Portobello High Street, Edinburgh

Remediation Strategy

For

Aldi Stores Ltd

Report Ref	Issue	Prepared by	Date	Reviewed by	Date
14517RS	1	N Watson	20.02.15	A Coverdale	20.02.15

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Portobello High Street, Edinburgh

Remediation Strategy

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FIGURES

APPENDICES

1 INTRODUCTION

1.1 It is proposed to develop the site of a former fuel filling station, with areas of car parking, and an adjacent building for a commercial development, with the proposed site plan included in **Appendix A**. The site, centred on National Grid Reference 330130, 674220, is located on the north-eastern side of Edinburgh adjacent to Portabello High Street, around 250m from the coastline of the Firth of Forth. A site location plan is included as **Figure 1**.

1.2 3e Consulting Engineers (3e) carried out Phase I and Phase II Geo-environmental Assessment Reports for this site during 2014 to assess the ground conditions and contamination levels, at locations as shown on the Exploratory Hole Location plan, included as **Figure 2**. As part of this report, reference has also been made to an additional Phase I Geo-environmental Assessment report completed by WSP Environmental Ltd (WSP), for this site and surrounding wider development area, during 2008 (Ref. 12151488).

1.3 The intrusive investigation works comprised the completion of seven mini percussive boreholes (WS1 to WS7) and two cable percussive boreholes (BH1 and BH2), with associated gas and groundwater monitoring installations (WS3, WS6 and BH2), soil and groundwater sampling and laboratory testing.

1.4 The following ground investigation reports should be read in conjunction with this remediation statement:

- Phase I Geo-environmental Assessment Report, 3e Consulting Engineers (3e), January 2014, ref 14517.
- Phase II Geo-environmental Assessment Report, 3e Consulting Engineers (3e), April 2014, ref 14517

1.5 A brief summary of the findings of the above reports are outlined in the following section.

2 SUMMARY OF GEO-ENVIRONMENTAL ASSESSMENT REPORTS

Site History

2.1 The site is recorded as being located within an industrial site setting since prior 1895, with historical site usage including a former clay pit, garage, petrol filling station, industrial works and a number of other miscellaneous developments. From historical plans, the former clay pit is shown to extend below a large proportion of the western site area, including below the area of the proposed Aldi store.

2.2 Following a review of available data, records relating to the former Claymore petrol filling station across the eastern site area, indicate that at least three Underground Storage Tanks (UST's) were present below the site from at least 1967, comprising two 5000 gallon petrol tanks and a single 5000 gallon dual compartment petrol and derv tank. These tanks reportedly passed pressure tests during 1987.

2.3 During 1990-1991 the site was reportedly refurbished, including a new forecourt. From the WSP report, the previous tanks were considered to have been replaced, with later information listing a different number and capacity of tanks, comprising the following:

- 18,600 litre Super Unleaded
- 27,200 litre Four-Star
- 27,200 litre Unleaded
- 13,600 litre Derv
- 13,600 litre Four-Star
- 13,600 litre Unleaded (possibly converted to diesel in 2002)

2.4 The above tanks reportedly passed a pressure test during 2004. Later records indicate that a method statement was produced during 2005 for temporary decommissioning of the above six tanks, which involved disconnecting the pumps, draining, flushing the lines and disconnecting the pipe work, although there is no record of this work having been carried out. At this stage, it is assumed that the above tanks have been temporarily decommissioned, but have not been removed.

2.5 At this stage, no definitive evidence has been provided to confirm the removal and/or decommissioning of the three former tanks associated with the earlier garage.

2.6 From the findings of the previous Phase I reports (3e and WSP), no plans are available showing the exact location of the tanks. However, from historical aerial photography a series of service covers are shown below and to the south of the former canopy and forecourt area, which could be associated with the former tanks, although this is unconfirmed at this stage.

