

KSL Planning
Environment Agency

By email only: KSLPLANNING@environment-agency.gov.uk

Date: 08 February 2023
Your Ref:
Our Ref : TV/2813/15273
email : toby@herringtonconsulting.co.uk

Dear Sirs,

We write to you on behalf of the applicant for the proposed development at **Custom House, The Terrace, Gravesend, DA12 2BW** in response to the Environment Agency (herein referred to as "EA") objection.

Please find the updated report by CTP Engineers to address the comments made by the EA in their latest response dated 25th January 2023 (**Ref: KT/2021/128685/04-L01**).

The following information and attached report have been provided by CTP in response to the final outstanding items to overcome the objection as confirmed by the EA:

- **Removal of existing asset** – this is confirmed in the updated attached report, for both the new proposed flood wall as well as the flood gate.
- **Confirming Buildability** - This latest report confirms the buildability of the new proposed flood defences and addresses further points made by the EA in Section 6 , Section 7 and Section 8. We would like to clarify that this option (full replacement of new defences) is confirmed as the only option at this stage and is not a fall back position. The buildability is further confirmed by the construction methodology report by Knights Brown Construction , an experienced marine projects contractor -further details in the attached report.

We feel the applicant has now provided more than sufficient information that can reasonably be requested at this stage, and we note that the final design will still be subject to the EA's approval.

The applicant has clearly demonstrated that an appropriate strategy is available to meet the EA requirements and any further technical details can be provided as part of the detailed design and secured through appropriate worded planning conditions.

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We therefore request that the EA review the additional information provided in detail, and I trust that sufficient information has been provided at this stage to allow the application to progress.

Yours faithfully

Toby Vaughan BSc (Hons) MCIWEM
Senior Flood Risk Analyst

Documents Appended:

- CTP Consulting Engineers '*Custom House River wall Remedial works Report P5 final 07.02.23*'



Project Name: Custom House River Wall

Remedial Works Report

Date: February 2023

Project Number: A7752

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Appendix A – Drawings of remedial works

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Document Status and Signatures

Document Status		
Document Reference: A7752-02		
Issue Date	Version	Rev
27 May 2022	First Draft Issue	P1
21 June 2022	Comments incorporated	P2
23 June 2022	Comments incorporated	P3
15 December 2022	Revision to report	P4
06 February 2023	Revision to report	P5

File location: \\neptune\\main\\Jobs\\A7750-A7999\\A7752\\4 - Reports and Specifications

Signed on behalf of CTP	
	
Prepared by:	Robert Byrneham - BEng (Hons) MSc CEng MICE
	
Reviewed by:	CC Neil Casey – BEng CEng MStructE

1.0 Introduction

- 1.1 This supplementary report has been prepared following Environment Agency comments received in letter reference KT/2020/127776/08-L01ENVPAC/1/KSL/00360 dated February 2022 & Comments received on 11th November reference KT/2021/128685/03-L01. The report also takes into account comments received 25th January 2023 reference KT/2021/128685/04-L01.
- 1.2 This report goes demonstrates the replacement to both different wall types with a new sheet piled solution. The aim of this report is to enable the Environment Agency to remove their objection to the development planning permission. The existing tidal flood defence asset including the floodgate will be removed. and the sheet pile to be cut below existing ground levels.
- 1.3 This report should be read in conjunction with CTP inspection report reference A7752-01, which detailed the existing condition of the structure, the remedial works options and conclusions presented in A7752-01 are superseded by the proposals contained within this report (A7752-02).
- 1.4 All of the proposals in this report are subject to detailed/ technical design at pre-commencement stage. To be agreed and approved by the Environment Agency.

2.0 Existing Steel sheet piled wall in tidal zone

- 2.1 The length of wall at the north west of the development site, comprises of cantilever steel sheet piling, with a reinforced concrete capping beam. Photograph 1.0 shows the existing wall clouded in yellow.



Photograph 1.0 - The length of existing exposed steel sheet piled wall

- 2.2 It has been confirmed by the Environment Agency that a managed maintenance approach (periodically maintaining the existing sheet piled wall) to extend the serviceable life of the structure would not be acceptable.
- 2.3 This length of wall is to instead be replaced. A new steel cantilever sheet piled wall with reinforced concrete capping beam is to be constructed behind the existing wall, within the Clients ownership. The new defence will be designed with a minimum of 100-year design life, built to the 2070 raising level of 8.0m AOD. This will be constructed as part of the development. Section C-C shown on Appendix A shows further details and also confirms the worst-case space available for inspection post development.

- 2.4 The proposed extent of this replacement wall is indicated on A7752-100, the details of the wall interface between new and existing will be provided during the detailed design of this wall. A 90-degree return will be provided at each end of the new sheet piled wall, to enable connection into the existing wall. Buildability is also demonstrated in Appendix D.
- 2.5 Ecological enhancements are included as part of the development proposal. The creation new planted terraces along the foreshore. The new sheet piled wall will incorporate biodiverse features, details of which will be provided during the detailed design stage.
- 2.6 Ship impact will be considered for the new tidal section of the defence during detailed design.
- 2.7 The existing sheet piled wall will be cut down to below ground level. At the intersection with the boundary of the existing sheet piled wall, A wailing beam is located below existing ground level. a tapered cut at an angle of 45 degrees will transition the adjacent structure outside of Custom House ownership, and the cut down structure within it. This will enable the wailing beam to remain, not change the adjacent structure, and will still enable inspection of the new sheet piled wall.

3.0 Existing steel sheet piled wall encased in concrete & masonry

- 3.1 The length steel sheet piling encased in concrete and clad in masonry, with a reinforced concrete capping beam, is indicated below on Photograph 2.0.



Photograph 2.0 - Existing steel sheet piled wall, encased in concrete and clad in masonry

- 3.2 In order to remove the Environment Agencies objection, this length of sheet piled wall will also be replaced with a new sheet piled wall. The new sheet piled wall will be designed with a minimum 100 year design life, and would be installed to the 8m AOD level. Section A-A and section B-B in Appendix A show further details and also confirms the worst-case space available for inspection, post development.
- 3.3 CTP maintain that the existing defence could be raised with some remedial works carried out (as detailed in the previous version of this report). Should the Environment Agency Approve this alternative option in the future.

