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CONTAMINATION MIGRATION PILING RISK ASSESSMENT

Proposed Marstons Public House Bognor Regis

CLIENT: Marstons

JOB NO: 13174

DATE: March 2017

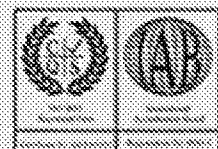


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1.0 INTRODUCTION

A Contamination Piling Risk Assessment has been prepared as part of the proposed construction of a new Marstons Public House for the site known as Shripney Road, Bognor Regis.

1.1 Site Location and Description

Site Address	Proposed Marstons Public House, Shripney Road, Bognor Regis, PO22 9NG
National Grid Reference	494212E, 100849N

The site comprises an irregular shaped parcel of land. The site of the proposed Marstons is currently unoccupied, the previous buildings on site have been demolished and the demolition materials removed. The site is level and generally covered in concrete hardstanding. No visible evidence of contamination was noted on the surface of the site.

A review of the previous site investigations reports suggests that the site was previously occupied by commercial units, including a manufacturer of refrigeration plant. The eastern area of the site was used to store materials including timber pallets and shipping containers. A detailed synopsis of the historic land uses can be found in the Enzygo Site Investigation report.

1.2 Background

This Contamination Piling Risk Assessment has been developed due consideration of the regulatory authorities requirement to demonstrate that the proposed construction works will not present any unacceptable risk to controlled waters of the wider environ.

The Environment Agency recommends that when considering any piling for deep building foundations on contaminated sites underlain by aquifers, a suitable risk assessment should be completed to inform the decision making process.

The proposed public house building footprint is underlain by variable matrices of soft gravelly-clay and weak chalk.

1.3 Ground Conditions & Contamination Distribution

A detailed Ground Investigation and Contamination Risk Assessment has been completed by Enzygo Ltd as detailed within their report (Geo environmental Report: Proposed Marstons, Shripney Road, Bognor Regis, PO22 9NG dated August 2016 (ref: CRM.413.111); The Salient features of which are summarised below.

Ground Conditions are described by Enzygo as:

Ground conditions were noted to comprise Made Ground over River Terrace Deposits and structureless Chalk to 3.50m bgl and Grade C Chalk and Grade B Chalk below 3.50m bgl. Groundwater was encountered at depths of between 1m and 1.7m bgl.

Asbestos and Dibenzo(a,h)Anthracene have been identified within the Made Ground. It is recommended that cover soils are provided to soft landscape areas. Elevated PAH have been measured in shallow groundwater.

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1.4 Remediation Works

Previous solvent contamination has been encountered in the underlying chalk however the site has been remediated with the approval and sign off of the Environment Agency and therefore the risk to the underlying chalk and groundwater has been dismissed. The risk to surface waters has also been dismissed given that remediation has been encountered and no new pathways are anticipated.

Widespread contamination from PAH's has not been identified at the site to date, nor is it expected. Any unforeseen gross contamination will be excavated out and disposed of appropriately.

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2.0 Contamination Piling Risk Assessment

The purpose of the piling risk assessment is to ensure that the proposed piling method will not have an adverse impact by creating new pathways for the migration of contamination, considering the protection both of water resources and human health.

Two main generic piling methods, including displacement piles and non-displacement piles, are considered in the Environment Agency's guidance on 'Piling into contaminated sites'.

The Environment Agency's guidance document, Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (2001) considers six pollution scenarios.

It should be noted that the installation of displacement piles would involve using a driven pile and therefore for the purpose of the risk assessment displacement piling methods are assessed separately in Table 2.1.

