

URS

Hedon Haven
Evidence Base

Baseline Geo-
Environmental
Study

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Prepared for: East Riding of
Yorkshire Council

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1 Introduction

1.1 Land at Hedon Haven

- 1.1.1 The land at Hedon Haven comprises approximately 240 ha of farmland, owned by Associated British Ports (see Figure 1).
- 1.1.2 The parcel of land to the south of Salt End, adjacent to the Humber Estuary (approximately 80 ha) is allocated for employment uses by the Holderness District Wide Local Plan in 1999 (East Riding of Yorkshire Council, 1999). The allocation of the wider 240 ha site for port-related employment uses is being considered through the emerging East Riding Local Plan.
- 1.1.3 A series of baseline environmental studies are being undertaken to inform the emerging Local Plan Strategy and Allocations Documents, and the supporting Sustainability Appraisal/ Strategic Environmental Assessment and Habitats Regulations Assessment.
- 1.1.4 The report summarises the geo-environmental baseline information as informed through a detailed desk-based assessment and a site walkover.
- 1.1.5 For ease of reference, the 240 ha site is referred to throughout this report as follows (see Figure 1):
- Hedon Haven North site;
 - Hedon Haven South site; and
 - Paull site.

2 Methodology

2.1 Project Objectives

2.1.1 The overall objectives for the study were:

- to assess current and/ or historical uses of the site and immediately adjacent sites with respect to their potential to have impacted soil and groundwater;
- to characterise the environmental setting of the site, identify key migration pathways and likely vulnerable receptors for contamination potentially originating at the site;
- to assess historical and current surrounding land use in relation to known or potential off-site contamination issues that may have impacted the subject property; and
- to provide conclusions to address the identified issues at the site.

2.2 Scope of Works

2.2.1 The study comprised a preliminary desktop review, one day site walkover and preparation of this report. Photographs of the site have been included in Appendix A.

2.2.2 The desktop assessment comprised a review of available topographical, geological and hydro-geological maps and aerial photographs, together with various pertinent public websites to assess the sensitivity of the site environmental setting. Historical topographical maps were also reviewed to assess the development of the site and surrounding area and hence potential sources of contamination and pathways for migration.

2.2.3 URS contracted Landmark Information Group Limited in order to conduct a database search for available regulatory agency records to evaluate whether activities on or near the subject property have the potential to create a significant environmental impact on the subject property.

2.2.4 A site walkover was completed on 28th June 2012 to assess:

- surrounding land use, the nature of activities in the vicinity of the site and potential nearby off site sources of contamination and their potential environmental impact on the site; and
- site setting and current adjacent land-use, with a view to identifying environmental receptors potentially at risk from the subject site (including wetlands and streams, ecological resources and presence of vulnerable flora and fauna), and potential migration pathways, together with identification of potential on-site sources of soil and groundwater contamination related to past or present site activities.

2.2.5 Upon completion of the above activities, the objectives, methodology, key findings and conclusions have been presented in this summary report.

3 Baseline Conditions

3.1 Site Description

Table 3.1: Site description

Site name	Hedon Haven
Site address	Hedon Haven site is located approximately 200 m south-west of Hedon and approximately 3 km south-east of Hull. A site location plan is included as Figure 1.
Grid reference	517250 427260
Reported site area	240 hectares
Freehold/leasehold	Freehold.
Site activities	Arable farmland with the exception of two properties adjacent to the southern boundary named Newton Garth.
Site visit details	Site visit conducted on 28 th June 2012. Auditor: Ben Wilson and Rachel Pottinger.
Sources of information	Publicly available maps and web sites reviewed: <ul style="list-style-type: none"> British Geological Survey (BGS) 1:50,000 Geological map; Environment Agency website; and, County Series 1:10,560; Plan 1:10,000 and 1:10,000 Raster Mapping Ordnance survey maps. List of documentation reviewed: <ul style="list-style-type: none"> Landmark Information Group Envirocheck report reference: 39542712_1_1 (extracts provided in Appendix C).
Site location and surroundings	The site is located approximately 1 km north of the village of Paull, near Hull, Humberside. The immediate surrounding area is a mix of heavy industry and arable farmland. The city of Hull is located approximately 3 km to the north-west. Site appears to be in two parts separated by Hedon Haven in the centre of the site which flows from east to west. Land uses surrounding the site are generally as follows: North: The A1033 Hull Road is adjacent to the northern boundary, beyond this is a car racing track and some industrial/ commercial properties. . East: The A1033 Hull is located on the north-eastern boundary, beyond which is Hedon Town. To the south-east of the site is arable farmland. South: Far bridge Lane separates the site from more arable farmland. West: Paull Road runs adjacent to the western boundary in the north part of the site. Hedon Haven stream with tidal mud flats and the Humber Estuary beyond in the southern part of the site.
Site description	The site currently comprises several fields for that are used for agricultural practises. Across the centre of the site running from east to west is Hedon Haven, a tributary of the Humber Estuary. The site consists of several drainage ditches that are located across the Hedon Haven site which mark field boundaries. In the northern half of the site Reedmere sewer runs from the eastern boundary to western boundary.

