Chemtech Environmental Limited

SOILS

Lab number			53504-1	53504-2	53504-3	53504-4	53504-5	53504-6
Sample id			TP 1	TP 2	TP 2	TP 2	TP 3	TP 3
Depth (m)			0.10	0.10	0.60	3.50	0.10	5.50-6.00
Date sampled			12/11/2014	12/11/2014	12/11/2014	12/11/2014	12/11/2014	12/11/2014
Test	**Method**	**Units**						
Arsenic (total)	CE127 M	mg/kg As	31	15	15	10	24	32
Cadmium (total)	CE127 M	mg/kg Cd	0.4	0.4	<0.2	0.4	0.4	0.5
Chromium (total)	CE127 M	mg/kg Cr	41	48	24	38	48	51
Chromium (VI)	CE050	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	41	48	24	38	48	51
Lead (total)	CE127 M	mg/kg Pb	72	79	25	21	63	83
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 M	mg/kg Ni	34	39	35	52	36	37
Selenium (total)	CE127 M	mg/kg Se	1.8	1.8	1.2	1.5	1.5	2.1
Zinc (total)	CE127 M	mg/kg Zn	120	140	68	136	129	105
pH	CE004 M	units	6.5	7.0	6.4	7.0	7.0	7.5
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	-	-	238	601	-	700
Sulphate (total)	CE062 M	mg/kg SO_4	-	-	3712	2131	-	3385
Sulphur (total)	CE127	mg/kg S	-	-	1432	<100	-	13846
PAH								
Naphthalene	CE087	mg/kg	0.16	0.22	0.35	<0.01	0.08	0.35
Acenaphthylene	CE087	mg/kg	0.01	0.04	<0.01	<0.01	<0.01	<0.01
Acenaphthene	CE087	mg/kg	0.06	0.15	<0.01	<0.01	0.02	<0.01
Fluorene	CE087	mg/kg	0.09	0.20	0.02	<0.01	0.03	0.06
Phenanthrene	CE087	mg/kg	1.14	3.11	0.42	0.03	0.54	0.41
Anthracene	CE087	mg/kg	0.28	0.94	0.03	<0.01	0.11	0.04
Fluoranthene	CE087	mg/kg	1.70	5.70	0.16	0.03	0.93	0.25
Pyrene	CE087	mg/kg	1.32	4.34	0.15	0.03	0.76	0.20
Benzo(a)anthracene	CE087	mg/kg	0.70	2.46	0.07	<0.01	0.38	0.09
Chrysene	CE087	mg/kg	0.63	2.06	0.07	<0.01	0.33	0.11
Benzo(b)fluoranthene	CE087	mg/kg	0.75	2.37	0.07	<0.01	0.45	0.12
Benzo(k)fluoranthene	CE087	mg/kg	0.36	1.16	0.03	<0.01	0.19	0.03
Benzo(a)pyrene	CE087	mg/kg	0.57	2.02	0.04	<0.01	0.33	<0.01
Indeno(123cd)pyrene	CE087	mg/kg	0.34	1.11	0.04	<0.01	0.21	<0.01
Dibenz(ah)anthracene	CE087	mg/kg	0.06	0.23	<0.01	<0.01	0.04	<0.01
Benzo(ghi)perylene	CE087	mg/kg	0.28	0.92	0.05	<0.01	0.19	<0.01
PAH (total of USEPA 16)	CE087	mg/kg	8.44	27.0	1.49	<0.16	4.59	1.66