Table 2.1 Potential Pollution Scenario

Generic Pollution Scenario	Site Considerations
Creation of preferential pathways associated with potentially soluble phase compounds within the perched aquifer.	The low permeability clay extending from depths of circa 1.00m to 2.0m will act to severely limit any vertical migration of soluble phase contaminants.
Exaggeration of lateral mobility of soluble phase compounds through general piling works that would reduce the general perched groundwater level.	The proposed use of a driven pile that will puncture and displace a clay aquitard while minimising the potential for any vertical migration will help to stabilise the shallow perched aquifer and negate any exaggerated movement. The land remediation works to remove all potential sources of soluble phase compounds and impact to the shallow perched aquifer has significantly reduced the overall risk to controlled waters.
Direct contact with the pile and potentially contaminated soil and leachable compounds.	The piles have been designed in due consideration of the known sulphate and PH regime for a mobile state environ and as such the risk is limited through design.
Pushing of any solid phase compounds downwards during piling operations.	The contaminated land assessment has not identified any significant quantities of solid phase contamination within the footprint of the proposed public house (and piling works). Furthermore, if any localised solid phase compound was inadvertently pushed downwards during piling, the soil would be quickly displaced laterally and as such the migration would be very minimal. Additionally, pile points are to be provided to all piles in order to limit vertical displacement of any localised solid phase compound.

2.2 Recommended Piling Scenario

The above table indicates that a displacement piling method, employing pre-cast driven piles is considered to be the best available technique given the contaminated nature of the made ground and characteristics of the underlying geology.

The displacement piling technique was selected as the most suitable for the following reasons:

- The technique displaces the soils laterally with the assistance of the provided pile points, with no contaminated arisings at surface, and therefore there is no risk of exposure of ground workers or other receptors to airborne asbestos fibres and other contaminants present in the made ground;
- There is no potential risk of spreading Japanese Knotweed into the shallow soils above the existing membrane, as no arisings are generated; and,
- Non-displacement piling techniques would generate a significant quantity of potentially contaminated spoil necessitating on-site pre-treatment and the off-site disposal of contaminated soil, resulting in significant environmental impacts associated with landfill disposal and vehicle movements, contrary to the sustainable development principles established for the QEOP; displacement piling will avoid these environmental impacts.

2.3 Environmental Considerations

One of the usual concerns expressed about the use of displacement piling on contaminated sites is the perceived likelihood of driving contaminated soil into aquifer units and introducing potential contamination pathways. The Environment Agency science report, *Piling in layered ground: risks to groundwater and archaeology* (2006) summarises the results of physical modelling of the disturbance caused to the ground by different piling methods, including the movement of contaminated soil associated with driven piles and changes in overall permeability of layered soil (aquitard) in the vicinity of a pile.

The report records three transport mechanisms. Firstly, a small amount of contaminated soil may be trapped and pushed down beneath the base of a flat-ended solid pile. A tendency for this soil to be shed around the sides of the pile within a clay layer was observed in some tests. However, the report concludes that the use of a pointed pile tip can eliminate this transport mechanism.

The second mechanism involves a larger volume of soil forced to move down ahead of the advancing pile and into the upper part of an underlying softer layer. Here, most of it (apart from that trapped beneath the base of a flat-ended pile) is left behind as the pile moves on and, importantly, no new soil is dragged-down as it does so. Given that the stratigraphy at Bognor Regis will involve driving piles through soft deposits into chalk, the potential for driving contaminated soil ahead of piles is very low.

The third mechanism involves the potential for carrying coarse-grained contaminated soil down within re-entrant sections, notably between the flanges of H-section piles, through a plugging mechanism. However, the proposed pre-cast driven piles for the proposed public house will have a square section and therefore will not be susceptible to this mechanism.

The results of the experiments also indicate that solid cylindrical piles effectively seal when driven through a clay layer with a thickness of 2 or more pile diameters. The square section driven piles, proposed for Bognor Regis, are expected to seal as well as cylindrical ones, given the similarity of the deformation mechanism seen in the tests.