Soil Profile

2.7 From the findings of the Phase II Geo-environmental Assessment report, site surfacing was noted to comprise a mixture of thin asphalt, reinforced concrete and paving slabs/block. Access was restricted during the intrusive works, due to the presence of buildings and site usage as a vehicle show area.

2.8 Beneath the hard-standing made ground was noted to be variable in nature, and generally comprised sand and gravel, with brick, pottery, ash, burnt shale, slag, clinker, concrete and sandstone, to depths of between 2.50m and 13.50m below ground level (bgl). A concrete obstruction was also recorded within WS5 at 0.65m.

2.9 The underlying shallow natural soils generally comprise soft to firm thinly laminated sandy gravelly clay and soft to firm silty clay (Marine Alluvium), which were recorded up to in excess of 20.45m bgl within BH1 and up to 24.50m bgl within BH2. At the location of BH2, very silty sand deposits were also noted up to 27.00m bgl, overlying firm to stiff sandy gravelly clay up to in excess of 30.00m bgl.

2.10 Bedrock was not encountered during the intrusive works.

Visual Evidence of Contamination

2.11 During the intrusive works, olfactory evidence of hydrocarbon contamination (odour) was noted within BH2, WS5 and WS6, targeted across the location of the former filling station and garage, at depths ranging between 0.30m up to 8.00m.

2.12 Although no visual evidence of free product was recorded, due to the olfactory evidence some hydrocarbon contamination was anticipated, most notably around the location of the UST's.

Groundwater

2.13 Groundwater was encountered at depths of between 1.20m and 24.50m during the intrusive works, with standing water levels of between 1.04m and 2.23m recorded during the subsequent monitoring period. When considering the hydrogeological site setting, these levels are considered to be attributable to perched water contained within the made ground and natural deposits below the site, rather than representing a continuous groundwater surface.

2.14 There was no visual and/or olfactory evidence of hydrocarbon contamination noted within groundwater encountered during the investigation. However, due to access restrictions the extent of potential contamination within the groundwater could not be fully assessed. When considering the nature of the natural deposits (cohesive and likely of low permeability), the potential risk of contamination affecting the wider water environment is considered to be low, however further assessment is recommended following removal of the UST's.

Gas Protection

2.15 The gas monitoring completed for this site recorded occasional slightly increased levels of Carbon Dioxide (up to 5.2% v/v) and Methane (up to 1.4% v/v), and as such gas protective measures in accordance with CIRIA C665 Characteristic Situation 2 (CS2) are recommended.

2.16 Taking into account previous site usage as a petrol filling station, there is also a potential risk for hydrocarbon vapour ingress into the proposed building, which could pose a risk to end users through inhalation. Therefore, it is recommended that the gas membrane also be suitably resistant to hydrocarbon vapour.

Chemical screening

2.17 As part of the investigation, eight samples of made ground were screened for Metals, Semi-metals and Polycyclic Aromatic Hydrocarbons (PAH's), whilst three samples were screened for Total Petroleum Hydrocarbons (TPH's) and five samples for Asbestos. The findings of the contamination screening are summarised in the following section.

3 CONTAMINATION ASSESSMENT

Soils

3.1 From the results of the ground investigation undertaken by 3e and assessment of the soils for a commercial end use, an elevated concentration of Lead was recorded which exceeded the adopted generic assessment criteria (GAC) for this site. In addition, five of the samples screened also tested positive for the presence of Asbestos.

3.2 From the results of the soil screening, combined with the site being underlain by low permeability clay, at this stage the potential risk to the underlying Aquifer and the wider environment (controlled waters) is considered to be low. However further assessment is recommended following removal of the UST's, as grossly impacted materials in the vicinity of the tanks could represent a potential risk if they are not remediated.

Potential risk to human health

3.3 The increased levels of Lead within the made ground could represent a potential to future site users (human health). In addition, laboratory analysis indicates the presence of Asbestos within the made ground below areas of the site, which could represent a potential risk. However, as no visual evidence of Asbestos was identified within the made ground during the investigation works, the quantities are likely to be very low.

