provide advice on geotechnical issues.</p> <p>The additional gas monitoring and ground water monitoring results have not been available for review.</p>
<b>Author:</b>	Laura Roberts
<b>Reviewer:</b>	Nicola Hayes
<b>Date:</b>	March 2020

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<b>Site Reference</b>	RES-SA4.7 Former D1 Oils (Land rear of AP Refractories)
<b>Site Address</b>	Dock Road South, Bromborough
<b>Grid Reference</b>	335226 384029
<b>Site Area</b>	1.88 Ha
<b>Introduction</b>	<p>In 2019 MEAS undertook a review of over 400 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>Although ELPS 254 was not part of that assessment given its location and proximity to other adjacent sites including ELPS 100 and ELPS 3043 it is likely that an AMBER classification would have been assigned. Requiring <b>additional information prior to allocation</b> as was the case for the two other sites cited. This document forms the basis for assessing the available information.</p>
<b>Aim</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary)</li> </ul>
<b>Proposed Development Allocation</b>	Housing
<b>Information Reviewed</b>	<p>The following information has been provided by Wirral MBC for review:</p> <ul style="list-style-type: none"> <li>• Capita (13 August 2018) Phase 1 Geo-Environmental Desk Study Bromborough Areas 3, 4 &amp; 6. Ref: CS/091040-03-P2</li> </ul>

	<ul style="list-style-type: none"> <li>• Capita (13 August 2018) Phase 1 Geo-Environmental Desk Study Bromborough Areas 2 &amp; 5. Ref: CS/091040-P1-02</li> <li>• Capita (12 October 2018) Phase 2 Ground Investigation and Assessment. Bromborough Areas 3, 4 &amp; 6. Ref: CS/091040-P2-02</li> <li>• Capita (12 October 2018) Phase 2 Ground Investigation and Assessment. Bromborough Areas 2 &amp; 5. Ref: CS/091040-P2-01</li> </ul> <p>The site has been partially included within Area 2 (Grammont Properties). This includes the thin strip of land that runs in between ELPS100 and ELPS 3043.</p>
<b>Current Site Use/Site Description</b>	<p>Images from Google Earth (2020) shows the site to be a thin strip of unused land which expands outwards towards the north and west of the site. The north and north western area of the site is well vegetated with numerous trees and shrubs.</p> <p>The remnants of the former chemical works lie to the west with a large vacant plot of land to the east, beyond which is the River Mersey. A factory is present in the north and north west.</p> <p>A waste transfer station lies to the south.</p>
<b>Geology</b>	<p>Made Ground</p> <p>Drift Geology (not always present): Glacial Till in the west and Tidal Flat Deposits in south and a thin band across the north.</p> <p>Bedrock: Chester Formation (Sandstone).</p> <p>An inferred fault in an approximate north-south orientation is indicated in the northern area of the site.</p>
<b>Controlled waters</b>	<p><u>Hydrogeology</u></p> <p>The Tidal Flat Deposits are classified as Unproductive Strata. The Glacial Deposits are classified as Secondary Aquifer. The underlying Chester Formation is classified as Principal Aquifer.</p> <p><u>Hydrology</u></p> <p>The River Mersey is lies approximately 170m to the east.</p>
<b>Site History</b>	<p>The Capita Phase 1 reports reviewed historical maps dated from 1850 to 2014.</p> <p>The earliest map (1882-84) shows the western area to be vacant possible agricultural land with a hedgerow running along the western boundary. The eastern boundary corresponds approximately with the High Tide Water in of the River Mersey, which in 1899 has a path marked along it and the hedgerow to the west has been replaced with a track.</p>

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	<p>By 1936 the land to the east is no longer shown as the River Mersey but appears to have been infilled and is now marshland. A railway line is shown to run along the full length of the eastern boundary. By 1955 further railway lines are shown and the area to the west is recorded as marshland. To the west running parallel with the railway line was a drain.</p> <p>By 1968-72 the drain is recorded as a pipe leading from the sewage works which lies to the west of the very northern area of the site. The factory in the west is also shown to have been constructed.</p> <p>The chemical works to the west is well developed by 1976-1978 with numerous tanks marked on site.</p> <p>The dismantling of the railway line begins prior to 1989-1991 and is completely removed by 2010.</p> <p>The historical aerial images (accessed via Google Earth) shows that the site is vacant in 2000 with numerous trees and shrubs present in the western area. The remnants of the old railway line can be seen.</p>
<b>Landfill sites &amp; ground gases</b>	<p>There are 3 no. landfills within 500m of the site. 2 are located onsite:</p> <ul style="list-style-type: none"> <li>• Along the eastern boundary and covering the full length of the strip of land lies Lubrizol Ltd Landfill Waste Licence no. 53984 License issued 1987 and surrendered June 2007. Industrial waste landfill &lt;25000 tonnes. Authorised to accept wastes including construction/demolition inert and non-combustible, waste permitted by license including oil/water mixtures, oily waste and waste oil) and wetted incinerator residues.</li> <li>• The very north east tip of the site is Graving Dock No. 1 Ref. 182/05, GDO M213 accepted Liquid Sludge.</li> </ul>
<b>Ground Investigation</b>	<p>The Capita Ground Investigation was split into different areas due to the differences in site ownership. Area 2 predominantly relates to ELPS 100 Southern Reclamation Area but includes the thin strip of land included within ELPS254. Between 17<sup>th</sup> July and 10<sup>th</sup> August 2018 17no. window sample boreholes were installed in Area 2 to depths of between 1.74m and 4.20mbgl.</p> <p>Of these 4 window samples were located within EPS254 including 2 in the larger western area of the site and 2 along the former railway. All of which had gas monitoring wells installed.</p> <p><u>Geology</u> Made ground topsoil was encountered in all 4 locations to depths of between 0.1mbgl to 0.3mbgl This included concrete, slag, sandstone,</p>