- 3.4 Drawings have been produced for the existing pre development showing the construction access and temporary works access requirements, it also demonstrates the manoeuvrability of the plant, refer to Appendix A.
- 3.5 The method statement included in Appendix D demonstrates buildability, prepared by Knights Brown a local construction Contractor with vast experience in marine construction projects. The methodology and plant requirements for the replacement of the wall presented for the replacement of the tidal section of wall are identical to the replacement of the concrete & masonry encased wall. Section 6 (Sheet Pile Wall) of the report in Appendix D also demonstrates how the existing sheet pile wall will be removed once the new wall is constructed.
- 3.6 The existing concrete capping beam, sheet piled wall and masonry cladding would be cut down and removed down to below existing ground level.

4.0 Existing flood gate & stairs

4.1 The existing floodgate and staircase is indicated on photograph 3.0 below.



Photograph 3.0 Flood gate and stair location

4.2 Following the replacement to the entire length of wall, the floodgate will be removed. The new defence (to be installed development side of the existing wall) would provide necessary flood protection.

4.3 The existing stairs will be removed as part of the development

5.0 Contamination

- 5.1 Soil sampling and laboratory testing has been undertaken on the foreshore the results data is contained in Appendix B. The proposed measures of replacing the northern section of wall, and concrete encasement to the remainder of the wall mean that any the classification of the soil becomes irrelevant to the structure, as it is to be designed out, for both scenarios.

6.0 Buildability

- 6.1 The method statement included in Appendix D demonstrates the proposals buildability, prepared by Knights Brown a local construction Contractor with extensive marine experience. The methodology and plant requirements for the new exposed sheet piled wall & the raising of the existing concrete capping beam. The detailed plant data sheets are included in Appendix E. It shows that the mobile crane to lift in the sheet piling equipment is capable of manoeuvring on the site both pre and post development, and demonstrates there is enough storage area on site to prevent adversely surcharging the structures. The Contractor has demonstrated in the Appendix E that the works could be undertaken.
- 6.2 Knights Brown have done an appraisal of buildability / method statement for the return section refer to Appendix D. The same methodology can be used for the full length of new wall. Including the removal of the existing flood defences and the flood gate. Section 6 (Sheet Pile Wall) of the report in Appendix D also demonstrates how the existing sheet pile wall will be removed once the new wall is constructed.

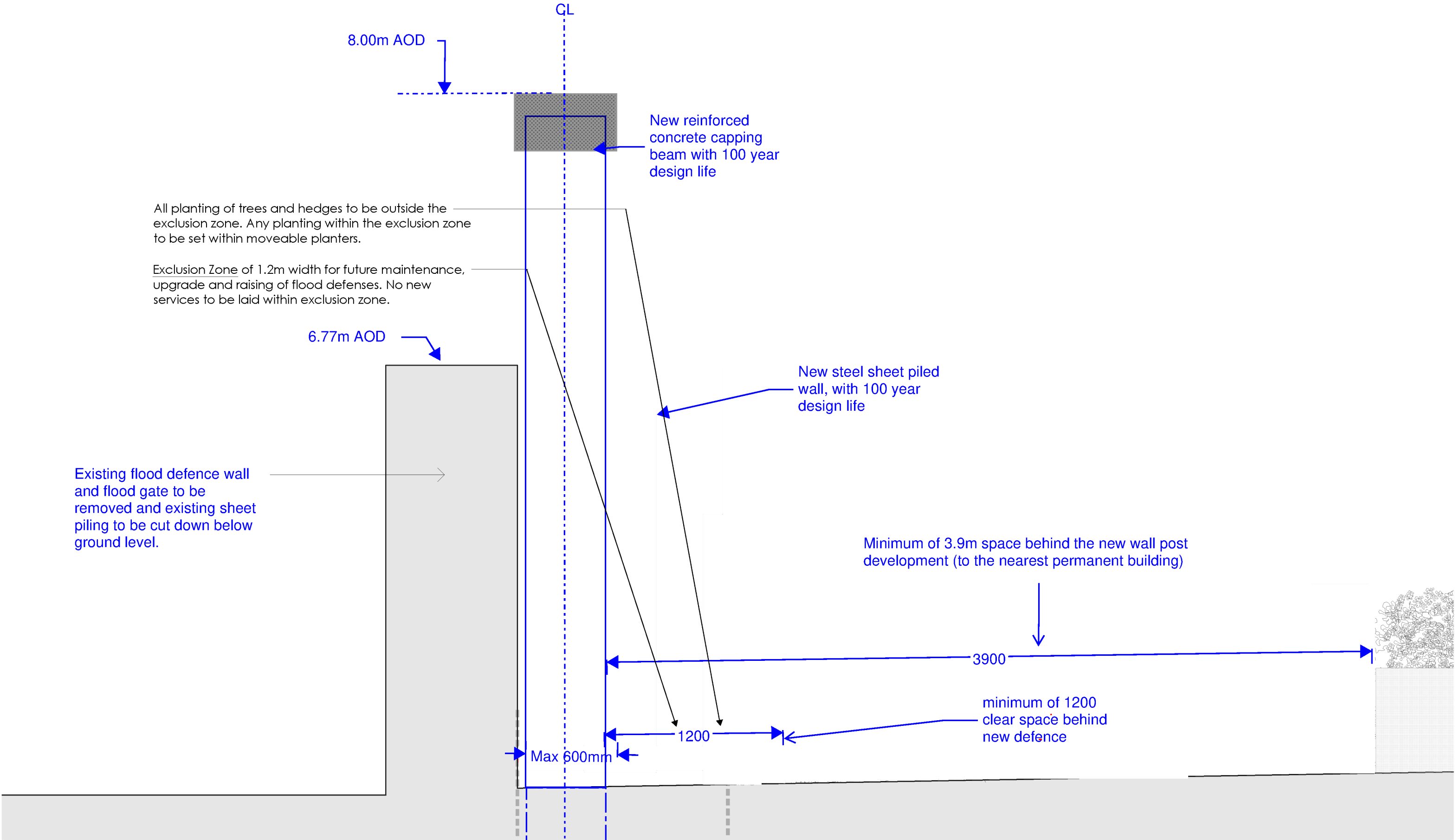
7.0 Design philosophy for new sheet piled wall

- 7.1 Design philosophy of the new structure
- Design life minimum of 100 years
 - The sea/ flood level the wall will be designed for the 2070 level of 8.0m AOD. And will take into account the Thames Estuary 2100 Plan for future sea levels.
 - The new wall would be designed for a full height flood condition
 - The new wall would be designed using Eurocode standards and factors of safety.