3.4 During construction, it is recommended that conventional dust suppression techniques are be employed to reduce the risk of inhalation to construction staff. Following completion of the development, the pathway to the end user will be broken by use of hardstanding or soft landscaping capping following which the risk is considered negligible.

3.5 When considering previous site usage as a petrol station and garage, from the results of the soil screening, no significantly elevated levels of hydrocarbon contamination were identified which represent a potential risk to human health, based upon a commercial end use. In addition, when considering the potential for internal vapour migration and accumulation, the implementation of a hydrocarbon vapour barrier will negate any further risk to the proposed building and end users.

Potential Risk to Surface and Groundwater

3.6 The nearest watercourse is Figgate Burn located approximately 92m east, which flows into the Firth of Forth situated around 250m east of the site. The bedrock deposits are classified as Moderately Permeable.

3.7 During the investigation works, groundwater was encountered at depths of between 1.04m and 24.50m during the intrusive works and groundwater monitoring period. However, these levels are considered to be attributable to perched water within the made ground and natural deposits, rather than representing a continuous groundwater surface.

3.8 During the ground investigation, a significant thickness of low permeability clay was also identified below the site, which will prohibit migration to the nearby stream and provide protection to the underlying bedrock deposits, thereby negating any potential risk to the wider water environment. Taking this into account, the development of site specific remedial target values for soils and/or groundwater (DQRA) is not considered appropriate for this site, taking into account the presence of low permeability clay and anticipated isolated nature of any affected perched water.

3.9 When considering the potential for grossly affected hydrocarbon soils in the vicinity of the underground tanks, the removal of these materials will also remove the potential source from below the site further negating any potential risk. However, should any free phase product be encountered within the perched water encountered during excavation works, this will be suitably treatment and/or removed. Based on the available evidence groundwater remediation is no considered necessary for this site.

Remediation Overview

3.10 In view of the above, the most suitable form of remediation is considered removal the underground storage tanks, associated infrastructure (pipelines, etc) and any surrounding grossly affected hydrocarbon materials, followed by the emplacement of a 600mm remedial capping layer in all areas of soft landscaping to break the physical pathway between source and receptor (i.e. human health).

3.11 UKWIR testing may be required by Scottish Water if new water supply pipes are installed. It is recommended that this testing is carried out once demolition and tank removal

has been completed in order to confirm the suitability of proposed water pipes. Given the former site use as a fuel station, it is anticipated that barrier pipes will be required.

3.12 Due to the potential presence of VOC's in the made ground and need for Characteristic Situation 2 ground gas precautions a combined gas and hydrocarbon vapour resistant barrier is recommended. This will be installed by suitably competent and qualified professionals approved by the Local Authority (LA) and then appropriately validated by an appropriately qualified independent third party. In addition, the ground bearing floor slab will be well constructed with the minimum of penetrations and seals in the vapour barrier at entries in accordance with BRE414:2001: Protective measures for housing on gas contaminated land and BS8485:2007: Code of practice for the characterisation and remediation from ground gas affected developments.

3.13 At this stage, it is understood that a vibro piled foundation solution is to be utilised for this site, which is not considered to be detrimental to environmental receptors due to the proposed high proportion of hardstanding reducing infiltration, general lack of leachable contaminants in the made ground and presence of the hydrocarbon vapour barrier which would mitigate against the upward migration of any remnant VOC's in the groundwater.

4 REMEDIATION STRATEGY

4.1 The following remediation strategy details a method of working and validation that will ensure the site is left in a condition such that no significant risk is presented to human health or the water environment / adjacent sites. The strategy outlined below, is structured as follows, and details works required as part of the development:

Pre-Construction Works

- Demolition of all existing structures and removal of foundations/hard-standing.
- A 'watching brief' is required following the demolition works and removal of hard-surfacing, ground slabs, foundations and any other sub-surface structures, to confirm the absence of further unidentified contamination. This will be undertaken through on-site attendance.