3.2 Site Environmental Setting

Geology

- 3.2.2 A review of the BGS 1:50,000 map of the area and a borehole log (TA12NE192) located in the north-west corner of the site indicates the following geological sequence beneath the site.
- 3.2.3 Made ground is not anticipated over the majority of the site since the site is undeveloped arable farmland. However during the site walkover hardstanding was found at a site named 'Pollard' and it is likely that made ground exists in the shallow ground underneath Pollard.
- 3.2.4 The BGS map indicates that the site is underlain by marine and estuarine alluvium deposits. BGB borehole log TA12NE192 located in the north-west corner of the site indicates that 1 m of made ground directly overlays the alluvial deposits that comprise predominately interbedded silt and clay with occasional sand bands. Soft clays and silts have been identified to a depth of 19 mbgl (metres below ground level) which become stiffer with depth. A very similar strata has been identified in the south west of the site indicated by BGS borehole log TA12NE70.
- 3.2.5 Borehole log TA12NE192 identifies stiff clay at a depth of 18.50 mbgl, below this depth sands and gravels exist to 26.00 mbgl.
- 3.2.6 Firm clays are found beneath the sands and gravels before chalk bedrock of the Flamborough Chalk formation of the Upper Cretaceous age is identified at 38 mbgl. The chalk is of unknown thickness.
- 3.2.7 According to the BGS, there is one moderate hazard for compressible ground stability, all other ground stability hazards are very low to not present. It is reported that the site is in an area which is not affected by coal mining.
- 3.2.8 There are no known BGS mineral sites within a 1 km radius of site.

Hydrogeology and Hydrology

- 3.2.9 Made ground, if present beneath the site, is likely to be of variable permeability (depending on the nature of materials used).
- 3.2.10 The soils on site are of unknown leaching potential. The superficial deposits directly underlying the site are marine and estuarine alluvium deposits that are classified by the Environment Agency as unproductive strata, however, the chalk bedrock beneath the superficial deposits is classified as a principal aquifer. The glacial sand and gravels are not identified by the Environment Agency however it is thought that they may be able to support water supplies on a local scale.
- 3.2.11 The drift deposits 10 m to the south-west of the site are classed as beach and tidal deposits comprising clay, silt and sand which are likely to be able to support water if sand is present. However beneath the beach and tidal deposits the sediments are very similar to those found on site therefore the deposits beneath the beach and tidal deposits can be classed as unproductive strata.
- 3.2.12 The site is not in the area of any source protection zones.
- 3.2.13 One active groundwater abstraction has been identified within a 1km radius of the site. The abstraction is located 641 m west of the site and taken from the chalk for general cooling and industrial/commercial/domestic use.

Surface Water and Flood Risk

- 3.2.14 Hedon Haven, a tributary of the Humber Estuary, located in the centre of the site flows from the eastern to the western boundary. East of the site, this watercourse is referred to as the Burstwick Drain. There are also many drainage ditches towards the north of the site that connect with the Hedon Haven tributary. To the south of the site there are more drains that potentially connect to Hedon Haven or the Humber Estuary directly. A tidal barrier is located along the Hedon Haven towards the west of the site.
- 3.2.15 Reedmere Sewer, a drainage ditch located in the north of the site that appears to connect to the Hedon Haven tributary. Although the sewer is likely to be below ground level, it still potentially feeds into a surface water body.
- 3.2.16 There is river quality data from the Hedon Haven stream supplied by the Environment Agency on site. The Environment Agency has graded the chemistry of the Hedon Haven stream as E (Grade A – very good, Grade F – bad).
- 3.2.17 There is also a small pond in approximately the centre of the site.
- 3.2.18 The site is located in an area at risk from flooding but a flood defence is present along the Humber Estuary (although this is not currently shown on the Environment Agency mapping).
- 3.2.19 With respect to surface water, the site location is considered to be of moderate sensitivity. The site contains numerous drainage ditches and the Hedon Haven stream flow through the centre of the site. These may also represent a potential pathway to the Humber estuary located approximately 500 m south.
- 3.2.20 Further information on water quality and flood risk is provided in the Hedon Haven Baseline Water Quality and Flood Risk Reports, respectively (URS, 2012a and 2012b).