Chemtech Environmental Limited

SOILS

Lab number			53504-7	53504-8	53504-9	53504-10	53504-11
Sample id			TP 4	TP 5	TP 6	TP 6	TP 6
Depth (m)			0.45	0.30	0.30	0.75	4.20
Date sampled			12/11/2014	12/11/2014	12/11/2014	12/11/2014	12/11/2014
Test	**Method**	**Units**					
Arsenic (total)	CE127 M	mg/kg As	40	8.0	7.2	70	6.0
Cadmium (total)	CE127 M	mg/kg Cd	0.3	0.3	0.2	0.2	<0.2
Chromium (total)	CE127 M	mg/kg Cr	27	108	88	32	49
Chromium (VI)	CE050	mg/kg CrVI	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	54	27	11	41	15
Lead (total)	CE127 M	mg/kg Pb	55	40	16	75	23
Mercury (total)	CE127 M	mg/kg Hg	<0.5	0.5	0.5	0.5	0.5
Nickel (total)	CE127 M	mg/kg Ni	38	16	11	36	30
Selenium (total)	CE127 M	mg/kg Se	2.1	0.7	0.5	1.9	1.3
Zinc (total)	CE127 M	mg/kg Zn	102	74	45	95	102
pH	CE004 M	units	6.8	9.5	8.3	7.8	6.7
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	372	299	129	129	695
Sulphate (total)	CE062 M	mg/kg SO_4	5996	2359	1789	809	1897
Sulphur (total)	CE127	mg/kg S	1923	278	<100	10290	<100
PAH							
Naphthalene	CE087	mg/kg	0.26	0.18	0.10	1.03	<0.01
Acenaphthylene	CE087	mg/kg	<0.01	0.04	<0.01	<0.01	<0.01
Acenaphthene	CE087	mg/kg	<0.01	0.48	<0.01	0.13	<0.01
Fluorene	CE087	mg/kg	<0.01	0.35	<0.01	0.10	<0.01
Phenanthrene	CE087	mg/kg	0.28	2.41	0.26	0.57	<0.01
Anthracene	CE087	mg/kg	0.03	0.70	0.05	0.05	<0.01
Fluoranthene	CE087	mg/kg	0.22	3.35	0.51	0.11	<0.01
Pyrene	CE087	mg/kg	0.19	3.50	0.64	0.10	<0.01
Benzo(a)anthracene	CE087	mg/kg	0.12	1.59	0.36	0.04	<0.01
Chrysene	CE087	mg/kg	0.12	1.63	0.52	0.05	<0.01
Benzo(b)fluoranthene	CE087	mg/kg	0.15	2.00	0.41	0.03	<0.01
Benzo(k)fluoranthene	CE087	mg/kg	0.05	0.94	0.15	0.03	<0.01
Benzo(a)pyrene	CE087	mg/kg	0.09	1.93	0.30	0.04	<0.01
Indeno(123cd)pyrene	CE087	mg/kg	0.05	1.10	0.18	<0.01	<0.01
Dibenz(ah)anthracene	CE087	mg/kg	<0.01	0.20	<0.01	<0.01	<0.01
Benzo(ghi)perylene	CE087	mg/kg	0.06	0.92	0.20	<0.01	<0.01
PAH (total of USEPA 16)	CE087	mg/kg	1.62	21.3	3.68	2.27	<0.16

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE050	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO_4
CE062	Sulphate (total)	Acid extraction, ICP-OES	Dry	M	100	mg/kg SO_4
CE127	Sulphur (total)	Acid extraction, ICP-MS	Dry		100	mg/kg S
CE087	PAH (speciated)	Solvent extraction, GC-MS	Wet		0.01	mg/kg

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
A	Sampling date not provided
B	Sampling time not provided (waters only)
C	Sample exceeded holding time(s)
D	Sample not received in appropriate containers
E	Headspace present in sample container
F	Sample not chemically fixed (where appropriate)
G	Sample not cooled
H	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
53504-1	TP 1	0.10	N	
53504-2	TP 2	0.10	N	
53504-3	TP 2	0.60	N	
53504-4	TP 2	3.50	N	
53504-5	TP 3	0.10	N	
53504-6	TP 3	5.50-6.00	N	
53504-7	TP 4	0.45	N	
53504-8	TP 5	0.30	N	
53504-9	TP 6	0.30	N	
53504-10	TP 6	0.75	N	
53504-11	TP 6	4.20	N	

Contaminant	Intended Land Use				
	Commercial/Industrial End Use (mg/kg)				
	Human Health	Phytoxicity			
		pH 5.0-5.5	pH 5.5-6.0	pH 6.0-6.5	pH >7.0
Arsenic	640	50			
Cadmium	230	3			
Chromium	5,000	400			
Chromium (VI)	35	-			
Lead	750	300			
Mercury	26	1			
Nickel	1,800	50	60	75	110
Selenium	13,000				
Copper		80	100	135	200
Zinc		200	200	200	300

Notes:

The assessment values are the Soil Guideline Values derived by DEFRA and Environment Agency using the '*Contaminated Land Exposure Assessment*' model. The assessment concentrations for arsenic, cadmium, nickel, mercury and selenium are outlined in the Environment Agency's Science Report series SC050021. These are based on a sandy loam soil and 6% soil organic matter.