Measures required following Demolition Works and Site Strip

- Further investigation works around the location of the 6 UST's and forecourt area, to confirm the location and condition of the tanks, along with further screening to assess the potential vertical and lateral extent of contamination migration (if present). These works should also confirm removal and/or decommissioning of the 3 former tanks associated with the earlier garage.
- Sampling for UKWIR analysis.

Measures required as part of Demolition and Construction Works

- Decommissioning and removal of the UST's, along with associated infrastructure (pipelines, etc), and any contaminated materials encountered around these areas.
- Provision of clean cover in limited areas of soft landscaping.
- Inclusion of gas and vapour protective measures (barrier) by qualified installers and validated by a third party independent engineer.
- Placement of water services in clean bedding and/or using protective pipework (details to be confirmed following the results of UKWIR testing).

Remediation Methodology

Decommissioning and Removal of Underground Storage Tanks (UST's)

4.2 The following remedial works should be undertaken in conjunction with the demolition and construction works:

- Safe removal of UST's and infrastructure, including; pipelines, interceptors and concrete sub-structures. At this stage, although it is assumed that the 6 known tanks have been temporarily decommissioned, an allowance should be made for degassing and cleaning of the tanks prior to removal.
- Removal of significantly impacted material from around the tanks and associated infrastructure. The surrounding soils will be initially assessed for removal by a suitably qualified engineer, followed by laboratory screening (where applicable).
- During the excavation works, any significantly contaminated material will be excavated for immediate removal off-site or suitably stockpiled on Visqueen with the edges suitably rolled to avoid any spillages/leakages, within an isolated area of the site for later removal.
- For materials where further assessment may be required these should also be stockpiled separately on Visqueen, to await the results of laboratory testing to confirm off-site disposal criteria and/or suitability for re-use.
- Following removal representative samples will be taken from the sides and base of the excavation, for appropriate laboratory validation testing, to verify the removal of all affected materials.
- If encountered, treatment and/or removal of any hydrocarbon free phase product within groundwater encountered during excavation works.
- Backfill the resultant excavation/s with clean and acceptable granular fill to an appropriate specification; Given that foundations are likely to be vibro stone columns, the granular backfill will be loosely placed in the excavation void to meet the requirements of the specialist contractor.

4.3 If during the demolition and construction works other areas of gross contamination or soils which differ from those encountered in the site investigations are exposed they will be assessed by a geo-environmental engineer from 3e Consulting Engineers as part of the 'watching brief'.

Provision of Clean Cover (Remedial Capping)

4.4 The following remedial works will likely be completed towards the end of the construction phase:

- A minimum 600mm of clean cover is to be emplaced within all areas of soft landscaping, to provide a safe and permanent barrier against the contamination present on this site. This barrier can incorporate granular materials to be emplaced as part of the site preparation works. However an overlying thickness of topsoil would be required to promote future plant growth.

4.5 Any materials brought on to site should be suitably screened and tested for human health assessment by the source supplier prior to delivery with these results sent to 3e for approval prior to delivery onto site. To confirm the suitability of these materials, validation testing will also be required following emplacement and/or importation onto site.

Gas and Vapour Protective Measures (Barrier)

4.6 Gas protective measures in accordance with CIRIA C665 Characteristic Situation 2 (CS2) are required for this development, in order to provide necessary protection to the proposed end users. Due to site usage as a petrol filling station, the gas membrane should also be suitably resistant to hydrocarbon vapour.

4.7 The design details and specification for the membrane should be in accordance with BRE414:2001: Protective measures for housing on gas contaminated land and BS8485:2007: Code of practice for the characterisation and remediation from ground gas affected developments.

Validation Requirements

4.8 Following completion of the remedial works, the following validation works are required to ensure the remedial works have been completed in accordance with the Remediation Strategy. These works will be undertaken by a suitably qualified engineer from 3e Consulting Engineers.