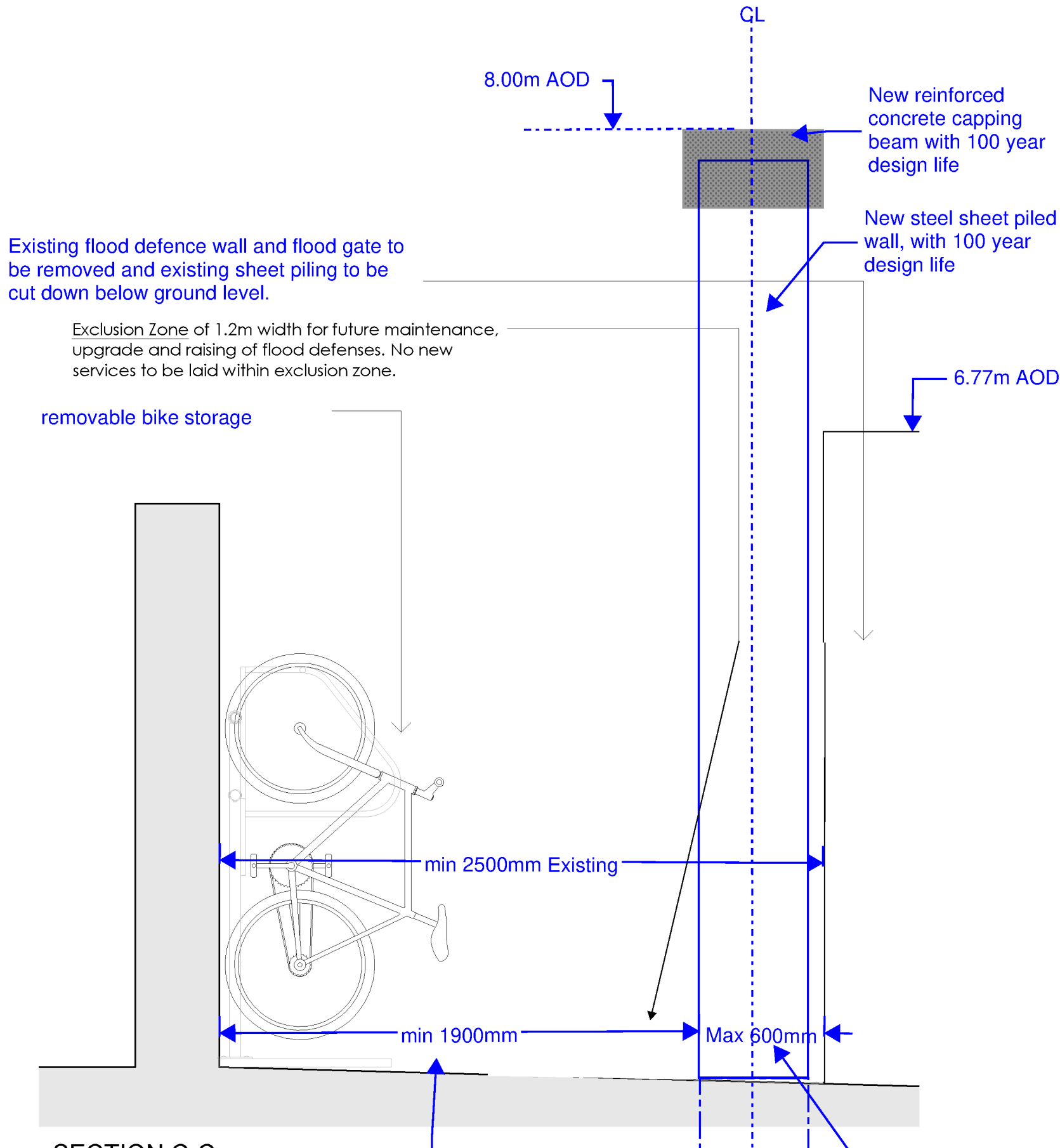
8.0 Interface with neighbouring defences

- 8.1 If the Environment Agency have approved the adjacent defences for 100year lifespan, in which case the new wall can connect into the adjacent structures, with the details prepared during detailed design stage.
- 8.2 The alternative to the above is installation of an open sheet pile clutch would be installed on the boundaries of the development. This would enable neighbouring owners to connect new walls into the structure in the future.
- 8.3 As built details of the new wall will be prepared with accurate setting out and section sizes. This gives adjacent owners information to design their new structures accordingly. The interface could be a continuation of the wall with sheet piling, welding of reinforcement to provide a key or other method proposed by a competent designer and approved by the Environment Agency. Note that the defence is reliant on continuity by adjacent landowners out of the control of Custom House ownership. The future Environment Agency requirements will be applicable to adjacent owners, who will need to make their own arrangements for compliance.