Sites of Natural and Ecological Importance

- 3.2.21 The site is located approximately 200 m north-east of a Site of Special Scientific Interest (SSSI), SPA (Special Protection Area), IBA (Important Bird Area) and is classified as a Ramsar site. The site therefore is considered to have a medium environmental sensitivity.

Surrounding Land Use

- 3.2.22 The site is located approximately 200 m north-east of the village of Paull and approximately 20 m south-east of Salt End chemical works at Salt End which primarily produces acetic acid. The site and Salt End chemical works is separated by Hedon Haven to the south and Paull Road to the north. Approximately 400 m to the east is Hedon town. Arable farmland lies towards the north and around the southern part of the site. Hull city is approximately 3 km to the north-west.
- 3.2.23 The site itself is considered to be of low sensitivity with regard to surrounding arable farmland, but high with regard to the adjacent chemical works.

3.3 Site History and Potential for Significant Contamination

- 3.3.1 Ordnance Survey maps of scales 1:10,000 and 1:10,560, and 1:10,000 raster maps dated between 1883 and 2011 (see Appendix D) have been studied.

Site History

3.3.2 The history of the site and surrounding area is summarised in Table 3.2 below.

Table 3.2: Site history

Year	Description
1855	The site comprises agricultural land and two hamlets named Newton Garth and Pollard. Newton Garth is noted to have a pump and the grassed area to the west is labelled hospital garth. The subject area is bounded by Hull Road to the north and an unnamed road to the south. To the west lays arable farmland and Hedon town is located 500 m to the east. Hedon Haven tributary runs across the site from east to west and splits into Hedon Haven which forms the original stream line and Hedon Clough which is a straight river cutting. Hedon Clough forms the eastern part of Burstwick Drain to the east of the site which flows through Hedon Haven. Reedmere sewer is located to the north of the site and is likely to flow from east to west. A pond is located 50 m from Hedon Haven tributary. One other pond is located 300 m west of the site. A series of drains are located in both the north and the south parts of the site. A railway line is located 650 m to the north of the site.
1891-1892	Reedmere sewer has now been straightened however the surrounding area remains unchanged.
1910-1911	Additional field boundary and possibly drainage ditches are shown to the north of Reedmere Sewer. The surrounding area remains unchanged.
1928-1929	Site remains unchanged however, Saltend distillery is present 500 m to the west of the site.
1938-1952	Site and surrounding are remain unchanged.
1956	The layout of the settlement named Pollard has changed, the rest of the site remains unchanged. Salt End distillery has been replaced with an unnamed industrial site with several storage tanks which extends up 10 m north-west of the site.
1957-1968	The industrial site to the west has now been expanded and is named as works. A small works 200 m to the north-west of the site is now shown.
1970-1971	The settlement named Pollard is no longer shown and some field boundaries have been removed. The works to the west is now named chemical works and has been expanded further. A garage is shown on maps from this date 150 m north-west on Hull road. A saw mill and timber yard is now present 300 m north-east of the site. The train line 650 m to the north has now been dismantled. In the village of Paull, 250 m to the south-east of the site a shipyard can now be located.
1981-1985	Hedon Haven now appears to be dry, with the stream flowing only through Hedon Haven Clough. The chemical works to the west now has a different layout and also has undergone another expansion.
1993	The site remains unchanged. A car racing track has now been built 450 m north of the site. More residential properties have been constructed in Paull.
2006	The site remains unchanged. A power plant now exists approximately 1,000 m west of the site. Approximately 500 m the north-east a waste water treatment works is now operational. Changes to the road network have been slightly altered just outside the north-east corner of the site. An electricity sub station located 500 m north-east of the site is now shown on historical maps.
2012	The site remains unchanged. The chemical works to the west now shows a different layout.