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	<p>mudstone, limestone, coal with some locations also recording occasional wood and polythene.</p> <p>Made ground was identified at all locations except for WS101 (which is located the very south of the site where the topsoil was directly underlain by sandstone).</p> <p>Made ground was recorded to depths of 0.5mbgl, 1mbgl and 1.8mbgl (located in the south of the site). Made ground varied in composition and included predominantly granular fill. A hydrocarbon odour was noted in WS116 within the shallow made ground.</p> <p>Glacial Till was identified underlying made ground in 2 locations in the western area of the site. Sandstone was identified at depths of between 0.2mbgl and 3.1mbgl.</p> <p><u>Intrusive Investigation</u> One soil sample of made ground topsoil, 3 soil samples of made ground and 3 samples of natural strata were subject to chemical analysis. The chemical analysis suite included metals, non-metals, PAH, TPH, BTEX, VOCs, PCBs and asbestos.</p> <p><u>Risk Assessment</u> Results were compared to generic assessment criteria (GAC) for a residential with plant uptake end use. Arsenic equalled the GAC for arsenic (37mg/kg) in 2 samples, one made ground the other glacial till.</p> <p>There were also slightly elevated concentrations of certain PAHs and VOCs in the natural strata and made ground in WS116 located in the west area of the site. No asbestos was detected.</p> <p>Capita state that a clean capping layer or hardstanding installed onsite during development should mitigate risks to human health from contamination identified onsite based on current information. It is understood that site levels will be raised to mitigate the risk of flooding to the site and a clean cover system could be incorporated into the design.</p> <p>Capita also state that superficial deposits in the area may not provide a suitable founding strata and house foundations are likely to require piling.</p> <p><u>Gas monitoring</u> One round of gas monitoring was undertaken on 23<sup>rd</sup> August 2018 from 2 of the wells as the other 2 could not be located. No methane was detected with a maximum carbon dioxide concentration of 1.3%v/v. No flow rate above the limit of detection was detected in any</p>
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	<p>boreholes. An additional 2 rounds of gas monitoring were planned but the amendment report was not available for review. Capita note that further gas monitoring will be required post planning and gas protection measures will be required within any residential development. It is understood that site levels within Area 2 will be raised (using material from the stockpiles on the adjacent site) and ground gas monitoring will be required on completion of these works.</p> <p><u>Controlled waters</u> Capita state that to identify the extent of contamination of the ground water, monitoring and analysis will be required and the results will be submitted within an amendment to the Ground Investigation Report. This has not been provided for review. Capita suggest that it is possible that leaching of contaminants from the made ground may have migrated into the Tidal Flat Deposits below and it is likely that there will be hydraulic continuity between groundwater beneath the site and the adjacent River Mersey.</p>
<p><b>CONCLUSION</b></p>	<p>The amended report containing the results of the groundwater monitoring and additional ground gas monitoring was not available for review. However, based on the information reviewed to date we conclude that the contamination risk identified onsite could be adequately addressed through standard remedial actions. The information contained within the reports suggests that the site is not grossly contaminated, and no significant contamination has been noted within the area (although the investigation was limited within the area of current interest).</p> <p>Owing to the lack of groundwater monitoring further intrusive works relating to the potential risk to controlled waters will be required. The site is located within a highly industrialised area and as such monitoring would be required to differentiate between any contamination originating from any onsite sources and those generated from offsite. Some groundwater remediation is considered likely.</p> <p>We recommend that it is possible to allocate ELPS 254 Land rear of AP Refractories as potential Housing Land within Wirral MBC Local Plan.</p> <p>A review of all available information would be required at the planning application stage in relation to the proposed development. This review would then form the basis of further site investigation to quantify the risks and inform the necessary remediation and mitigation measures.</p>

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<b>Anticipated remediation costs</b>	Medium
<b>Limitations</b>	MEAS are not able to provide advice on geotechnical issues.  The additional gas monitoring and ground water monitoring results have not been available for review.
<b>Author:</b>	Nicola Hayes
<b>Reviewer:</b>	Lesley Bye
<b>Date:</b>	July 2021

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<b>Site Reference</b>	RES-SA4.7 Former D1 Oils (Waste Transfer Station)
<b>Site Address</b>	Dock Road South, Bromborough
<b>Grid Reference</b>	335523 383737
<b>Site Area</b>	1.71 Ha
<b>Introduction</b>	<p>In 2019 MEAS undertook a review of over 400 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>The review including part of the site under the assessment of SHLAA 4021 (which was predominantly ELPS 3043). The site was initially assessed as being <b>AMBER requiring additional information prior to allocation</b>. A review of available information was undertaken, and the site was reclassified as <b>AMBER requiring additional information at planning application stage</b>.</p> <p>The site of current interest incorporates the waste transfer station and includes a small parcel of land to the south which has not previously been assessed.</p>
<b>Aim</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary)</li> </ul>
<b>Proposed Development Allocation</b>	Housing
<b>Information Reviewed</b>	The following information has been provided by Wirral MBC for review:

	<ul style="list-style-type: none"> <li>• Capita (13 August 2018) Phase 1 Geo-Environmental Desk Study Bromborough Areas 3, 4 &amp; 6. Ref: CS/091040-03-P2</li> <li>• Capita (13 August 2018) Phase 1 Geo-Environmental Desk Study Bromborough Areas 2 &amp; 5. Ref: CS/091040-P1-02</li> <li>• Capita (12 October 2018) Phase 2 Ground Investigation and Assessment. Bromborough Areas 3, 4 &amp; 6. Ref: CS/091040-P2-02</li> <li>• Capita (12 October 2018) Phase 2 Ground Investigation and Assessment. Bromborough Areas 2 &amp; 5. Ref: CS/091040-P2-01</li> <li>• Capita (February 2018) Preliminary Ground Investigation and Assessment, Bromborough Waste Transfer Site Ref: CS091040-PGIA rev 2</li> </ul>
<b>Current Site Use/Site Description</b>	<p>Images from Google Earth (2020) shows the north of the site to be an active waste transfer station, with several buildings on site including a large steel roofed open-ended shed. Large stockpiles of waste are present as well as storage of materials including vehicles with limited hardstanding. North West Construction is shown as the operator.</p> <p>In the southern area several shipping containers are present with possible storage of small boats on site. Northern Marine is shown to be present.</p> <p>The eastern site boundary is immediately adjacent to the River Mersey Estuary with a slipway. The land to the north is vacant which is predominantly heavily vegetated although a series of roads are present. This comprises the former Lubrizol chemical works and southern reclamation areas.</p>
<b>Geology</b>	<p>Made Ground  Drift Geology: Glacial Till in the west, with Silica Sand in the far west and Tidal Flat Deposits part of the east.  Bedrock: Chester Pebble Bed Formation (Sandstone).</p>
<b>Controlled waters</b>	<p><u>Hydrogeology</u>  The Tidal Flat Deposits are classified as Unproductive Strata. The Glacial Deposits are classified as Secondary Aquifer. The underlying Chester Formation is classified as Principal Aquifer.</p> <p><u>Hydrology</u>  The River Mersey is immediately adjacent to the eastern site boundary.</p>
<b>Site History</b>	<p>The Capita Phase 1 reports for Areas 2,3,4,5 and 6 have been reviewed as well as the historical Ordnance Survey maps dated from 1850 to 2014.</p>

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	<p>The eastern half of the site was within the River Mersey Estuary High water mark in 1850. By 1887-8 a small collection of residential properties are shown in the very south. The 1936-1938 map shows the site no longer within the River Mersey Estuary and marsh land is present in the east. There is a reclamation pond marked with a railway line in the central area of the site.</p> <p>A Shipbreaking Yard is recorded in the south of the site to the north of the slipway in 1955.</p> <p>By 1965-7 the pond is no longer shown</p> <p>The 1976-1978 map shows that the residential properties are no longer marked with several large works present in the surrounding area including a chemical works to the north/north west.</p> <p>The Shipbreaking Yard is no longer shown in 1993.</p> <p>The historic area photographs accessed via Google Earth shows the site to be cleared by 2000 with the area to the west heavily vegetated with numerous trees shown. The east has several unidentifiable features possibly fly tipping. By 2003 the access road has been constructed and the east is further vegetated. Some time between 2009 and 2012 the site is developed as a Waste Transfer Station with the majority of the vegetation cleared. The southern area is covered in hardstanding by 2015 with lorry storage and later shipping containers (2018) shown.</p>
<p><b>Landfill sites &amp; ground gases</b></p>	<p>There are two landfills within 500m of the site. The first is partially on site (in the east) and extends northwards:</p> <ul style="list-style-type: none"> <li>• Lubrizol Ltd Landfill Waste Licence no. 53984 License issued 1987 and surrendered June 2007. Industrial waste landfill &lt;25000 tonnes. Authorised to accept wastes including construction/demolition inert and non combustible, waste permitted by license including oil/water mixtures, oily waste and waste oil) and wetted incinerator residues.</li> </ul> <p>The second is located 140m to the south:</p> <ul style="list-style-type: none"> <li>• R.V. Chemicals Limited Waste Licence no: 015/05, GDO M213 issued unknown with the last input in 1987. The site was authorised to accept liquid sludge.</li> </ul>
<p><b>Ground Investigation</b></p>	<p>A preliminary site investigation by Capita was undertaken on the current waste transfer station in 2018. This comprised 7 window samples and 2 trial pits.</p> <p><u>Geology</u></p>

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	<p>Made ground was recorded to a maximum depth of 2m (although several boreholes had to be terminated due to oversized obstructions). The made ground was variable and comprised sandy gravel, clayey sandy gravel, very gravelly sand and coarse fill. Gravel typically comprised brick, concrete, sandstone, tarmacadam, wood, ceramic, plastic, fabric, coal, tile fragments and metal. Oversize concrete sleepers and kerb stones were recorded within the trial pits.</p> <p>Underlying the made ground was Glacial Till (where present) or Tidal Flat Deposits (where present). Sandstone bedrock was encountered in one location at 1.9mbgl.</p> <p>No visual or olfactory evidence of contamination was noted within the made ground although organic odours were noted in the Tidal despots associated with the decaying organic matter (wood).</p> <p>Two locations recorded elevated levels of metal and/or PAHs within the natural strata at depth.</p> <p><u>Risk Assessment</u></p> <p>Seven samples of made ground were analysed and compared against relevant generic assessment criteria for a residential with plant uptake end use. One sample recorded elevated lead (300mg/kg compared to a GAC of 180mg/kg). Dibenz(ah)anthracene was also elevated in one sample (0.6mg/kg compared to the GAC of 0.24mg/kg). Asbestos was recorded at 4 locations (Chrysotile fibres was identified at 3 locations and Amosite fibres at 2). The concentration varied between &lt;0.001% and 0.051%.</p> <p>No groundwater was encountered, and no gas monitoring was undertaken as part of this phase of investigation.</p> <p>Capita recommended that a site turnaround would be required to allow the breaking out and removal of any existing sub-structures including brick and concrete foundations. A detailed site investigation (to include gas and groundwater monitoring) would be required if the site were to be developed.</p> <p>The report recommended that remedial measures could include breaking any pollutant linkage by with the presence of hardstanding or a cover system in areas of private gardens and soft landscaping.</p> <p>Capita also note that potential foundation solutions include reinforced strip foundations bearing on vibro treated Made Ground, raft foundations or short bored piles.</p>
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<b>CONCLUSION</b>	<p>The Preliminary Ground Investigation Report for the Waste Transfer Site (which excluded the small parcel of land to the south) provides an initial assessment of the underlying ground conditions. The intrusive investigation did not record the ground as being grossly contaminated, although it should be noted that no groundwater or gas monitoring was undertaken although wells were installed.</p> <p>Based on the information reviewed to date we conclude that the contamination risk identified onsite could be adequately addressed through standard remedial actions.</p> <p>Owing to the lack of groundwater monitoring further intrusive works relating to the potential risk to controlled waters will be required. The site is located within a highly industrialised area and as such monitoring would be required to differentiate between any contamination originating from any onsite sources and those generated from offsite. Some groundwater remediation is considered likely.</p> <p>Additional investigation would also be required to establish the gas risk associated with the site as well as a more comprehensive site investigation in line with current best practice and guidance.</p> <p>We recommend that it is possible to allocate the Waste Transfer Station including the small parcel of land Former Carmet Marie as potential Housing Land within Wirral MBC Local Plan.</p> <p>A review of all available information would be required at the planning application stage in relation to the proposed development. This review would then form the basis of further site investigation to quantify the risks and inform the necessary remediation and mitigation measures.</p>
<b>Anticipated remediation costs</b>	Medium
<b>Limitations</b>	<p>MEAS are not able to provide advice on geotechnical issues.</p> <p>No gas monitoring and ground water monitoring has been undertaken.</p>
<b>Author:</b>	Nicola Hayes
<b>Reviewer:</b>	Lesley Bye
<b>Date:</b>	July 2021