- Attendance on site following demolition works and removal of hard-surfacing, to confirm the absence of further unidentified contamination ('watching brief').
- Attendance on site during removal of the UST's and associated infrastructure, to confirm the removal and extent of these features, with these works to include validation screening and a photographic record.
- Attendance on site during removal of all significantly affected hydrocarbon soils from around the tanks and associated infrastructure.
- Following completion of the excavation works representative samples will be taken from the sides and base of each excavation for appropriate laboratory validation testing, to verify the removal of all affected materials. Assessment criteria are provided in **Table 1**.
- Validation of the correct installation and thickness of clean cover within all landscaped areas (600mm). This will include site attendance and photographic evidence to confirm the required thickness and construction has been attained.
- Any materials brought on to site for use within the clean cover system, or as a backfill medium following completion of the excavation works, will require validation testing to confirm the suitability of these materials for use on this site.

4.9 All imported materials to be used within areas of future soft landscaping; including topsoil/subsoil, fill for general earthworks and materials to be used as a backfill medium following removal of the tanks and associated infrastructure, will require screening for potential contaminants prior to importation onto site, using the assessment criteria for imported soils provided in **Table 2**.

4.10 The sampling frequency for these materials will be dependent upon the final volumes, nature and origin of the imported materials. Once the source of imported materials has been determined, the sampling regime will need to be agreed with the LA. For this development it is proposed to use adopt the sampling frequency shown in **Table 3**.

4.11 It should be noted that the threshold values outlined in the following table are in accordance with recently published guidance (Jan, 2015), and as such may differ slightly from the outlined within the Phase II Geo-environmental Assessment report (April, 2014).

Table 1 – Validation Following Fuel Tank Removal

DETERMINAND	COMMERCIAL END USE CRITERIA (mg/kg) IN SOIL (1)
PAH compounds:	
Naphthalene	190
Acenaphthene	84000
Acenaphthylene	83000
Fluorene	63000
Phenanthrene	22000
Anthracene	520000
Fluoranthene	23000
Pyrene	54000
Benzo(a)anthracene	170
Chrysene	350
Benzo(b)fluoranthene	44
Benzo(k)fluoranthene	1200
Benzo(a)pyrene	35
Indeno(1,2,3-cd)pyrene	500
Dibenz(a,h)anthracene	3.5
Benzo(g,h,i)perylene	3900
BTEX and TPH:	
Benzene	27
Toluene	56000
Ethylbenzene	5700
Xylenes	5900
Aliphatic EC 5-6	3200
Aliphatic EC >6-8	7800
Aliphatic EC >8-10	2000
Aliphatic EC >10-12	9700
Aliphatic EC >12-16	59000
Aliphatic EC >16-35	1600000
Aliphatic EC >35-44	1600000
Aromatic EC >5-7	26000
Aromatic EC >7-8	56000
Aromatic EC >8-10	3500
Aromatic EC >10-12	16000
Aromatic EC >12-16	36000
Aromatic EC >16-21	28000
Aromatic EC >21-35	28000
Aromatic EC >35-44	28000

Notes:

(1) LQM/CIEH S4UL 2015 guidance value for Commercial end use (based upon 1% SOM)

Table 2 – Imported Soil Assessment Criteria

DETERMINAND	RESIDENTIAL END USE CRITERIA (mg/kg) IN SOIL [1]
Metals:	
Arsenic	37
Cadmium	11
Chromium	910
Lead	450[2]
Mercury	40
Selenium	250
Copper	2400
Nickel	180
Zinc	3700
PAH compounds:	
Naphthalene	13
Acenaphthene	1100
Acenaphthylene	920
Fluorene	860
Phenanthrene	440
Anthracene	11000
Fluoranthene	890
Pyrene	2000
Benzo(a)anthracene	13
Chrysene	27
Benzo(b)fluoranthene	3.7
Benzo(k)fluoranthene	100
Benzo(a)pyrene	3.0
Indeno(1,2,3-cd)pyrene	41
Dibenz(a,h)anthracene	0.30
Benzo(g,h,i)perylene	350
TPH	
Aliphatic EC 5-6	160
Aliphatic EC >6-8	530
Aliphatic EC >8-10	150
Aliphatic EC >10-12	760
Aliphatic EC >12-16	4300
Aliphatic EC >16-35	110000
Aliphatic EC >35-44	110000
Aromatic EC >5-7	300
Aromatic EC >7-8	660
Aromatic EC >8-10	190
Aromatic EC >10-12	380
Aromatic EC >12-16	660
Aromatic EC >16-21	930
Aromatic EC >21-35	1700
Aromatic EC >35-44`	1700
Inorganics:	
Water soluble sulphate	0.5g/l[3]
Acidity (pH)	not less than 5
Asbestos	Presence