The assessment concentrations for the remaining metals/metalloids are described in the Contaminated Land Report Series (CLR), which have now been withdrawn. The SGV threshold value is not intended to be applied to individual sample results where materials are similar, as the levels of contaminants will have a natural variability across the site. The modified mean value should instead be compared with the SGV.

The assessment values for phytotoxicity are levels at which plant growth is thought to be affected. These are taken from the maximum permissible and advisable concentrations in soil after application of soil sludge given in the '*The Code of Good Agricultural Practice for the Protection of Soil*', MAFF, 1998.

The assessment criterion for chromium (VI) have been taken from Nathanail, C. P., McCaffrey, C., Ashmore, M. H., Cheng, Y. Y., Gillett, A., Ogden, R. & Scott, D., 2009 '*The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment 2nd Edition*', Land Quality Press, Nottingham. These are also all based on a sandy loam soil and 6% soil organic matter.

Prepared	AJK	Typist	AJK	Checked	CAT	Date	1.12.2014	Job No	37688

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SAFESTYLE UK LTD

GENERIC ASSESSMENT CRITERIA

COMMERCIAL/INDUSTRIAL

Organic Compounds	Intended Land Use Commercial (mg/kg)		
	1% SOM	2.5% SOM	6% SOM
Naphthalene	200	480	1100
Acenaphthene	85,000	98,000	100,000
Acenaphthylene	84,000	97,000	100,000
Fluorene	64,000	69,000	71,000
Phenanthrene	22,000	22,000	23,000
Anthracene	530,000	540,000	540,000
Fluoranthene	23,000	23,000	23,000
Pyrene	54,000	54,000	54,000
Benzo(a)anthracene	90	95	97
Chrysene	140	140	140
Benzo(b)fluoranthene	100	100	100
Benzo(k)fluoranthene	140	140	140
Benzo(a)pyrene	14	14	14
Dibenz(a,h)anthracene	13	13	13
Indeno(1,2,3-cd)pyrene	60	61	62
Benzo(g,h,i)perylene	650	660	660
Phenol	1,100,000	1,100,000	3,200
Benzene	~	~	95
Toluene	~	~	4,400
Ethylbenzene	~	~	2,800
o-Xylene	~	~	2,600
m-Xylene	~	~	3,500
p-Xylene	~	~	3,200

The assessment criteria for the sixteen polycyclic aromatic hydrocarbon (PAH) species covered under the USEPA test have been taken from Nathanail, C. P., McCaffrey, C., Ashmore, M. H., Cheng, Y. Y., Gillett, A., Ogden, R. & Scott, D., 2009 *'The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment 2nd Edition'*, Land Quality Press, Nottingham. This is also the case for phenol at 1% and 2.5% SOM. These are also all based on a sandy loam soil.

The assessment values for phenol (6% SOM) and the BTEX compounds are the Soil Guideline Values derived by DEFRA and Environment Agency using the '*Contaminated Land Exposure Assessment*' model. These are outlined in the Environment Agency's Science Report series SC050021. The threshold value is not intended to be applied to individual sample results where materials are similar, as the levels of contaminants will have a natural variability across the site. The modified mean value should instead be compared with the threshold value.