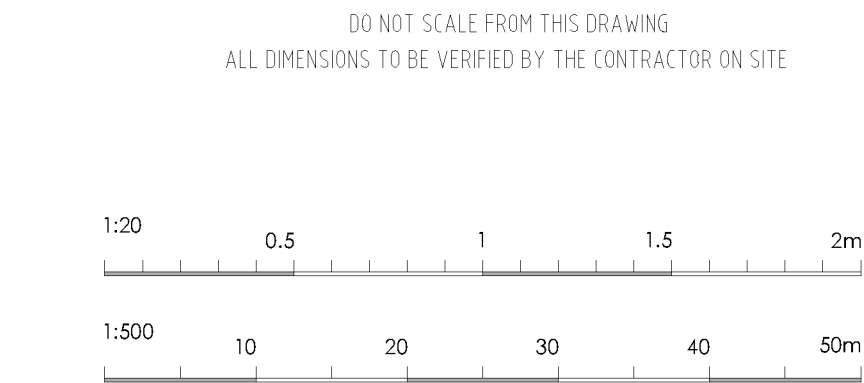
Appendix A – Drawings of remedial works



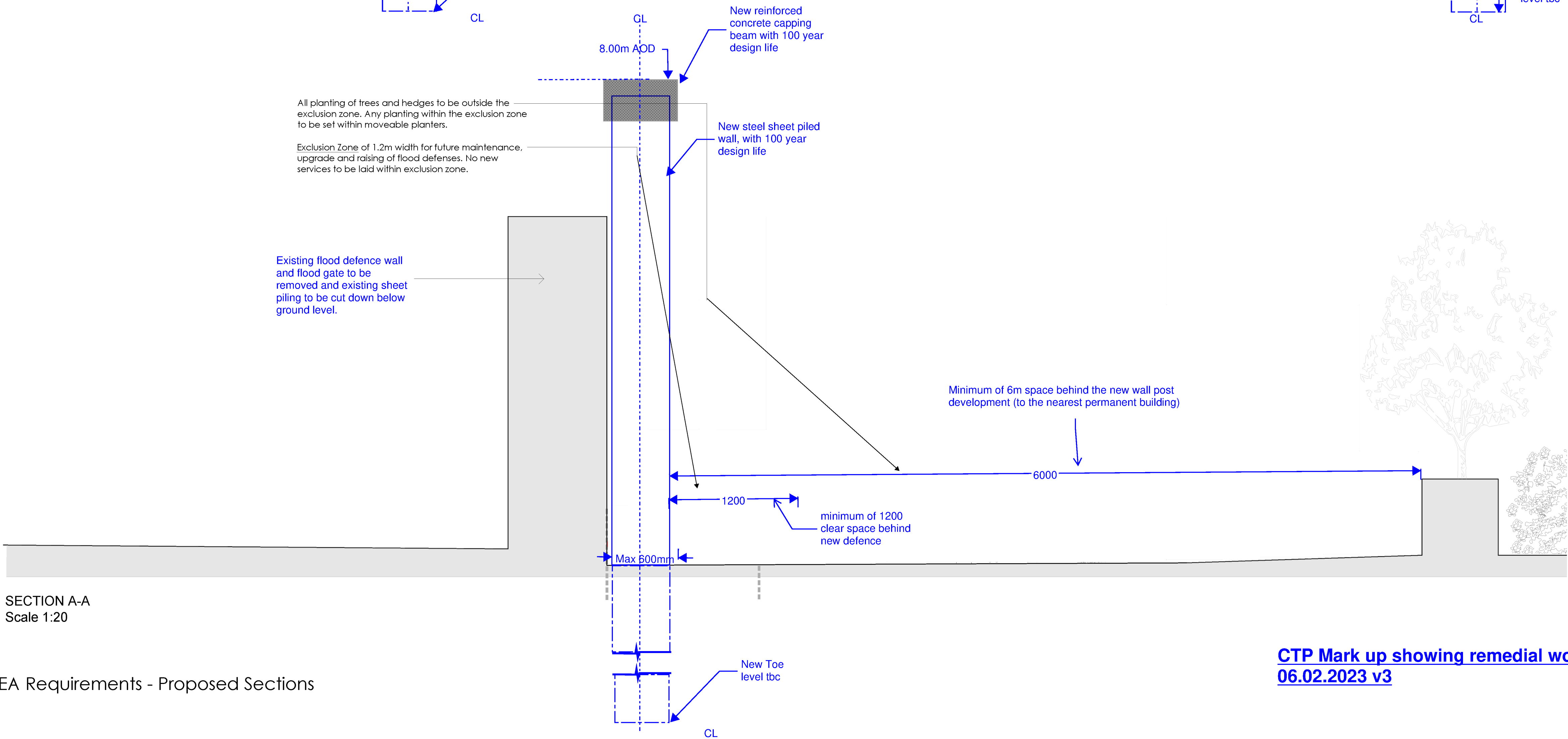
SECTION B-B
Scale 1:20



SECTION C-C
Scale 1:20



LEGEND
Scale 1:500



SECTION A-A
Scale 1:20

EA Requirements - Proposed Sections

CTP Mark up showing remedial works to river walls
06.02.2023 v3

REV	DESCRIPTION	DATE	BY	CHKD
TURNER JACKSON+DAY ASSOCIATES Radio House Thanet Way, Whitstable Kent CT5 3DX client details Mile Property Group Ltd project details Custom House The Terrace, Gravesend, DA12 2DE drawing title Proposed Site Sections EA REQUIREMENTS date Jan '22 scale 1:20@A1 drawn by AR checked by project no. 1735 drawing no. 036 revision - t: 01227 261453 e: enquiries@tjda.co.uk www.turnerjacksonday.co.uk				

Appendix B – Soil testing results

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e: reception@i2analytical.com

Analytical Report Number : 22-52253

Project / Site name:	Custom House	Samples received on:	14/04/2022
Your job number:	4353	Samples instructed on/ Analysis started on:	14/04/2022
Your order number:		Analysis completed by:	26/04/2022
Report Issue Number:	1	Report issued on:	26/04/2022
Samples Analysed:	12 soil samples		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 22-52253
Project / Site name: Custom House

Lab Sample Number				2241559	2241560	2241561	2241562	2241563
Sample Reference				TP1	TP1	TP1	TP1	TP3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	1.00	1.30	0.30
Date Sampled				13/04/2022	13/04/2022	13/04/2022	13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	40	< 0.1	< 0.1	44
Moisture Content	%	0.01	NONE	7.4	13	27	15	5.2
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.8	1	1.2

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	JSW	JSW	JSW	JSW	JSW

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.2	9.4	8.4	8.4	9.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	210	99	410	130	170
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.11	0.05	0.2	0.065	0.087
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	107	49.6	204	65.3	87.3
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.5	1.5	3.7	1	0.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	3.4	1	0.6	0.98	0.4
Acenaphthene	mg/kg	0.05	MCERTS	0.98	< 0.05	< 0.05	0.26	0.33
Fluorene	mg/kg	0.05	MCERTS	3.1	0.24	< 0.05	0.6	0.23
Phenanthrene	mg/kg	0.05	MCERTS	45	3.5	5.6	11	1.8
Anthracene	mg/kg	0.05	MCERTS	7.2	1.1	0.91	2.4	0.45
Fluoranthene	mg/kg	0.05	MCERTS	80	12	21	31	6
Pyrene	mg/kg	0.05	MCERTS	66	9.6	17	27	5.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	39	8.1	9.2	16	2.9
Chrysene	mg/kg	0.05	MCERTS	24	6.9	7.8	13	2.5
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	32	8.7	13	20	3.4
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	19	2.4	3.6	4.4	1.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	32	6.1	9	14	2.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	16	4.4	5.2	6.5	1.6
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	4.4	1.2	1.4	2	0.43
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	18	4.5	5.9	7.7	1.9

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	391	69.7	99.1	156	31.1
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Analytical Report Number: 22-52253
Project / Site name: Custom House

Lab Sample Number	2241559	2241560	2241561	2241562	2241563
Sample Reference	TP1	TP1	TP1	TP1	TP3
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	0.70	1.00	1.30	0.30
Date Sampled	13/04/2022	13/04/2022	13/04/2022	13/04/2022	13/04/2022
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	27	19	78	39	7.2
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	1.5	3.9	0.9	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	NONE	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	22	31	15	8.4
Copper (aqua regia extractable)	mg/kg	1	MCERTS	110	95	480	69	24
Lead (aqua regia extractable)	mg/kg	1	MCERTS	5200	1900	1500	1300	220
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.8	1.6	3.7	5.1	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19	23	54	14	7.1
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	440	190	660	230	52