Potential On-Site Sources of Contamination (Current, Historic and Future)

3.3.3 Based on a review of the historical maps, potential sources of current and historic on-site contamination have been identified as follows:

- Historic
 - Historical maps have shown that the site has only been arable farmland with small settlements, no on-site potential sources have been identified therefore the likelihood of potential contamination is very low.
 - Anecdotal evidence suggests that the some sewage sludge has been disposed of at the site, however given the agricultural nature of the land, this is likely to have been for the enhancement of the site.
- Current
 - The site is currently arable farmland, no other land use has been identified. The likelihood of contamination from current onsite activities is very low.
- Future
 - Port-related employment uses are proposed. It is assumed that best practice and mitigation would be employed to prevent contamination.

Potential Off-Site Sources of Contamination (Current and Historic)

3.3.4 The following sources of off-site contamination have been identified:

- Historic
 - Saltend distillery to approximately 350 m west of the site; and
 - chemical works 10 m (at nearest point) to the north west of the site.
- Current
 - Chemical works 10 m (at nearest point) to the north-west of the site;
 - Garage 150 m north-west of the site;
 - Saw mill, timber yard, works and electricity substation 400 m to the north-east of the site;
 - The waste water treatment works approximately 500 m north-east of the site;
 - Car racing track 450 m to the north;
 - Dismantled train line 650 m to the north; and
 - The ship yard located in Paull appears to be abandoned although the infrastructure and some machinery are still present.

Potential for Contamination

3.3.5 The potential for contamination is considered to be high, given the historical and current surrounding land as a distillery, saw mill, electricity substation, waste water treatment facility, car racing track and dismantled train line there is a potential for significant contamination. The close proximity of a large chemical works (1956 – present) to the west of the site increases the potential for off-site sources of contamination.

3.4 Regulatory Database Search

3.4.1 To gain an understanding of other activities in the vicinity of the site, and to determine potential impacts from those activities, URS commissioned an Envirocheck UK regulatory authority database search (Report Ref: 39542712_1_1, dated 8 June 2012) from Landmark Information Group Ltd to obtain information on the following types of operations within a 1 km radius of the site:

- landfill locations;
- waste transfer and treatment sites holding Waste Management Licenses;
- those facilities holding permits under Part I of the Environmental Protection Act 1990 and the Pollution Prevention and Control (England and Wales) Regulations 2000;
- prosecutions and enforcement notices;
- those holding radioactive substance authorisations;
- those holding consents under the Planning (Hazardous Substances) Act 1990;
- Control of Major Accident Hazards (COMAH) Sites;
- pollution incidents to controlled waters;
- those holding discharge consents under the Water Resources Act 1991 and Water Industry Act 1991;
- those subject to regulatory prosecutions and statutory nuisance enforcement;
- fuel stations; and
- ecologically/ environmentally designated or protected sites, e.g. Sites of Special Scientific Interest, Special Conservation Areas, Ramsar Sites and National Nature Reserves.

3.4.2 Extracts from the database are shown in Appendix B.

3.4.3 The Envirocheck report details operational activities for which licences or authorisations are required and have been obtained pursuant to environmental laws. It is therefore possible that there are unauthorised activities being carried out (e.g. surface water abstractions) or potentially contaminative activities that do not require licences or activities, in the vicinity of the area that are not detailed.

3.4.4 No enquiries have been made of the Local Authority or the Environment Agency to ascertain whether any preliminary surveys of land in the area have been undertaken pursuant to Part 2A of the Environmental Protection Act 1990.