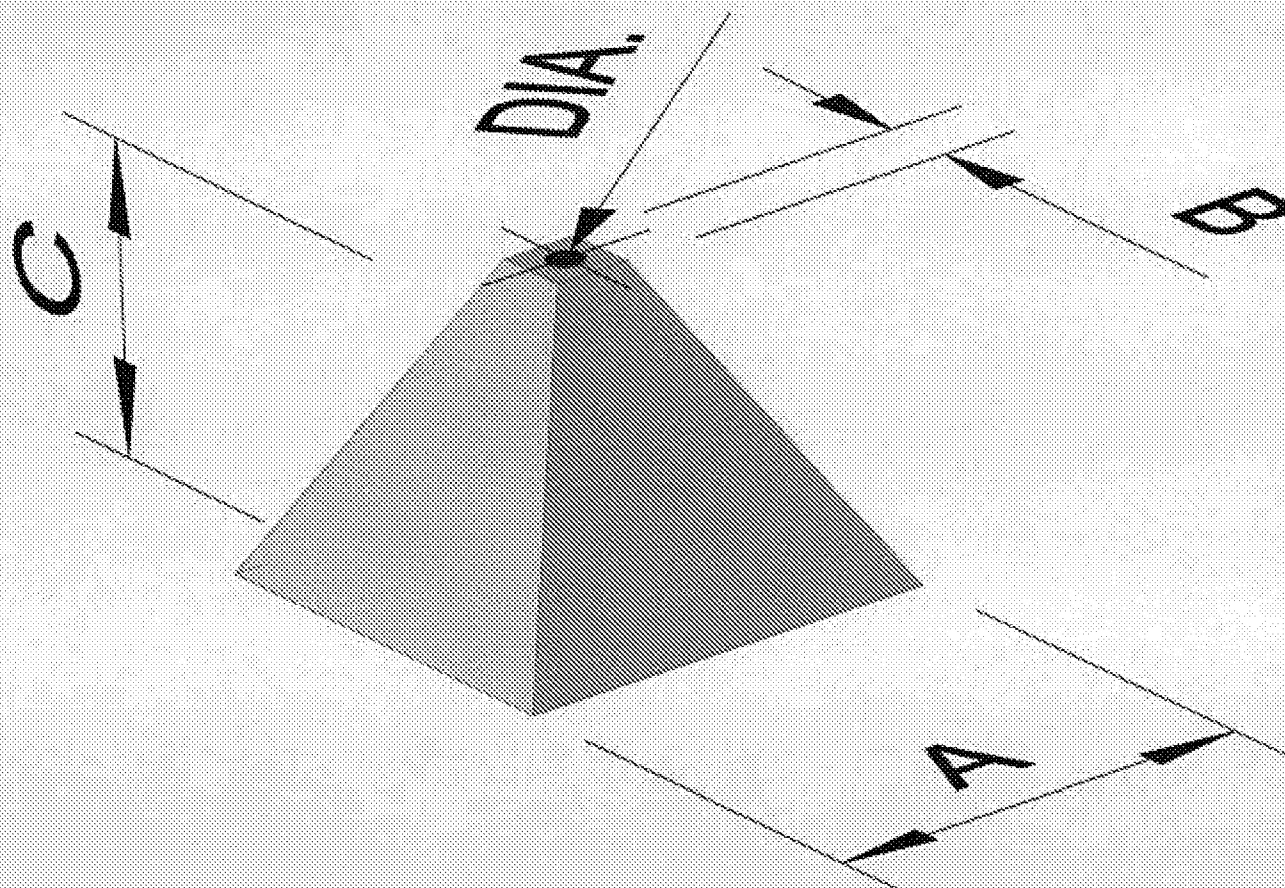
Pre-cast driven piles proposed for the Marston's Public House development would be constructed to a maximum depth of approximately 13m bgl and the piles will penetrate the near surface cohesive layers. However, as the proposed pile sizes are between 200mm and 300mm and the cohesive layers range in thickness up to 1.0m, the experimental results indicate that an effective seal should be achieved.