Notes:

(1) LQM/CIEH S4UL 2015 guidance value for residential with home grown produce (6% SOM)
(2) CLEA 1.04
(3) Upper level for Class 1 concrete (BRE Special Digest:2005)
Assessment criteria based on 6% soil organic matter

Table 3 – Imported Soil Testing Frequency

TYPE OF MATERIAL	FREQUENCY OF TESTING (Number of Samples)	TESTING SCHEDULE
Virgin Quarried Materials	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material	• Standard metals/metalloids
Crushed Hardcore, Stone, Brick	Minimum 3 or 1 per 500m^3	• Standard metals/metalloids • Speciated PAH's • Asbestos • Leachate analysis
Greenfield Soils	Minimum 3 or 1 per 250m^3	• Standard metals/metalloids • Speciated PAH's • Asbestos
Brownfield Soils	Minimum 6 or 1 per 100m^3 (whichever is greater)	• Standard metals/metalloids • Speciated PAH's • Asbestos • Speciated TPH's

4.12 On completion of the works a validation report will be prepared. This will outline the works carried out and include any appropriate waste transfer notes and the results of any necessary validation testing. Following this an addendum report/s will be prepared following importation of materials onto site for use within areas of landscaping, to confirm suitability.

4.13 Following installation of the gas and hydrocarbon vapour barrier, a validation report should be issued to the Local Authority by an appropriately qualified individual, which includes details of the membrane performance, details of seals at service entry points and floor slab construction.

Figures

Date	Revision	Checked	Rev.

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Project	Portobello High Street Aldi Stores Ltd		
Title	Site Location Plan		
Scale 1:25,000 at A4	Drawn CB	Checked AC	Date Apr '14
Job No. 14517	Drawing No. Figure 1		Rev 0

SITE NORTH

WS7

WS6

WS5

WS4

WS3

WS2

WS1

BH2

BH1

PORTOBELLO HIGH STREET

B6415

3

5 to 15

5

5

Garage

17 to 21

10

+9.6

BH Cable Percussion Borehole

WS Window Sample Borehole

Proposed Store Location

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Project	Portabell High Street Aldi Stores Ltd			
Title	Exploratory Hole Location Plan			
Scale 1:500	Drawn RB	Checked AC	Date Apr' 14	
Job No. 14517	Drawing No. Figure 2		Rev 0	