3.4.5 The findings are summarised in Table 3.3 below.

Table 3.3: Regulatory database search findings

Local authority and Integrated Pollution Controls	There are thirty two recorded Integrated Pollution Prevention and Control Permits between 251 m and 500 m for inorganic and organic chemicals and combustion processes within the fuel and power industry, however seven have been revoked. There are no active Local Authority Pollution Prevention and Control (LAPPC) permits within 1 km of the site.
Wastewater Discharge Consents	One discharge consent has been issued on site which discharges trade and process effluent into receiving water named Lords Clough which is possibly located at the tidal barrier on the Hedon Haven. This discharge consent could be linked to the Salt End BP chemical plant. Twenty recorded discharge consents, eight of which belong to BP have been issued within a 1 km radius of site of which eight have been revoked. The consents concern domestic treated sewage wastewaters, cooling water and trade discharges, and the nearest is licensed to Battery Cottage, located approximately 34 m south-east of the site.
Radioactive and Hazardous Substance Authorisations	There is one radioactive substances authorisation within 1 km of the site, registered to BP Chemicals Ltd, approximately 465 m north-west of the site. There are seventeen entries for sites handling hazardous substances; these entries concern COMAH/ NISHH sites and planning hazardous substances consents for BP Chemicals Ltd located 50 m to the north-west of the site. There are three active registered COMAH consents located 661 m to the north-west of the site held by BP Chemicals Limited, Nippon Goshei Uk Ltd and Vivergo Fuels limited. All three COMAH consents are classed as upper tier for storage of hazardous goods. There are three planning hazardous substances consents within 1 km of the site. The nearest is 382 m north-west and involves the use of methane at the BP Chemicals site. There is also two notification of installations handling hazardous substances within a 1 km radius, the nearest is licensed to Air Products Plc located 155 m south-west of the site. There are no active registered COMAH consents located on site, however, there are two consents granted within a 1 km radius of the site. These are licensed to Air Products Plc and Ineos Manufacturing Ltd at 300 m south-west and 37 0m south-west from the site respectively.
Groundwater and Surface Water Abstraction Licences	One active groundwater abstractions has been identified within a 1 km radius of the site. This is located approximately 641 m west of the site and the abstractions are licensed for general cooling and industrial and commercial use.
Registered Landfills	There are two historic landfills on site which are located on the eastern part of the site, on the former route of the Hedon Haven tributary. The landfills were licensed to accept wastes which included inert materials and household waste. There is one registered landfill that is located in the same area as the historical landfills which accepted excavated natural materials, hardcore and rubble. However this license has been cancelled. The landfills listed above extend off site approximately 500 m to the east along the former route of the Hedon Haven. Permitted wastes include natural materials, hardcore and rubble.
Fuel Station Entries	There is one active Petrol filling station (PFS) 180 m north-east of the site.
Registered Waste Transfer, Treatment and Disposal Sites	There are no recorded waste treatment, transfer or disposal sites within a 1 km radius of site boundary. There is one waste management facility located 782 m north-west of the site which has no known restriction on the source however the license has been cancelled and the facility is not likely to impact the site due to the distance between the site and the waste transfer station.
Pollution Incidents to Controlled Waters	There are two recorded pollution incidents to controlled waters at the site boundary. One occurred in 1994 at the road bridge over the Hedon Haven and involved oils, the second involved a release of crude sewage at the location of the A1033 and the Burstwick Drain in 1993. Both incidents are classified as category 3 minor incidents. Please note that the locations are approximate – the descriptions indicate that these

	<p>actually occurred on the site boundary</p> <p>Ten pollution incidents have occurred offsite since 1989, the closest incident was classed as a category 1 major incident that involved vehicle washings and de waxing approximately 17 m north-west of the site. Given the close proximity, this incident could potentially contaminate the Hedon Haven site.</p>
Substantiated Pollution Incident	<p>There are two substantiated pollution incidents which were recorded by the Environment Agency 553 m (2011) and 660 m (2009) to the north of the site. These were recorded as category 2 (significant) incidents to air. The impact was caused by hydrocarbon contamination from within the chemical works. However, this is unlikely to have impacted the site.</p>
Prosecutions Relating to Authorised Processes or Relating to Controlled Waters	<p>There are no prosecutions relating to controlled water recorded within 1 km of the site.</p> <p>There is one prosecution relating to authorised processes. This is located approximately 400 m north-west of the site and concerned a gas leak of carbon monoxide in 2011.</p>
Hazardous Substance Planning Consents	<p>There are thirteen hazardous substance consents within 1 km of the site these are all located within the chemical plant 50 m west of the site.</p> <p>The nearest consent is located 382 m to the north-west of the site that concerns methanol. Two other consents in the area involve hydrogen and ammonia.</p>
Ground Gas (Radon, Methane, Carbon Dioxide etc.)	<p>The British Geological Survey, National Geoscience Information Service records show that the property is in a lower probability radon area (with less than 1% of homes above the action level) therefore radon protection measures will not be necessary for the construction of new dwellings or extensions.</p>