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2.4 Environmental Benefits

The preferred driven piling method offers a piled solution that minimises waste generation and impact on the environment (other than noise and vibration considerations). By minimising the off-site disposal of contaminated soils and associated vehicle movements, and avoiding the use of valuable landfill capacity in the South East is promoting sustainable development solutions.

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Precast Pile Size	Dim A	Dim B	Dim C	Hole Dia.
200 x 200	180mm	50mm	200mm	18mm
250 x 250	230mm	50mm	200mm	24mm
300 x 300	280mm	50mm	200mm	24mm

NOTES

THIS DRAWING IS BASED ON:

A - JR Dwg 3002001

B -

C -

REF: DRAWING REFERENCE

REV: DATE: DESCRIPTION



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DRAWING: CONSTRUCTION: APPROVED: CONSTRUCTION:
PROJECT: CONSTRUCTION: APPROVED: CONSTRUCTION:

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Concrete Piles

Convex Shoes

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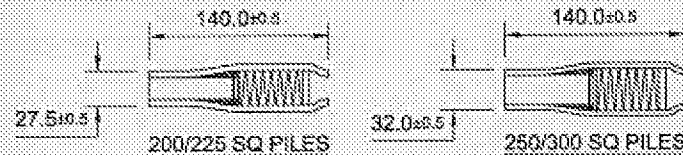
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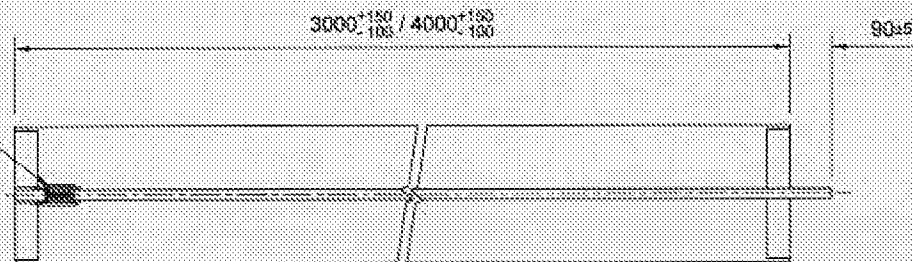
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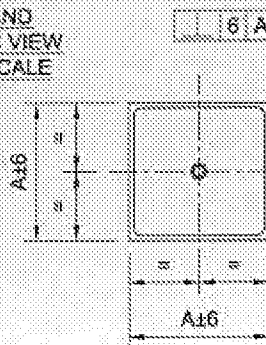
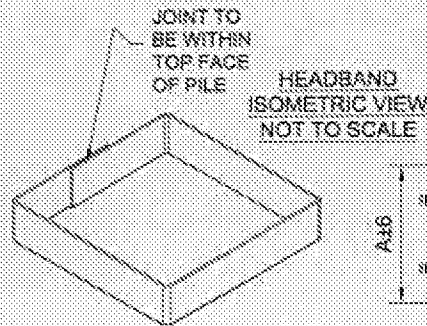
RB COLLET ASSEMBLIES