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<b>Site Reference</b>	<b>EMP-RA6.2 MEA Park West</b>
<b>Site Address</b>	Wallasey Bridge Road,
<b>Grid Reference</b>	330039 390528
<b>Site Area</b>	9.2ha
<b>Introduction</b>	<p>In 2019 MEAS undertook a review of over 400 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>Following an initial assessment, ELPS 357 Former Mobil Oil site was classified as Amber (further information required <b>prior to allocation</b>).</p>
<b>Aims:</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary).</li> </ul>
<b>Proposed Development Allocation</b>	Employment Land
<b>Information reviewed</b>	<p>The following information has been provided by Wirral MBC for review:</p> <ul style="list-style-type: none"> <li>• RSK (November 2014) Preliminary Risk Assessment, West Float, Phase 3 &amp; 4 for Peel Land and Property (Ports) Limited Ref: 321304-R03 (01) Draft</li> <li>• RSK (February 2015) Interpretative Geo-Environmental Site Assessment, West Float, Phases 3 &amp; 4, Birkenhead for Peel Land and Property (Ports) Limited Ref: 321304-R05 (00) Draft</li> </ul>

	<ul style="list-style-type: none"> <li>• RSK (February 2015) Remediation Strategy Report, West Float for Peel Land and Property (Ports) Limited Ref: 321304-R08 (00)</li> <li>• RSK (Aug 2017) Enabling Works 2014-2017 Verification Report 321304-R11 (00)</li> <li>• Decision notice for OUT/11/00645</li> </ul>
<p><b>Current Site Use/Site description</b></p>	<p>A site visit undertaken by MEAS on 12<sup>th</sup> March 2020 identified that the land is largely vacant apart from a gatehouse close to the entrance of the site off Beaufort Road; a large steel framed building in the south east of the site, which is currently being used as a film studio; an electricity substation along the western site boundary. The site is surrounded by palisade fencing to the west and south, with entrances off Beaufort Road and Wallasey Bridge Road. The site is covered by concrete hardstanding towards the south and crushed demolition material in the north and west.</p> <p>The site is predominantly surrounded by commercial and industrial land uses. To the north east is West Float dock with industrial land beyond. To the south east is Graving Dock 3 and vacant land (Phase 1 and 2). The operational Sasol Wax lies to the southwest with Beaufort Road and Birkenhead North Park and Ride further south. To the west is the former Bidston Dock (now vacant open land) and Bidston Recycling Centre.</p>
<p><b>Planning History</b></p>	<p>The site was granted planning permission in 2012 OUT11/00645:</p> <p><b>Outline planning application with all matters reserved for the demolition of existing buildings and the construction of:</b></p> <ul style="list-style-type: none"> <li>• <b>Two buildings providing an overall maximum of 111,780 sq m of floor space to be used as an International Trade Centre (Sui Generis Use) (comprising trade showrooms, storage, distribution and product assembly space, exhibition space, ancillary food and drink facilities, ancillary office and management accommodation, security facilities, and associated car parking, access points, servicing areas and landscaping), on land north of Beaufort Road and east of Graving Dock No. 3, West Float, Wirral Waters, Wirral; and.</b></li> <li>• <b>Two buildings providing an overall maximum of 116,529 sq m of floorspace to be used as one or a combination of, an International Trade Centre (as defined), B2 General Industry and B8 Warehouse/Distribution (with associated car parking, access points, servicing areas and landscaping) on land east of Wallasey Bridge Road and west of Graving Dock No. 3, West Float, Wirral Waters, Wirral. equating to a total combined floorspace of 228,300 sq m of mixed employment floorspace.</b></li> </ul>

	<p>This included Phases 1 and 2 of the West Float Remediation Scheme (outside the scoping of the planning application) which has been partially remediated but not been developed. ELPS 357 also had reserved matter planning permission for a 16,248sqm manufacturing facility under DLS/14/01579 (A20/02/2015), in the west of the site fronting onto Wallasey Bridge Road. It forms part of Phase 3 and 4 of the West Float Remediation Scheme but has only be partially remediated.</p>
<p><b>Geology</b></p>	<p>Artificial: Made ground noted to be present across the site. Superficial: Tidal Flat deposits (including peat) over Devensian Till. Bedrock: Wilmslow Sandstone Formation.</p>
<p><b>Controlled Waters</b></p>	<p><u>Hydrogeology</u> The superficial deposits are categorised as a Secondary A Aquifer. The Wilmslow Sandstone Formation is classed as a Principal Aquifer.</p> <p>Information available on the Defra's data services portal indicates the south-eastern section of the site lies within a Source Protection Zone 3 (total catchment).</p> <p><u>Hydrology</u> West Float Dock forms the north eastern boundary of the site with Graving Dock 3 approximately 30 metres to the south east, these connect with the River Mersey approximately 2.5km to the east. There is also a watercourse, The Birket, immediately off-site to the south, which is culverted along Beaufort Road.</p>
<p><b>Site History</b></p>	<p>1876 map shows a building labelled as Mortar Mill with associated kiln in the north eastern section of site. The Graving Dock is shown to the southeast.</p> <p>The 1899 map shows the south western section occupied by the Anglo-American Oil Company Depot with eight associated large circular structures. Other buildings and structures are shown in the east.</p> <p>The 1911 to 1935 maps show the expansion of the site with additional buildings and tanks.</p> <p>1954 map records further circular tanks within the western section now labelled 'vacuum oil and grease works'.</p> <p>Anecdotal information suggests that the site was practically destroyed by a bombing raid in March 1941.</p>