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GENERIC ASSESSMENT CRITERIA

COMMERCIAL/INDUSTRIAL

TPH Fraction	Intended Land Use Commercial (mg/kg)		
	1% SOM	2.5% SOM	6% SOM
Aliphatic EC 5-6	3,400	6,200	13,000
Aliphatic EC >6-8	8,300	18,000	42,000
Aliphatic EC >8-10	2,100	5,100	12,000
Aliphatic EC >10-12	10,000	24,000	49,000
Aliphatic EC >12-16	61,000	83,000	91,000
Aliphatic EC >16-35	1,600,000	1,800,000	1,800,000
Aliphatic EC >35-44	1,600,000	1,800,000	1,800,000
Aromatic EC 5-7	28,000	49,000	90,000
Aromatic EC >7-8	59,000	110,000	190,000
Aromatic EC>8-10	3,700	8,600	18,000
Aromatic EC >10-12	17,000	29,000	345,000
Aromatic EC >12-16	36,000	37,000	37,800
Aromatic EC >16-21	28,000	28,000	28,000
Aromatic EC >21-35	28,000	28,000	28,000
Aromatic EC >35-44	28,000	28,000	28,000

The assessment criteria for each of the petroleum hydrocarbon fractions have been taken from Nathanail, C. P., McCaffrey, C., Ashmore, M. H., Cheng, Y. Y., Gillett, A., Ogden, R. & Scott, D., 2009 *'The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment 2nd Edition'*, Land Quality Press, Nottingham. These are also all based on a sandy loam soil.

Within the Environment Agency Science Report P5-080/TR3, Askari, K. & Pollard, S., 2005 *'The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils'* it is stated that the assessment values should not be considered individually; instead the potential additive effects should be calculated. This is achieved by calculating an individual Hazard Quotient (HQ) for each fraction. The HQ is the proportion of the assessment concentration represented by the recorded concentration. The HQs are then added together to form a Hazard Index (HI) and where this exceeds unity a potential significant risk to human health may exist.

Where only a TPH screen is undertaken, the assessment value used should be taken as the most onerous value given for individual carbon bands, as described above. This should be the assessment for Aliphatic band EC>8-10, assuming a SOM value of 1%. The assessment value should therefore be taken as 2,100 mg/kg.

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GENERIC ASSESSMENT CRITERIA

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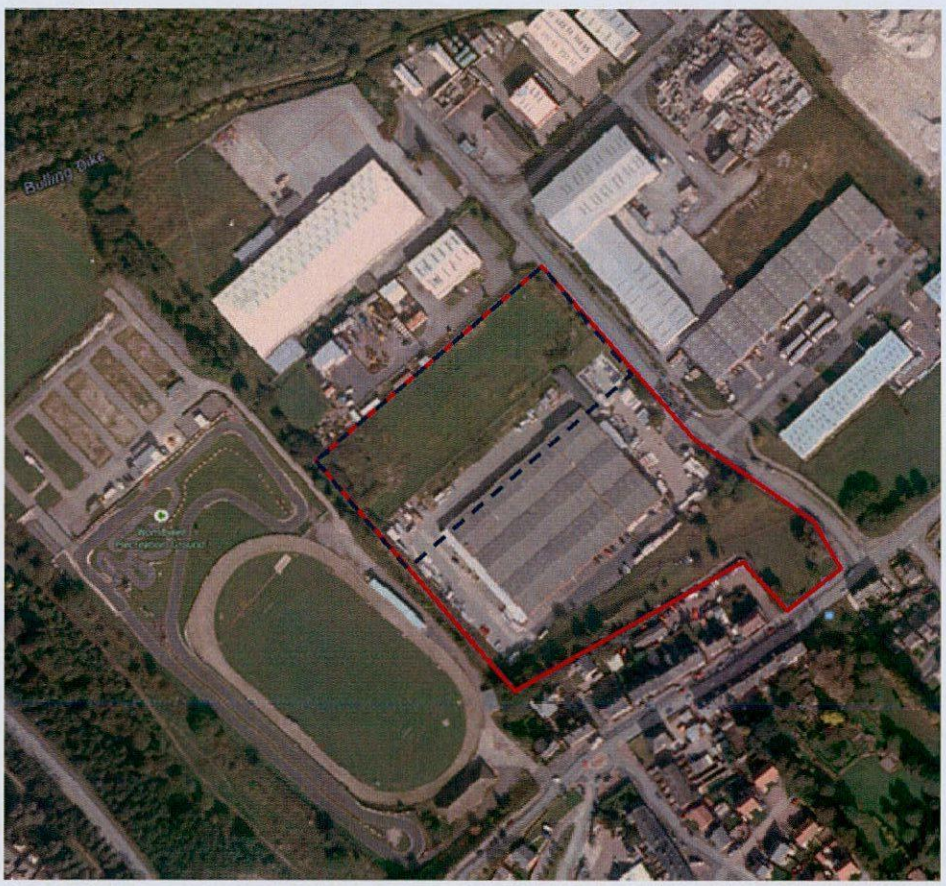
E P