3.5 Site Visit Findings

3.5.1 The findings of the site visit are summarised in Table 3.4 below.

Table 3.4: Site visit findings

Environmental Management.	<p>The site consists of a number of arable fields that are currently supporting crops. Associated drainage ditches are located around the edges of fields. A flood support embankment is located along the south-western boundary of the site.</p> <p>A 6' BP pipeline runs below ground approximately north-south along the south-western boundary of the site.</p> <p>A high pressure gas pipeline was identified on site running north-south along the western boundary.</p> <p>A water mains pipeline was also identified at the western part of the site.</p> <p>A transformer is located on the western part of the site that is associated with the electricity lines that run northeast – southwest across the site.</p> <p>To the north-west of the site there is an area of hard standing that appears to be the footprints of buildings. This area is named as 'Pollard' on historical maps and the layout of the area suggests that the land was formerly industrial end use. Around 'Pollard' an abandoned shipping container and small concrete building was identified 50 m to the east. Access to both was not gained.</p> <p>Offsite there is an entrance to a gas valve compound 20 m to the north-west of the north west corner of the site.</p> <p>Located directly south of the south-west corner of a site is a small concrete building that is associated with a gas installation.</p>
Permitting	<p>There are no known permits on site.</p>
Materials Storage	<p>No materials are stored on site.</p>
Water/Wastewater/ Drainage	<p>There are no groundwater abstraction points on site.</p> <p>Numerous drainage ditches are located on the site that flow into the Hedon Haven stream.</p>

Waste Management	The site does not hold a waste management license.
Air Emissions	There are no processes on site leading to point source releases to air.
Noise and Nuisance	No onsite sources of noise noted during the site walkover.
Ozone-Depleting Substances	No ozone depleting materials was observed onsite.
PCBs	There are no PCB containing materials onsite.
Asbestos Containing Materials	Asbestos is unlikely to be onsite due to the current land use. No likely asbestos containing materials were seen on site.
Radioactive Substances	During the site visit there was no evidence that radioactive materials are stored, emitted or pass through the subject site.

3.6 Conceptual Site Model

Previous Investigations

3.6.2 There is no known knowledge of previous investigations on the site.

Potential On-Site Sources of Contamination

3.6.3 Historical sources of contamination on site comprise:

- two recorded pollution incidents (minor) that involved oils and sewage;
- East Riding of Yorkshire Council has advised that some sewage sludge disposal has taken place at the site, however this is assumed to have been for the enhancement of the land; and
- two historical landfills located to the east of the site.

3.6.4 No current land uses have been identified as potential sources of contamination.

Potential Off-Site Sources of Contamination

3.6.5 Historical sources of contamination in the vicinity of the site comprise:

- one pollution incident (major) 17 m north-west of the site involving car washings and de-waxings; and
- the Salt End chemical works approximately 10 m to the west (nearest point).

3.6.6 Current sources of contamination in the vicinity of the site comprise:

- active PFS 180 m to the north-east;
- Salt End chemical works to the west;
- waste water treatment plant situated 400 m north-west of the site;
- timber yard, saw mill and works to the north-west;
- electricity substation to the north-west;
- car racing track 400 m to the north;
- PFS 180 m to the north-east of the site; and

-
- a garage 150 m north-west of the site.

Potential Contaminants of Concern

3.6.7 Potential contaminants of concern identified by the study are:

- Total Petroleum Hydrocarbons (TPH);
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Volatile Organic Compounds (VOCs);
- Semi-Volatile Organic Compounds (SVOC);
- metals;
- Polycyclic Aromatic Hydrocarbons (PAH); and
- acids.

Potential Pathways

3.6.8 Potential pathways for contamination to reach human health receptors comprise:

- vapours – migration of vapours through tidal flat deposits to above ground buildings or future excavations or offsite;
- particulate – ingestion, inhalation, dermal contact with soil particulates; and
- ground gas – migration of ground gas through made ground and shallow alluvium into above ground buildings or off-site.

3.6.9 Potential pathways to controlled waters that have been identified are:

- leaching of chemicals of potential concern from shallow soils into groundwater within underlying unproductive strata (alluvium) followed by vertical migration into the underlying principal aquifer;
- vertical migration of impacted water (if present in made ground) into groundwater of underlying unproductive strata (tidal flat deposits) followed by further migration into the underlying principal aquifer;
- leaching – migration of chemicals of potential concern from soils into groundwater, followed by migration to surface water; and
- migration of impacted perched water (if present) into underlying groundwater, followed by migration to surface water.

Potential Receptors

3.6.10 Potential human health receptors that could be affected by contamination are:

- residents at Newton Garth at the south of the site;
- potential future site workers; and
- off-site workers in adjacent commercial/ industrial properties (located 30 m to south of the site is a small industrial estate and caravan park).