Appendix A

Proposed Development Plans

Store Type: CONCEPT II, 1254, flat roof

Sales Area = 1,254m² / 13,498ft²

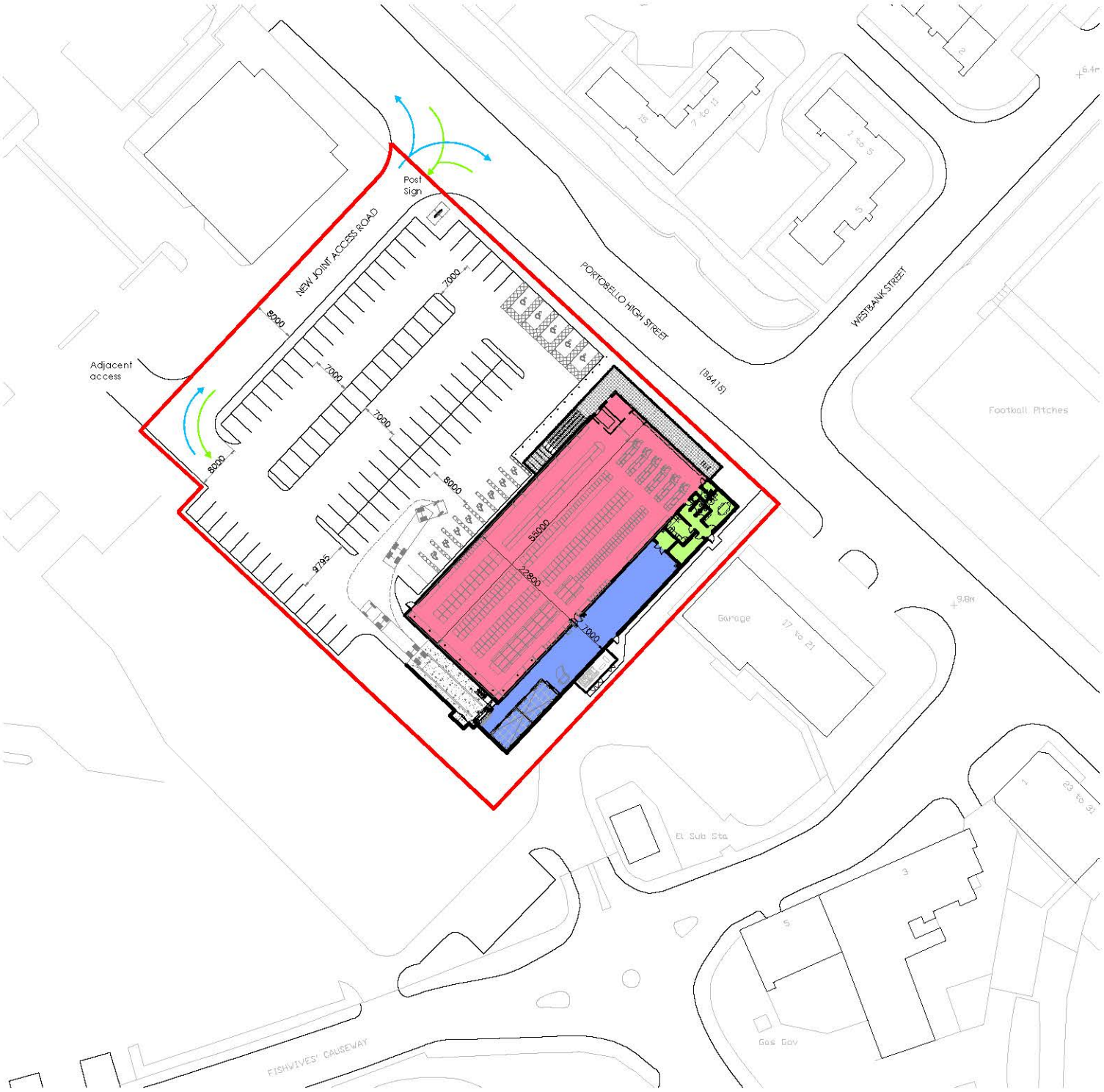
Storage = 320m² / 3,444ft²

Amenity = 100m² / 1076ft²

Site Area = 6,881m² / 1.70 acres

Vehicular Site Access

Vehicular Site Egress



Car Parking:

Standard Bays (2.7x5.0m) =89
- Accessible (3.7x6.2m) = 5
- Parent & Child (3.0x5.0m) = 8

Total = 102

Client
ALDI Stores Ltd.

Project Address
Portobello High Street
Edinburgh

Drawn PG
Checked by DM
Date 24.01.13
Scale 1:1000 @A4

Project
Aldi - Edinburgh

Drawing Title
Proposed Site Plan
[STAGE A]

Drawing Number
0058 - SK009

Revision
-

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