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	2	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	8.7	< 2.0	< 2.0	9	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	36	11	< 8.0	16	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	530	57	27	38	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	MCERTS	580	68	32	63	< 10

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	14	3	2.5	14	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	180	53	42	110	14
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	470	140	83	200	38
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	MCERTS	660	200	130	330	52

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Project / Site name: Custom House

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Sample Reference				TP1	TP1	TP1	TP1	TP3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	1.00	1.30	0.30
Date Sampled				13/04/2022	13/04/2022	13/04/2022	13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

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Project / Site name: Custom House

Lab Sample Number				2241559	2241560	2241561	2241562	2241563
Sample Reference				TP1	TP1	TP1	TP1	TP3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	1.00	1.30	0.30
Date Sampled				13/04/2022	13/04/2022	13/04/2022	13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		
1,2,3-Trichlorobenzene				µg/kg	1	ISO 17025	< 1.0	< 1.0

VOCs TICs

VOCs TICs Compound Name		N/A	NONE	ND	ND	ND	ND	ND
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U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-52253
Project / Site name: Custom House

Lab Sample Number				2241564	2241565	2241566	2241567	2241568
Sample Reference				TP3	TP3	TP3	TP4	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.70	1.00	0.30	0.50
Date Sampled				13/04/2022	13/04/2022	13/04/2022	13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	41	59	< 0.1
Moisture Content	%	0.01	NONE	5.1	29	14	5	13
Total mass of sample received	kg	0.001	NONE	0.5	0.8	0.8	0.8	1.2

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	JSW	JSW	JSW	JSW	JSW

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.8	7.7	9.3	10.1	10.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	3.3	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	150	770	510	160	340
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.075	0.39	0.25	0.078	0.17
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	74.9	386	253	77.6	169
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	< 0.1	6.4	1.7	0.7	0.6

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	5	0.92	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.41	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	0.82	0.4	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.3	14	4.7	0.98	1.9
Anthracene	mg/kg	0.05	MCERTS	0.2	4.1	1.5	0.27	0.56
Fluoranthene	mg/kg	0.05	MCERTS	3.3	48	10	3.3	6.9
Pyrene	mg/kg	0.05	MCERTS	2.9	35	7.6	3.1	6.1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.5	26	6.5	1.7	3.3
Chrysene	mg/kg	0.05	MCERTS	2	27	5.1	1.7	3
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.3	24	5.4	2.5	4.2
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.77	11	2.2	0.71	1.7
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.8	19	4.3	1.8	3.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.1	14	2.9	1.2	1.9
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.27	3.9	0.81	0.31	0.57
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1	14	2.9	1.3	2.3

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	18.5	247	55.4	18.8	35.9
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Project / Site name: Custom House

Lab Sample Number				2241564	2241565	2241566	2241567	2241568
Sample Reference				TP3	TP3	TP3	TP4	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.70	1.00	0.30	0.50
Date Sampled				13/04/2022	13/04/2022	13/04/2022	13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	35	2.2	15	13	18
Boron (water soluble)	mg/kg	0.2	MCERTS	0.2	5	2.4	1.7	2.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	NONE	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	2.7	21	22	20
Copper (aqua regia extractable)	mg/kg	1	MCERTS	270	9.3	55	48	58
Lead (aqua regia extractable)	mg/kg	1	MCERTS	1000	62	870	330	390
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	2.1	< 0.3	1.1	0.6	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	45	2	18	16	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	410	16	170	140	160

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	13	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	72	35	67	21
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	MCERTS	< 10	84	41	72	21

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	14	4.5	3.1	2.3
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	12	200	35	18	21
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	27	390	110	110	71
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	MCERTS	40	610	150	130	94

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Lab Sample Number				2241564	2241565	2241566	2241567	2241568
Sample Reference				TP3	TP3	TP3	TP4	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.70	1.00	0.30	0.50
Date Sampled				13/04/2022	13/04/2022	13/04/2022	13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Analytical Report Number: 22-52253
Project / Site name: Custom House

Lab Sample Number				2241564	2241565	2241566	2241567	2241568
Sample Reference				TP3	TP3	TP3	TP4	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.70	1.00	0.30	0.50
Date Sampled				13/04/2022	13/04/2022	13/04/2022	13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		
1,2,3-Trichlorobenzene				µg/kg	1	ISO 17025	< 1.0	< 1.0

VOCs TICs

VOCs TICs Compound Name		N/A	NONE	ND	ND	ND	ND	ND
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U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-52253
Project / Site name: Custom House

Lab Sample Number				2241569	2241570
Sample Reference				TP4	TP4
Sample Number				None Supplied	None Supplied
Depth (m)				1.00	1.20
Date Sampled				13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	15	22
Total mass of sample received	kg	0.001	NONE	1.2	1.2

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	JSW	JSW

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	8.1
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	420	590
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.21	0.29
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	208	293
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.4	2.6

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	1.7	0.96
Acenaphthene	mg/kg	0.05	MCERTS	0.75	< 0.05
Fluorene	mg/kg	0.05	MCERTS	1.1	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	14	7.5
Anthracene	mg/kg	0.05	MCERTS	3.6	1.2
Fluoranthene	mg/kg	0.05	MCERTS	28	24
Pyrene	mg/kg	0.05	MCERTS	20	20
Benzo(a)anthracene	mg/kg	0.05	MCERTS	14	11
Chrysene	mg/kg	0.05	MCERTS	15	10
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	13	16
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	5.4	4.7
Benzo(a)pyrene	mg/kg	0.05	MCERTS	9.9	12
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	6.9	7
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	2	1.9
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	7	8.5

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	142	126
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Analytical Report Number: 22-52253
Project / Site name: Custom House

Lab Sample Number				2241569	2241570
Sample Reference				TP4	TP4
Sample Number				None Supplied	None Supplied
Depth (m)				1.00	1.20
Date Sampled				13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	29	45
Boron (water soluble)	mg/kg	0.2	MCERTS	2.5	3.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	NONE	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	36	33
Copper (aqua regia extractable)	mg/kg	1	MCERTS	120	230
Lead (aqua regia extractable)	mg/kg	1	MCERTS	3400	5400
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	2.8	2.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	29	43
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	300	570