FLOOD RISK ASSESSMENT

SAFESTYLE FACTORY EXTENSION
VALLEY ROAD, WOMBWELL

FOR

SAFESTYLE UK LTD



37825-001

January 2015

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FLOOD RISK ASSESSMENT

SAFESTYLE FACTORY EXTENSION
VALLEY ROAD, WOMBWELL

FOR

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Job No.	:	37825
Report Status	:	Issue 1
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S R Ellis

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Yorkshire Water	Sewer record plan

1.0 THE DEVELOPMENT & NATIONAL PLANNING POLICY GUIDANCE

1.1 Introduction

This Flood Risk Assessment has been prepared in accordance with the National Planning Policy Framework (March 2012) on behalf of Safestyle UK Ltd. Any other parties using the information in this report do so at their own risk, unless previously approved in writing.

The project comprises the proposed extension of an existing factory.

1.2 Site Location & Description

The site is located in an industrial estate to the north-east of Wombwell, at OS grid reference SE 403 034. The site is bounded by Valley Road to the east, housing on Station Road to the south, Wombwell Recreation Ground to the west and industrial units to the north.

The site of the proposed extension comprises 1.2 ha of car park, service yard and scrubland to the north-west of the current factory.

The nearest watercourses are Bulling Dike and the River Dove; 240 m and 360 m to the north of the site, respectively. These watercourses outfall to the River Dearne which lies 2 km to the east of the site.

1.3 Site Layout

The site is to be developed with a 5,500 m^2 industrial building and a service yard. An indicative site layout is appended.

1.4 Site Levels

The site slopes downwards from north-west to south-east. The high point of the site is at 30.75 mAOD. The level of the existing service yard is between 27.60 and 27.80 mAOD. The floor level of the factory is not recorded on the topographical survey but is at least 27.80 mAOD.

Around the site, the site boundary with the recreation ground is bunded to a height of at least 28.50 mAOD. Beyond the site, Valley Road falls from 28.95 mAOD at the northern site boundary to 25.90 mAOD at the junction with Station Road,

1.5 Environment Agency Flood Map

The Environment Agency flood map shows the factory and the proposed extension to lie in flood risk Zone 2, that is, in an area at moderate risk of flooding where the presence of flood defences are not taken into account. Flood Zone 2 indicates the extent of a flood with a 0.1% (1 in 1,000) chance of happening each year or the extent of a recorded historic flood, whichever is greater.

1.6 Barnsley Metropolitan Borough Council - Strategic Flood Risk Assessment

The Level 1 Strategic Flood Risk Assessment was undertaken by JBA Consulting in September 2010. The flood maps show the site to lie in Zone 2.

1.7 Planning Practice Guidance to the National Planning Policy Framework

The Planning Practice Guidance "Flood Risk and Coastal Change" sets out the principles for assessing the suitability of sites for development, in relation to flood risk, as part of the planning process. A risk-based approach is adopted through a strategic approach with regard to site selection and a methodology for managing flood "pathways" and reducing the adverse consequences of flooding.

Initially the "Sequential Test" is applied to the allocation of land suitable for development.

This section of the report assesses the suitability of the development under the National Planning Policy Framework. It is not the intention of this report to provide a full Sequential Test assessment.

1.7.1 Sequential Test

Table 2 of the Guidance provide details of vulnerability classifications for particular types of development in relation to flood risk zones. Industrial use is classed as "Less Vulnerable".

Table 3 indicates that "Less Vulnerable" development is compatible with Flood Zones 1, 2 and Zone 3a and incompatible with Zone 3b.