	<p>The site produced petroleum-base products for lubricating oils, greases and specialist wax emulsions. It included numerous above ground tanks which were predominantly situated in the north of the site either side of the former slipway. Oil blending took place in the central part of the site blending stock or base oils with various additives. A grease plant was located to the south. The Warehousing on site reportedly had the capacity to store about 7 million litres of product.</p> <p>Demolition of the above ground structures was undertaken in 2014 with substantial underground structures/slabs still present. Further works were undertaken in 2015 as part of the enabling works which included some remediation.</p>
<p><b>Landfill sites &amp; ground gases</b></p>	<p><u>Off site</u> Two landfills are recorded to the south east of the site associated with the infilling of Graving Docks 1 and 2 between 1987 and 1990.</p> <p>Bidston Moss Landfill lies to the west of the site on the other side of Wallasey Bridge Road (&lt;30m). This landfill was operated by Merseyside Waste Disposal Authority and was infilled between 1932 and 1995. It accepted household, commercial and industrial wastes including asbestos, sewage sludge, chemical and hospital waste.</p> <p>There is evidence of additional infilling both on site and off site.</p> <p><u>On site</u> The historical maps from 1935 show a slipway present in the northern part of the site which was shown to be infilled by 1954.</p> <p><u>Off Site</u> Bidston Dock which lay to the north west, on the other side of Wallasey Bridge Road was infilled sometime between 2000 and 2005. It is not known what material has been used as fill or under what regulatory regime this was carried out.</p>
<p><b>Ground Investigation (partial)</b></p>	<p>Several very localised site investigations have been undertaken on site in relation to specific development projects:</p> <ul style="list-style-type: none"> <li>• Strata Surveys Limited 1990 - Connected with the proposed construction of underground interceptors/diversion pumping chambers at approximately 5m depth. Investigation locations were positioned toward the western and southern boundaries of the site.</li> <li>• CC Geotechnical 1997 - Within the infilled slipway and dock area (formerly known as Cubbins Yard).</li> </ul>

	<ul style="list-style-type: none"> <li>• Geotechnics, 2012 (United Utilities SI report) -To obtain information on the ground and groundwater conditions, for a proposed deep culvert beneath Bidston Dock in the north and west of the site.</li> </ul>
<p><b>Ground Investigation</b></p>	<p>RSK undertook an extensive investigation of the site in 2014 covering Phase 3 and 4 of planning permission OUT/11/00645. This is a slightly larger area than that of ELPS 357 as it extended all the way east to Graving Dock 3.</p> <p><u>Intrusive Works</u> The site investigation comprised 45 trial pits, 12 probeholes (6 in the vicinity of the proposed building) and 32 boreholes. This provided general site coverage based on a 50m grid spacing.</p> <p>Monitoring wells were installed in all boreholes and WS7, to a maximum depth of 27.5m (BH2) with dual installations in twenty-seven boreholes.</p> <p><u>Ground Conditions</u> Made ground was encountered in almost all exploratory holes either from ground level or beneath reinforced concrete with a maximum depth of 11.5m bgl. Underlying the made ground were superficial deposits comprising Tidal Flat Deposits of silt/clay, sand and peat with Glacial Deposits encountered at depth. Peat was recorded to a maximum depth of 10.0m bgl and thickness of 5.0m.</p> <p>Extensive visual and olfactory evidence of hydrocarbon contamination was noted within the made ground across the site.</p> <p><u>Groundwater</u> Groundwater monitoring was undertaken on at least 5 occasions between September and December 2014.</p> <p>Three separate water bodies have been encountered within the made ground, peat/silt layer and in the deeper sand deposits. The site may be under some tidal influence especially in the infilled dock where it appears to be in continuity with West Float.</p> <p>Light Non Aqueous Phase Liquid (LNAPL) was recorded in 5 locations during monitoring. RSK determined that there were two LNAPL plumes:</p> <ul style="list-style-type: none"> <li>• Plume 1 is located beneath the auxiliary tank farm to the south of the infilled slipway around BH16, where anecdotally a waste pit was historically located. A sample of free product from BH16(s) comprised mainly TPH (70% by weight). There is also the possibility of Dense Non Aqueous Phase Liquid (DNAPL) in this area.</li> </ul>

- Plume 2 is located to the northwest of the infilled slipway and southeast of the main tank farm in the north of the site.

RSK believed that the two plumes were separated by the walls of the infilled slipway.

Various contaminants exceeded the relevant Generic Assessment Criteria including arsenic, chromium, zinc, phenols and TPH (maximum 4.9mg/l) and various other organic contaminants.

#### Soil

Approximately 238 soil samples were analysed for a range of inorganic and organic contaminants including tributyl tin and asbestos (made ground only). Only the risk to future site users from vapour was assessed owing to the future presence of hardstanding across the site.

#### Ground Gas and Vapour

Six rounds of ground gas monitoring were undertaken over a three-month period with a maximum methane and carbon dioxide concentration of 99.9%v/v and 16.2%v/v respectively (BH27). The maximum flow rate was 3.63l/hr.

BH27 had its response zone in the peat, flow was subsequently monitored further, and this reduced to 0.1l/hr after 5 minutes.

Soil gas samples were also collected from the wells surrounding the proposed building footprint. Numerous VOC and TPH fractions were detected, including BTEX compounds, vinyl chloride, 1,2-dichloroethene and TCE. However, there were no reported exceedances of the generic assessment criteria.