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	4.5
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	3.2	10
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	16	36
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	76	120
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	MCERTS	95	170

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	MCERTS	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	9.4	12
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	87	83
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	190	190
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	MCERTS	280	280

Analytical Report Number: 22-52253
Project / Site name: Custom House

Lab Sample Number				2241569	2241570
Sample Reference				TP4	TP4
Sample Number				None Supplied	None Supplied
Depth (m)				1.00	1.20
Date Sampled				13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
VOCs					
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0

Analytical Report Number: 22-52253
Project / Site name: Custom House

Lab Sample Number				2241569	2241570
Sample Reference				TP4	TP4
Sample Number				None Supplied	None Supplied
Depth (m)				1.00	1.20
Date Sampled				13/04/2022	13/04/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0

VOCs TICs

VOCs TICs Compound Name		N/A	NONE	ND	ND
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U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-52253

Project / Site name: Custom House

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2241559	TP1	None Supplied	0.3	Brown sandy loam with gravel and vegetation.
2241560	TP1	None Supplied	0.7	Brown sandy loam with stones and brick.
2241561	TP1	None Supplied	1	Brown clay and sand with gravel.
2241562	TP1	None Supplied	1.3	Brown sandy loam with gravel and vegetation.
2241563	TP3	None Supplied	0.3	Light brown sand with stones.
2241564	TP3	None Supplied	0.5	Light brown sand.
2241565	TP3	None Supplied	0.7	Brown sandy loam with gravel.
2241566	TP3	None Supplied	1	Brown sandy clay with gravel and stones.
2241567	TP4	None Supplied	0.3	Brown sandy loam with stones and brick.
2241568	TP4	None Supplied	0.5	Brown sandy loam with gravel.
2241569	TP4	None Supplied	1	Brown sandy loam with gravel and brick.
2241570	TP4	None Supplied	1.2	Brown clay and loam with gravel.

Analytical Report Number : 22-52253
Project / Site name: Custom House

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Tentatively identified compounds (VOC) in soil	Determination of volatile organic compounds total ion count in soil by headspace GC-MS followed by a full library scan.	In-house method based on USEPA8260	L073-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

Analytical Report Number : 22-52253
Project / Site name: Custom House

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

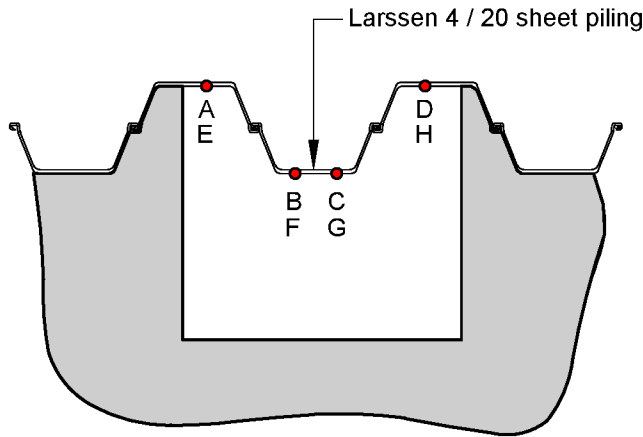
Appendix C – Further ultrasonic thickness readings