3.6.11 Potential controlled water receptors that could be affected by contamination are:

- groundwater: Principal Aquifer associated with the chalk bedrock;
- surface water: pond located in the centre of the site;
- surface water: series of drainage ditches including Reedmere Sewer on site;
- surface water: Hedon Haven that runs east to west through the centre of the site; and
- surface water: Humber Estuary approximately 1 km to the south-west of the site.

Preliminary Pollutant Linkage Assessment

3.6.12 Tables 3.5 and 3.6 summarises potential source-pathway-receptor pollutant linkages that have been identified, in the event that significant contamination may be present in the identified source areas.

Table 3.5: Pollutant linkage assessment: human health

Key Sources (Key Contaminants)	Key Potential Pathways	Key Receptors	Preliminary Likelihood of Significant Pollutant Linkage
Off site (historical and current): pollution incidents, chemical works, petrol filling station, timber yard, electricity substation, car racing track, garage. Contaminants of Potential Concern: TPH, BTEX, VOCs, SVOCs, Metals, PAH, acids	Vapours: Migration of vapours through made ground/tidal flat deposits and subsurface infrastructure to the site.	Future site workers	High: Due to the proximity of the chemical works, however the presence of impermeable drift deposit will reduce the pathway.
	Particulate – Ingestion, inhalation, dermal contact, with soil particulates.	Future site workers	Low: The majority of the site will be covered in hardstanding following development. Vapour pathway is the only viable pathway from off site sources.
On site: Landfill	Ground gas: Migrations through made ground and shallow soils to above ground structures.	Future on site buildings	Medium: Landfills are located on site but should contain inert waste and natural soils, however some domestic waste was permitted.

Table 3.6: Pollutant linkage assessment: controlled waters

Key Sources (Key Contaminants)	Key Potential Pathways	Key Receptors	Preliminary Likelihood of Significant Pollutant Linkage
Off site (historical and current): pollution incidents, chemical works, petrol filling station, timber yard, electricity substation, car racing track, garage. Contaminants of Potential Concern: TPH, BTEX, VOCs, SVOCs Metals, PAH.	Leaching of contaminants from shallow soils (made ground and alluvium) into the groundwater followed by vertical migration. Vertical migration of potentially perched groundwater (if present).	Principle aquifer (chalk bedrock)	Low: The chalk is separated by approximately 35m of silts and clays however there are occasional sands that may provide pathways.
	Leaching of contaminants from shallow soils into groundwater followed by migration to surface waters. Lateral migration of any shallow groundwater to surface waters.	Hedon Haven Drainage ditches Reedmere Sewer	Medium: Alluvium deposits will reduce migration of contaminants however the Hedon Haven site is thought to be up gradient of the chemical works. However tidal influence may have an effect on groundwater flow patterns.

4 Limitations or Difficulties

- 4.1.1 No significant limitations or difficulties were encountered during the preparation of this baseline study.

5 Conclusions

- 5.1.1 The sensitivity of the site to contamination is considered to be **low** with respect to groundwater because, although the site is underlain by a principal aquifer, it is at a depth of approximately 35 mbgl and is overlain by tidal flat deposits comprising silt and clay.
- 5.1.2 With respect to surface water, the site location is considered to be of **moderate** environmental sensitivity to contamination because the numerous drainage ditches in the surrounding area may be interconnected and potentially represent a direct pathway to Hedon Haven tributary and Humber Estuary, located 1 km south of the site.
- 5.1.3 The site is considered to be of **moderate to high** sensitivity with respect to surrounding land-use due to the heavy industry and arable farmland.
- 5.1.4 With regard to human health receptors (on and off-site workers), the environmental sensitivity of the site is considered to be **low**, since the site currently is occupied by arable farmland. This would change following the construction of new development and new potential pollutant linkages may arise.
- 5.1.5 Given the environmental sensitivity of the site, it is considered that there are no foreseeable issues associated with the site that may hinder its development given the proposed land use. If issues are identified during the planning process and/or construction on site they are likely to be minor and may be resolved with additional investigation, risk assessment and/or remediation,