1.7.2 Climate Change

An issue emphasised in the Guidance is the requirement to take account of potential climate change effects. New development is generally accepted as having a 100 year design life for flood risk purposes. The Environment Agency's report "Climate change allowances for

planners" recommends a 30% increase in peak rainfall intensity is taken into account for design horizons up to 2115.

1.8 Application of the Sequential Test

The current flood zone maps indicate that the development will be appropriate to the site. Thus, application of the Sequential Test can be demonstrated.

2.0 FLOOD RISK

2.1 Potential Sources of Flooding

The Environment Agency and Strategic Flood Risk Assessment maps are intended for general guidance on flood risk and it is also necessary to consider other, more detailed, sources in relation to local factors.

2.1.1 Fluvial

Modelled river levels for Bulling Dike and the River Dove have been received from the Environment Agency and are presented in the table, below.

Modelled river levels			
	1 in 50 yr	**1 in 100 yr**	**1 in 100 yr + CC**
BUL01_3367	26.36 mAOD	26.42 mAOD	26.56 mAOD
DOVE01_1799	28.56 mAOD	28.37 mAOD	28.54 mAOD
DOVE01_1524	26.95 mAOD	27.01 mAOD	27.09 mAOD

River Dove Mapping Study, JBA Consulting, 2009

Chainage 3367 on Bulling Dike and chainage 1799 on the River Dove are on or immediately upstream of the site. Chainage 1524 on the Dove is downstream of the site, between Valley Road and Stonyford Road.

Site levels are higher than the modelled river levels for Bulling Dike.

There is raised land to the north of the site which protects it from upstream flooding from the River Dove. However, ground levels around Stonyford Bridge and levels on Station Road suggest that there is a potential overland flood route along these roads with flood water approaching the site from the south-east. Chainage 1524 is the likely point at which the River Dove begins to spill onto Stonybridge Road and Station Road. Thus, the modelled river levels for chainage 1524 are taken to be the design flood levels for the site. We have no information on modelled river levels for events in excess of the 1 in 100 year plus climate change event.

The site is elevated some 4 m above the River Dearne and is not within the influence of this river.

2.1.2 Surface water

The Environment Agency surface water flood risk map shows the site to be at very low risk of flooding.

2.1.3 Groundwater

Groundwater is a potential flood risk to areas which are low lying and on permeable ground or, occasionally, to areas of higher ground in the vicinity of springs. These conditions do not apply to this site.

2.1.4 Sewerage

The site may be at risk of flooding resulting from surcharging of the local drainage system. However, the surrounding sewers are owned and maintained by Yorkshire Water. Barnsley MBC's Preliminary Flood Risk Assessment shows that there are no recorded capacity issues or historic flooding associated with these sewers.

2.2 Historic Flooding

The Environment Agency's historic flood map shows that existing factory flooded in 2007. Barnsley MBC's Preliminary Flood Risk Assessment shows the factory is on the 2007 flooded properties register.

Anecdotal evidence from site staff provides evidence of flood depth and flood extents across the site. Site staff note that flood water flowed from the east and that flooding was due to blockage at Stonyford Bridge. Water flooded buildings on the eastern side of Valley Road to depths of between 150 mm and 1000 mm and flooded the car park on the western side of Valley Road to a depth of about 50 mm. The existing factory on the western side of Valley Road was not flooded.

From this information we can estimate the level of flood water to be about 27.70 mAOD.

2.3 Residual Flood Risk

The site is at risk of flooding from the River Dove for exceptional events in excess of the 1 in 100 year plus climate change event. New building levels will be set at existing building level to allow level access between the buildings. Existing floor level is at least 700mm above the

downstream River Dove 1 in 100 year plus climate change level and at least 100 mm above the 2007 flood level.

For residual risk in excess of the 1 in 100 year plus climate change event the following flood mitigation measures are suggested.

2.4 General Flood Mitigation Measures

Flood resilient construction and materials may be provided to a height of 300 mm above finished floor level.

Building owners should sign up for the Environment Agency flood warning scheme operating in the area.