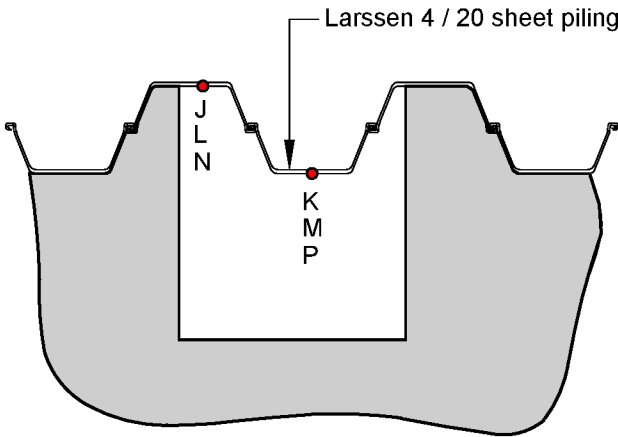
TP1 Photo



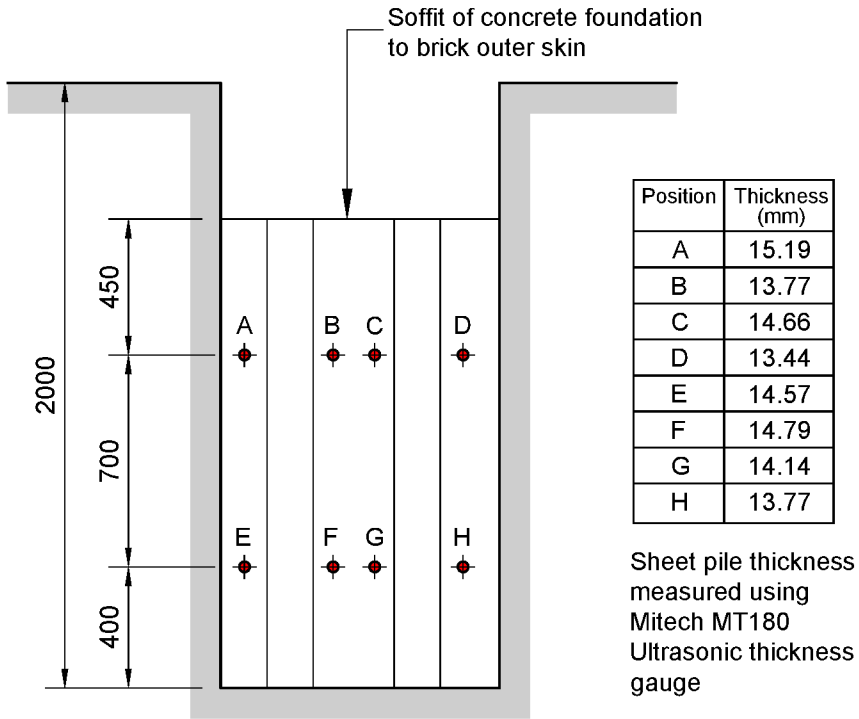
TP2 Photo



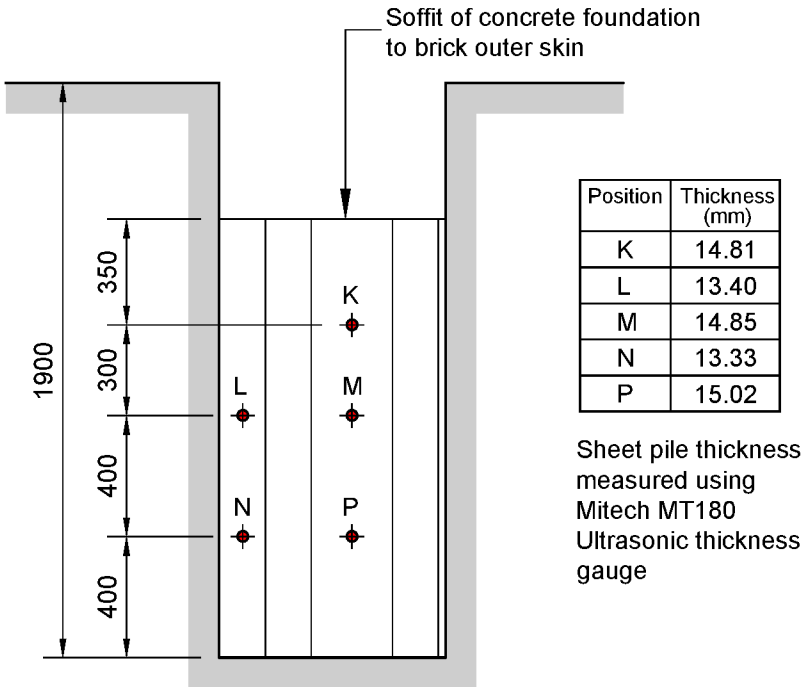
PLAN ON TRIAL PIT 1 (TP1)
Scale 1:25



PLAN ON TRIAL PIT 2 (TP2)
Scale 1:25



ELEVATION ON TRIAL PIT 1
Scale 1:25



ELEVATION ON TRIAL PIT 2
Scale 1:25

NOTES

- DO NOT SCALE THIS DRAWING. WORK TO FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
- This drawing is to be read in conjunction with all relevant Architect's, Engineer's and Specialist's drawings and their respective Specifications.
- All work to comply with the relevant British Standards, Codes of Practice and the Building Regulations.
- Any discrepancies between all working drawings, specifications and schedules of all disciplines to be immediately notified to CTP for clarification/correction prior to construction of relevant structure.



PART PLAN SHOWING TRIAL PIT LOCATIONS
nts



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www.ctp-llp.com

Project Title:

CUSTOM HOUSE RIVER WALL
GRAVESEND, KENT.

Drawing Title:

TRIAL PITS TP1 & TP2

P1 Issued for Information			RB		
Revision	Amendments	Date	Rev'd	Chk'd	Discipline
Created by:		Date created:			
PB		14.04.2022			STRUCT
Drawing Number:			Scale		
			1:25 @A3		
			Unless Noted Otherwise		
			Revision		
			P1		

A7752-SK100

The below corrosion analysis to buried portion of sheet piled walls is presented. This looks at the corrosion rates calculated from the site measurements. A 100 year analysis, and 48 year analysis are both carried out to check the section capacity of the raised sheet piled wall

Table A - 100 year analysis to 2122 with no remedial works

Location	Reading (mm)	start (mm)	Loss (mm)	% loss	Actual Rate of corrosion over 39 years (mm/year)	Loss of section over 100 years	residual pile thickness (mm)	residual % of thickness after 100 years	section modulus remaining after 100 years	2174 section modulus required
A	15.19	15.7	0.51	3.2	0.013	1.31	13.88	88.4	2135	not ok
B	13.77	15.7	1.93	12.3	0.049	4.95	8.82	56.2	1356	not ok
C	14.66	15.7	1.04	6.6	0.027	2.67	11.99	76.4	1844	not ok
D	13.44	15.7	2.26	14.4	0.058	5.79	7.65	48.7	1175	not ok
E	14.57	15.7	1.13	7.2	0.029	2.90	11.67	74.3	1795	not ok
F	14.79	15.7	0.91	5.8	0.023	2.33	12.46	79.3	1915	not ok
G	14.14	15.7	1.56	9.9	0.040	4.00	10.14	64.6	1559	not ok
H	13.77	15.7	1.93	12.3	0.049	4.95	8.82	56.2	1356	not ok
K	14.81	15.7	0.89	5.7	0.023	2.28	12.53	79.8	1926	not ok
L	13.4	15.7	2.3	14.6	0.059	5.90	7.50	47.8	1154	not ok
M	14.85	15.7	0.85	5.4	0.022	2.18	12.67	80.7	1948	not ok
N	13.33	15.7	2.37	15.1	0.061	6.08	7.25	46.2	1115	not ok
P	15.02	15.7	0.68	4.3	0.017	1.74	13.28	84.6	2041	not ok
Average	14.29	15.7	1.41	9.0	0.0362	3.62	10.67	67.94	1640	

Table B - 48 year analysis to 2070 with no remedial works

Location	Reading (mm)	start (mm)	Loss (mm)	% loss	Actual Rate of corrosion over 39 years (mm/year)	Loss of section over next 48 years	residual pile thickness (mm)	residual % of thickness after 48 years	section modulus remaining after 48 years	approx 1500 section modulus required
A	15.19	15.7	0.51	3.2	0.013	0.63	14.56	92.8	2239	ok
B	13.77	15.7	1.93	12.3	0.049	2.38	11.39	72.6	1752	ok
C	14.66	15.7	1.04	6.6	0.027	1.28	13.38	85.2	2057	ok
D	13.44	15.7	2.26	14.4	0.058	2.78	10.66	67.9	1639	ok
E	14.57	15.7	1.13	7.2	0.029	1.39	13.18	83.9	2026	ok
F	14.79	15.7	0.91	5.8	0.023	1.12	13.67	87.1	2102	ok
G	14.14	15.7	1.56	9.9	0.040	1.92	12.22	77.8	1879	ok
H	13.77	15.7	1.93	12.3	0.049	2.38	11.39	72.6	1752	ok
K	14.81	15.7	0.89	5.7	0.023	1.10	13.71	87.4	2109	ok
L	13.4	15.7	2.3	14.6	0.059	2.83	10.57	67.3	1625	ok
M	14.85	15.7	0.85	5.4	0.022	1.05	13.80	87.9	2122	ok
N	13.33	15.7	2.37	15.1	0.061	2.92	10.41	66.3	1601	ok
P	15.02	15.7	0.68	4.3	0.017	0.84	14.18	90.3	2181	ok
Average	14.29	15.7	1.41	9.0	0.0362	1.74	12.55	79.93	1930	

Table C - Analysis of 100 years, after concrete encasement carried out within 1 year.