#### DQRA

A detailed quantitative risk assessment (DQRA) was undertaken in relation to:

- Lateral migration of phenol to the wider groundwater. DQRA predicts no exceedance of the GAC for phenol at 15m and 100m compliance point protective of the dock and the surrounding Secondary A Aquifer
- Lateral migration of dissolved phase contaminants (including inorganics, TPH / PAH / phenols and VOC) to the West Float Dock. DQRA predicts no exceedance at 15m and 100m compliance
- Dissolution of contaminants within LNAPL and DNAPL to groundwater. ***NAPL will continue to dissolve into groundwater although at insufficient rate to adversely***

	<p><b><i>affect the wider aquifer or West Float dock from modelling undertaken</i></b></p>
<p><b>Remedial Actions</b></p>	<p>RSK produced a Remediation Strategy in February 2015 (Ref 321304-R08 (00)).</p> <p>Proposed remedial actions (for Phase 3A and 4A only) include:</p> <ul style="list-style-type: none"> <li>• general excavation of soils (and hard materials) in the top 1m, sorting, separation, treatment/disposal, stockpiling and verification testing</li> <li>• handpicking of visible asbestos from excavation surfaces and stockpiles</li> <li>• removal of free phase product (LNAPL) from soils / waters where encountered with skimmers and pumps</li> <li>• active bioremediation of soils identified from the site investigation or with visible hydrocarbons in turned windrows</li> <li>• treatment of waters with visible hydrocarbons through an activated carbon pod.</li> <li>• insitu chemical oxidation and vapour recovery of soils / groundwater impacted with chlorinated solvents</li> <li>• stabilisation/solidification of soils with high moisture content if necessary, for geotechnical reasons</li> <li>• use of cover systems required for the redevelopment of the site.</li> </ul> <p>In the spring of 2014, demolition works of the above ground structures (excluding the current Mobil building) was undertaken across Phase 3 and 4.</p> <p>Given that elevated concentrations of ground gas had been recorded it was proposed that further monitoring and assessment would be needed following completion of the remediation works, to allow appropriate ground gas mitigation measures to be designed for the building.</p>
<p><b>Verification</b></p>	<p>RSK produced a Verification Report in Aug 2017 which outlined the enabling and remedial works that had been undertaken between 2014 and 2017. These works were split into 2 distinct stages.</p> <p>Stage 1 (2014-2015) included but was not limited to:</p> <ul style="list-style-type: none"> <li>• removal of concrete slabs from the surface of the site in Phase 4A area (excluding the haul road)</li> <li>• recording foundations, hard points, services and drains</li> <li>• crushing demolition rubble</li> <li>• removal of oils from saturated soils and interceptor</li> <li>• collection and treatment of oily water for treatment on site (under a mobile treatment licence)</li> </ul>

- sampling stockpiled materials to check for asbestos fibres
- levelling of the site upon completion using crushed concrete

During the enabling works to break out the below ground floor slabs and structures free phase product (floating oil/LNAPL) was encountered and oil was skimmed/pumped from groundwater/tanks when found. Between December 2014 and May 2015 81,260 litres of oil had been removed from site. This work was undertaken under a Mobile Treatment Licence by a specialist subcontractor.

The Environment Agency in April 2015 confirmed that they had no objection to the proposed development and that the project would bring land back into beneficial use. However, remediation would be required in areas where contamination and a risk to controlled waters had been identified.

The Stage 1 enabling works were suspended in 2015, however the Stage 2 works recommenced in July 2016 for Phase 4A only.

Discussions with Wirral Council and the Environment Agency were undertaken in 2016 to consider how the remedial actions would be implemented and to seek general agreement with them.

Additional intrusive works were undertaken in July 2016 comprising 5 cable percussive boreholes and 55 trial pits to determine the extent of hydrocarbon plumes. Further ground gas and groundwater monitoring was also undertaken.

In groundwater the highest concentrations and the number of samples with a value greater than the limit of detection for organic compounds had reduced significantly following the LNAPL removal conducted during Stage 1 works in 2014/2015.

Stage 2 (2016-2017) included but not limited to:

- removal of concrete slabs from the surface of the site (haul road)
- identify any below ground foundations and remove to maximum 1m depth
- remove observed and recorded drainage runs to maximum of 1m depth within the Phase 4A boundary
- survey and record foundations (including piles), services, remaining hydrocarbon impacted soil and drainage runs observed that have not been removed
- construct an impermeable grout wall across the former slipway
- bio remediate up to 5000m<sup>3</sup> of soil from the worst affected areas on site

	<ul style="list-style-type: none"> <li>• removal of oils from saturated soils and interceptor tanks</li> <li>• collection and treatment of oily water treatment on site (under a mobile treatment licence)</li> <li>• Crushing of concrete and spread across site (37,677m<sup>3</sup>) with the remaining stockpiled</li> </ul> <p>Soils in the centre of the site were found to contain visible asbestos, 55.92t of fibrous asbestos was removed from site.</p> <p>A total of approximately 5000m<sup>3</sup> of hydrocarbon impacted soil was removed and bio remediated for reuse on-site.</p> <p>The reuse of material on was carried out under a Materials Management Plan (MMP)</p> <p>Approximately 6400 litres of LNAPL was removed across Phase 4A throughout the period between 31 October 2016 and 15 March 2017.</p> <p><u>Validation</u> Thirteen additional window samples were drilled on the 6<sup>th</sup> and 7<sup>th</sup> April 2017. Ground gas and groundwater monitoring was carried out on the 26/27<sup>th</sup> April and 8<sup>th</sup> May 2017.</p> <p>Three wells recorded LNAPL with a thickness of 2cm in one well. Elevated methane was also recorded with a maximum concentration of 70.7% with either a low or negative flow rate.</p> <p>Further identified work for Phase 4A:</p> <ul style="list-style-type: none"> <li>- Residual asbestos possible following asbestos removal</li> <li>- Presence of below ground structures at greater than 1m depth</li> <li>- Stage 2 targeted the worst affected hydrocarbon impacted area, further remediation would be required to fully remediate the site.</li> <li>- Potentially two historic abstraction wells present within the Phase 4A boundary. One has been decommissioned the other has yet to be identified.</li> </ul>
<p><b>Regulatory Input</b></p>	<p>During telephone conversations with Neil Coyne from RSK on the 21<sup>st</sup> May 2020 and David King-Hele from Wirral MBC on the 1<sup>st</sup> June 2020, it was confirmed that the both Environmental Health and the Environment Agency were accepting of the principles of the original Remediation Strategy. Both parties were satisfied with the remedial works that had been carried out on site but acknowledged that further remedial works are required.</p>