COLLET ASSEMBLY



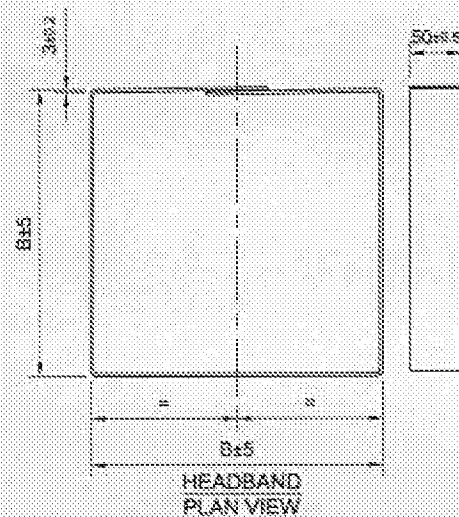
TOP ELEVATION



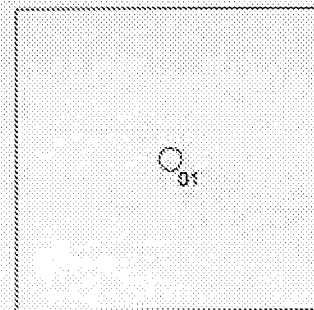
HEADBAND
SIDE ELEVATION

HEADBAND

PILE SIZE (A)	HEADBAND (B)
200	185
225	210
250	235
300	285



HEADBAND
PLAN VIEW



SECTION A-A

BENDING SCHEDULE

ALL DIMENSIONS IN ACCORDANCE WITH BS 5950:2005 U.K.S.

Member	Bar No.	Type	Size	No. Mtrls	No. Bars in each	Total No.	Length of each bar	Where Cut	A	B	Bar No.
200SQ PILE											
3m	01	H	16	1	1	1	2950	00	2947		
4m	01	H	16	1	1	1	3950	00	3947		
225SQ PILE											
3m	01	H	16	1	1	1	2950	00	2947		
4m	01	H	16	1	1	1	3950	00	3947		
250SQ PILE											
3m	01	H	20	1	1	1	2850	00	2847		
4m	01	H	20	1	1	1	3850	00	3847		
300SQ PILE											
3m	01	H	20	1	1	1	2950	00	2947		
4m	01	H	20	1	1	1	3950	00	3947		

NOTE: STRAIGHT BAR DIMENSIONS ARE NOMINAL & MAY REQUIRE INCREASING / DECREASING TO MEET TOLERANCE.

CONCRETE CLASS - C40

CONCRETE GRADE - C40/50 WITH A MINIMUM COMPRESSIVE STRENGTH OF 50N/mm² AFTER 14 DAYS.

ALL REINFORCEMENT CONFORMING TO BS 4449:2005 HIGH YIELD fy = 500N/mm²

MANUFACTURED IN ACCORDANCE WITH BS EN12754 & THE LATEST REVISION OF THE ROGER BULLIVANT PILE MANUFACTURING PROCEDURE DOCUMENT - W991.



Safety, Health & Environment

No significant or unusual risks identified.

CONSTRUCTION

REV. DATE DESCRIPTION

ROGER BULLIVANT
REGIONAL DEPARTMENT
P.O. BOX 1000, DUNDEE, DUNDEE, DUNDEE
DUNDEE, DUNDEE, DUNDEE

POC COLLET/SPIGOT PILE
3m/4m SECTION

NTS NOV 11 MHP

RB/PILE/COLLET-4M



From: SHEWARD Timothy
To: Andrew de Croos
CC: SPAREY Christian
Date: Mon, 21 Nov 2016 16:46:30 +0000
Subject: Marstons Public House
Attachment(s): 3

Hi Andrew,

Further to our earlier telephone conversations regarding the piling works for the above development we have looked further at the site investigation report and would comment as follows.

The report states that the Environment Agency has considered that there is unlikely to be a significant contamination risk to Chalk groundwater on this site. There has however been identified an elevated PAH result from a sample taken at 0.2m below ground level in WS4.

We propose the installation of precast concrete driven piles furnished with a point at the end of the pile. This point will push sideways any ground that is encountered beneath the toe thus greatly minimising the risk of any potential drag down of contaminated material into the aquifer beneath. In addition as indicated by WS4 there is clay beneath this contamination which will adhere to the shaft of the pile locking the contamination into the ground above the chalk. This pointed shoe is connected to the pile by means of a Collet mechanical joint which is the same as that used to connect the pile sections together.

We trust the above statement is of some assistance, should you require further information please don't hesitate to contact us.

Kind regards,

Tim.

For and on behalf of Roger Bullivant Limited

Tim Sheward

Technical Manager

cid:image019.png@01D147C2.9325A380

Roger Bullivant Limited

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line 2

See our interactive Foundation Package webpage: <http://www.roger-bullivant.co.uk/in/rbhouse.html>

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