6 References

URS (2012a) *Hedon Haven Evidence Base, Baseline Water Quality Study*

URS (2012b) *Hedon Haven Evidence Base, Baseline Flood Risk Study*

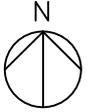
Figures



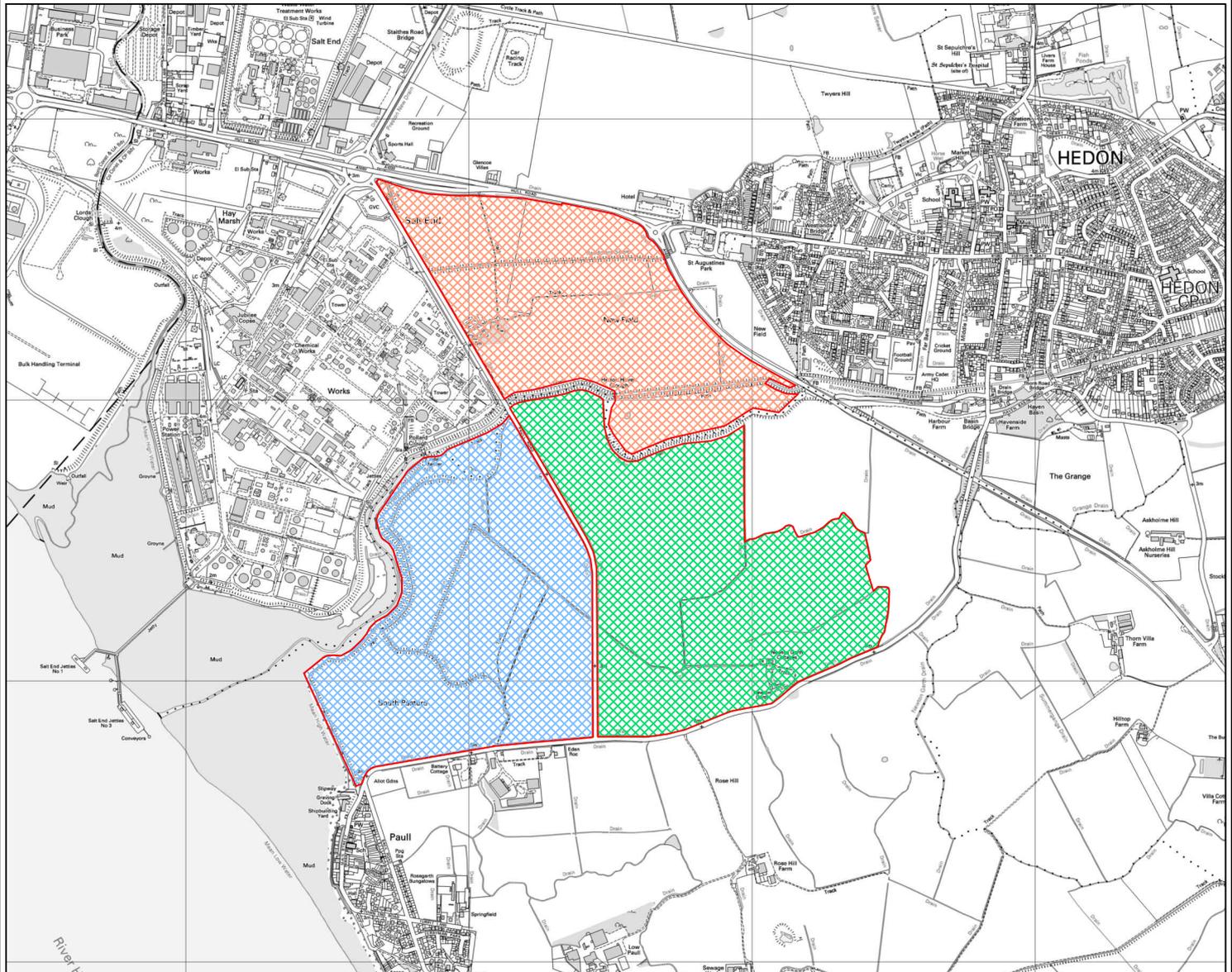
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Key

-  Hedon Haven North site
-  Hedon Haven South site
-  Paull site
-  Site Location



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<p>Drawing Title</p> <p>FIGURE 1</p> <p>SITE LOCATION PLAN</p> <p>HEDON HAVEN</p>	<p>Scale @ A4</p> <p>1:100,000 & NTS</p>		
	<p>Drawn</p> <p>CLH</p>	<p>Checked</p> <p>LM</p>	<p>Approved</p> <p>LM</p>
	<p>Date</p> <p>16.07.12</p>		<p>Rev</p>
	<p>Drawing Number</p> <p>47062982/AR/001</p>		
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Appendix A
Envirocheck Report and BGS Borehole Logs