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<b>CONCLUSION</b>	<p>Having reviewed the available information listed above we conclude that the contamination risk identified onsite could be adequately addressed through standard remedial actions and as such we conclude that it is possible to allocate <b>ELPS 357 Former Mobil Oil</b> as potential Employment Land within Wirral MBC Local Plan.</p> <p>A review of all available information would be required should a revised planning application be submitted in relation to the specifics of any proposed development. This would then form the basis of any further site investigation or remedial actions to reduce any risk to an acceptable level.</p>
<b>Anticipated remediation costs</b>	Medium
<b>Limitations</b>	MEAS are not able to provide advice on geotechnical issues.
<b>Author</b>	Nicola Hayes
<b>Reviewer</b>	Laura Roberts
<b>Date</b>	June 2020

<b>Site Reference</b>	<b>EMP-RA6.5 Northside West</b>
<b>Site Address</b>	Dock Road, Wallasey
<b>Grid Reference</b>	330664 390621
<b>Site Area</b>	2.3 ha
<b>Introduction</b>	<p>In 2019 MEAS undertook a review of over 400 sites which had been identified by Wirral MBC as potential redevelopment sites for either employment or housing. The objective was to identify and advise on any potential environmental constraints associated with each site. This information would feed into the site allocation process for the Local Plan.</p> <p>Red-Amber-Green (RAG) ratings were assigned to each site based on several specialist areas, including land contamination. A red RAG rating was used where there was significant constraint which would likely prevent redevelopment. Amber RAG rating was used where there was an environmental constraint that could be overcome or when further information was required to make an assessment. A green RAG rating was used where there were deemed to be no environmental constraints.</p> <p>MEAS has been appointed by Wirral MBC to either undertake a Phase 1 Desk Study Report or review existing available information for a number of brownfield sites that were identified as requiring further information prior to allocation within the Local Plan (Amber rated).</p> <p>Following an initial assessment <b>ELPS 417 Former Gas Holder</b> site was classified as Amber (Phase I Desk Study required prior to <b>allocation</b>).</p>
<b>Aims</b>	<ul style="list-style-type: none"> <li>• To review all available information relating to the site.</li> <li>• To determine if land contamination would pose a significant constraint to redevelopment.</li> <li>• To identify further actions (where necessary).</li> </ul>
<b>Proposed Development Allocation</b>	Employment Land
<b>Information Reviewed</b>	<p>The following information has been reviewed:</p> <ul style="list-style-type: none"> <li>• Envirocheck Report Order No. 241956293 obtained for ELPS 079 Birkenhead Dock. Information within the report covers the Dock Road site.</li> <li>• Indigo Planning (November 2014) Former Gasworks, Old Gorsey Lane, Wallasey. Prior Notification for Gasholder Demolition (submitted under DEM/14/01484)</li> </ul>

<p><b>Current Site Use/Site description</b></p>	<p>A site visit undertaken by MEAS on 12<sup>th</sup> March 2020 identified that the land was vacant. The site is surrounded by fencing and was viewed from surrounding footpaths. Most above ground structures have been removed and a layer of crushed concrete has been placed across the site.</p> <p>The site is predominantly surrounded by commercial and industrial land uses. To the north is the A59 dual carriageway which is the main Wallasey Tunnel approach road. To the west is vacant overgrown land which has been subject to waste disposal/tipping. To the east is a cluster of industrial units with some vacant plots which appear to be used for storage and a modern office block. To the northeast, lying to the north of West Float Industrial Estate (Millbrook Road) and Cashel Road, is an area of cleared hardstanding which was the former town gas works, where the high-pressure gas main vent is located. To the south is Dock Road with industrial units/workshops beyond.</p>
<p><b>Geology</b></p>	<p>Artificial: Made ground identified across the whole site Superficial: Tidal Flat Deposits Bedrock: Helsby Sandstone Formation</p>
<p><b>Controlled Waters</b></p>	<p><u>Hydrogeology</u> The Helsby Sandstone Formation is classified as a Principal Aquifer. The Tidal Flat Deposits are classified as a Secondary A Aquifer.</p> <p>Part of the site is within Zone III total catchment of a Source Protection Zone.</p> <p><u>Hydrology</u> West Float is 115m to the south of the site with the Mersey Estuary over 2km away.</p>
<p><b>Site History</b></p>	<p>A review of the historical maps has identified the following key features:</p> <p>The 1882 map shows Wallasey Gas and Water works marked onsite, including a gasometer and well. The surrounding area is fields with Great Float to the south.</p> <p>The 1899 map shows more buildings and tanks onsite. In 1913 two additional larger tanks are identified in the northern part of the site (total of 5 tanks). In the surrounding area there is a Sulphur Ore Shed, Petroleum Stores and Refuse Destructor.</p> <p>The 1927 and 1938 maps show a similar layout on site. By 1954 one of the smaller tanks has been removed with a timber yard and associated railway lines to the east. There is little change to</p>

	<p>the 1965 mapping and by 1973 there are less buildings onsite and only the 3 large tanks remaining. There are no changes onsite on the 1982-1999 maps.</p>
<b>Aerial photography</b>	<p>Google Earth Pro (accessed May 2020) shows the site in 2000 with 3 gas holder tanks present and above ground pipes in the east of the site. There is also a small brick built building on the western boundary. There are no visible changes to the site until the 2015 photograph when the southern and middle tanks have been removed. By 2016 the northern tank has also been removed. The 2018 shows only the above ground pipelines and small brick building remaining.</p>
<b>Landfill sites &amp; ground gases</b>	<p>There are 4 historical landfill sites approximately 250m to the south of the site. However, West Float lies directly between these and the site itself which would act as a barrier, preventing migration of any ground gases.</p> <p>The tipped material on the site immediately to the west may be a potential source of ground gas.</p>
<b>Information obtained from planning records</b>	<p>Information was submitted with a demolition notice DEM/14/01484 for the removal of three gas holders and redundant infrastructure in 2015. The National Grid Demolition Report for the removal of the gas holders states that the holders were to be dewatered and the slab and tank sides cleaned. The gasholders were to be dismantled to ground level, with the concrete tank remaining in situ below ground level. The associated buildings were to be dismantled to the ground with the floor slabs left in place. Post demolition site 'restoration' works would not be major. Restoration would involve the infilling of the below ground gasholders and small voids where redundant pipework is removed adjacent to the holders along with general levelling of the site. All material used to fill the gas holder and associated voids would pass National Grid's chemical screening process to ensure it is safe to use. The infilling would provide a suitable site restoration both from safety and visual amenity perspective. Any asbestos would be removed in line with statutory guidance. The ground would not to be broken by the dismantling works.</p>
<b>Information obtained from National Grid (phone call 26/08/2020)</b>	<p>Gareth Taylor, Land Regeneration Manager at National Grid provided a verbal overview of the Former Gas Holder Site at Dock Road. Ground investigations have been carried out onsite since 1996. In 2011 voluntary remediation was undertaken by National Grid which involved three older former gas holders being dismantled, infilled and remediated. Approximately 9000m<sup>3</sup> of material was removed to landfill. In 2015 three additional gas holders were removed from site and further site investigations were undertaken in 2018 and 2020. The investigations concluded that the site would not be classified as Contaminated Land under the Environmental Protection Act 1990: Part 2A</p>

	(including risk to controlled waters) based on the site in its current condition. There are some localised exceedances of contamination which would need addressing should the site usage change.
<b>CONCLUSION</b>	<p>Having reviewed the available information listed above and produced a conceptual site model (included within Appendix 1) we conclude that the potential contamination risk identified onsite could be adequately addressed through standard remedial actions and as such we conclude that it is possible to allocate <b>ELPS 417 Former Gas Holder, Dock Road</b> as potential Employment Land within Wirral MBC Local Plan.</p> <p>A review of all available information would be required at the planning application stage in relation to the proposed development. This would then form the basis of further site investigation to quantify the risks and inform the necessary remediation and mitigation measures.</p>
<b>Change to a more sensitive end use</b>	<p>This review has been undertaken considering site allocation for employment land. If this site was to come forward for residential development, a review of previous site investigation reports would be required and an intrusive investigation would need to quantify the risks for a residential end use and develop a suitable remediation strategy.</p> <p>Due to the more sensitive nature of residential end use, additional remediation would be necessary which is likely to be more complex and extensive than for a less sensitive end use such as employment land. This is to ensure that the land is suitable for the proposed use and reduces any risk to an acceptable level.</p> <p>Anticipated remediation costs are more likely to be 'high' rather than 'medium'.</p>
<b>Anticipated remediation costs</b>	Medium
<b>Limitations</b>	MEAS are not able to provide advice on geotechnical issues.
<b>Author</b>	Laura Roberts
<b>Reviewer</b>	Nicola Hayes
<b>Date</b>	October 2020

## Appendix 1: Preliminary Conceptual Site Model

<p><b>Potential sources of contamination</b></p>	<p>Information collected from publicly available sources identifies the following potential sources of contamination:</p> <ul style="list-style-type: none"> <li>• Inorganic contamination within the made ground and soil associated with the former use of the site</li> <li>• Organic contamination within the made ground and soil associated with the former use of the site including tanks.</li> <li>• Asbestos fibres associated with any demolition</li> <li>• Inorganic and organic contamination within any groundwater</li> <li>• Ground gas and vapours arising from made ground and organic material underlying the site</li> </ul>
<p><b>Potential Pathways</b></p>	<ul style="list-style-type: none"> <li>• Ingestion, inhalation, dermal contact for human health receptors</li> <li>• Infiltration and contaminant migration via permeable strata or the unsaturated zone</li> <li>• Migration of volatile contaminants into buildings</li> <li>• Gas migration into buildings</li> <li>• Direct contact and uptake by plants</li> <li>• Permeation of water supply pipes</li> </ul>
<p><b>Potential Receptors</b></p>	<ul style="list-style-type: none"> <li>• Construction workers</li> <li>• Commercial/industrial workers</li> <li>• West Float</li> <li>• Underlying Principal Aquifer</li> <li>• Buildings and Services</li> <li>• Water Supply Pipes</li> <li>• Off site users</li> </ul>
<p><b>Preliminary Risk Assessment</b></p>	<p>The site is located within a predominantly commercial/industrial area. It is currently vacant with former tanks and buildings on site removed to ground level. Potential on site sources of contamination include the former tanks and underground pipes, by-product and waste products of gas manufacture including coal tar, spent oxide and underlying made ground.</p> <p>National Grid has undertaken a programme of improvement on site and removal of the structures,</p>



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removing waste from tanks etc prior to demolition. National Grid report that site investigations have been undertaken on site. MEAS has not had access to or reviewed this information. However, National Grid has confirmed verbally that following voluntary remediation and site investigations they are satisfied that there are no Environmental Protection Act: Part 2A liabilities associated with the site in its current condition.

The underlying Helsby Sandstone Formation is classified as a Principal Aquifer and the site is located within 115m of West Float. The site is located within an industrial area and the Tidal Deposits may offer some protection to the underlying Aquifer. Groundwater monitoring may be required to assess the risk and determine what (if any) remediation is required.

It is likely that any contamination remaining on site can be dealt with through commonly used remedial techniques. Therefore, following a review of existing reports and further investigation and subsequent remediation of the site any future risk to noted receptors would be low.

# LOCAL PLAN

This document has been produced by  
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