Location	Reading (mm)	start (mm)	Loss (mm)	% loss	Actual Rate of corrosion over 39 years (mm/year)	Loss of section over next 1 year	residual pile thickness (mm)	residual % of thickness after 100 years	section modulus remaining after 100 years	2174 section modulus required
A	15.19	15.7	0.51	3.2	0.013	0.01	15.19	96.8	3802	ok
B	13.77	15.7	1.93	12.3	0.049	0.05	13.77	87.7	3584	ok
C	14.66	15.7	1.04	6.6	0.027	0.03	14.66	93.4	3721	ok
D	13.44	15.7	2.26	14.4	0.058	0.06	13.44	85.6	3533	ok
E	14.57	15.7	1.13	7.2	0.029	0.03	14.57	92.8	3707	ok
F	14.79	15.7	0.91	5.8	0.023	0.02	14.79	94.2	3741	ok
G	14.14	15.7	1.56	9.9	0.040	0.04	14.14	90.1	3641	ok
H	13.77	15.7	1.93	12.3	0.049	0.05	13.77	87.7	3584	ok
K	14.81	15.7	0.89	5.7	0.023	0.02	14.81	94.3	3744	ok
L	13.4	15.7	2.3	14.6	0.059	0.06	13.4	85.4	3527	ok
M	14.85	15.7	0.85	5.4	0.022	0.02	14.85	94.6	3750	ok
N	13.33	15.7	2.37	15.1	0.061	0.06	13.33	84.9	3516	ok
P	15.02	15.7	0.68	4.3	0.017	0.02	15.02	95.7	3776	ok
Average	14.29	15.7	1.41	9.0	0.0362	0.04	14.29	91.00	3663.51	ok

The above table concludes the additional section modulus of the pile.

The concrete and shear studs create a composite steel & concrete section, the section modulus therefore increases

Table D - Table of sheet pile section properties

Section	Dimensions				A	G _{sp}	G _w	I _y	W _{el,y}	S _y	W _{pl,y}
	w	h	t _f	t _w							
	mm	mm	mm	mm							
4A	400	381	15.7	9.4	236	74	185.1	45 160	2 371	-	-
4/20	508	381	15.7	9.4	218	86.8	170.9	45 924	2 414	-	-

Appendix D – Knights Brown Construction methodology

Delivery Methodology:

Contract Number:	-
Site:	Custom House, Gravesend, DA12 2DE
Method Statement No:	-
Task / Activity:	Proposed River Wall Defence

	Prepared by:	Reviewed by: (where applicable)	Approved by: (where applicable)
Name:	Sam Smith	Frank Fealey	
Position:	Graduate Engineer	Head of Pre-Construction and Business Development Manager	
Date:	06/04/2022	12/04/2022	

Records of Amendments to Method Statement.

Issue:	Date:	Details of Amendments:	Amended by:	Comment / response required by (Date)

Note: Following amendment the Method Statement shall be re-briefed with a record maintained.

Ref:	Item:	Comments:
1	Describe what the task is and what it is to achieve.	- Installation of a new North South sheet pile wall behind the existing piled wall on the West side of the site to conform to the 2070 requirement of 8.00 AOD. - On completion of the sheet pile installation, return connections to either end will be made achieving a water seal. - Once the seal is achieved the existing sheet pile wall will be removed, and the new wall with the revised protection level of 8.00 AOD will act as the replacement flood wall. The capping beam detail will be added as required, possibly in a later phase. - Installation of a new reinforced concrete wall to reflect the existing construction will be installed as a replacement for the existing floodgate which is to be removed in this phase. - Extend the remaining East West reinforced concrete flood walls capping beam to suit the 2040 flood requirement level of 6.9 AOD. - Prior to the 2070 flood level requirement the existing East West flood wall modified in this activity will need further enhancements to meet the 8.00 AOD requirement. This can be done using similar equipment to that already identified with this methodology.
2	Program for the work. Timing of the work including date, start and finish times if applicable, and duration.	TBC. Will be driven by receipt of the necessary marine licenses.

Ref:	Item:	Comments:
3	Work area clearly identified with references to drawings, sketches, grids, elevations. Where exactly on site is the task to be undertaken.	All works to be carried out within the existing site constraints where the site compound will be established, which will be segregated from the public, with the only access route via the main gate. The compound will be utilised for the delivery and safe storage of plant, welfare units, pavement protection and Heras fence panels to produce a safe worksite for operatives, and enable sufficient access for the works, as well as protecting the public. Signage will be used on the main entrance gate, making members of the public aware of the works. 
4	Supervisory and monitoring arrangements. Who will be supervising the task?	All tasks to be supervised by a member of the site team: Project Manager: TBC Site Engineer/Manager: TBC General Foreman: TBC
5	Schedule of plant to be used. List the plant and equipment required to undertake the task.	• Hiab lorry crane (for delivery and collection of welfare units /plant/machinery) • AC 70T Mobile Crane • WP150 U Silent Piler with power pack and water pump • Welding equipment • Small tools. • Concrete Placement Equipment. • Heras/pedestrian fencing All plant and tools will be managed in accordance with PUWER regulations and manufacturers guide notes. Will be inspected weekly and before use.
6	Sequence of task. Describe how the task is to be undertaken, (if applicable break it down into individual steps).	Pre setup: • Site inductions to be completed and full PPE to be issued and worn by all • All necessary permits to be in place • Each morning prior to commencement of works, all operatives will sign on to the daily briefing. This will cover the scope of the tasks at hand, any issues, safety precautions, the weather, and any changes and/or relevant information. • The team will be briefed on the control measures as detailed in the environmental plan which includes the following activities: Refuelling and COSHH storage arrangements, working next to a water course, ground water discharge, dust management, lighting arrangements, emergency spill and incident procedures, vibration management, noise management, and concrete wastewater management.

Ref:	Item:	Comments:
		Covid-19: • Covid-19 will be managed as detailed in the company procedure and current government advice and the workers will be briefed on the requirements. • When signing into site all persons will check off the COVID symptom checklist, so that they are aware of the symptoms, and they confirm that they do not have any symptoms of Covid Initial preparation of work site: • Delivery and safe set up of site welfare units (green area in image below) • Erect Heras fencing around works area and relevant signage. • Access and egress for emergency vehicles must be always maintained through main gate • All delivery vehicles are to be directed to required location and if reversing must be directed by a banksman • All Heras fencing will be full height, double clipped, and installed and maintained as per the manufacturer's details. 

Ref:	Item:	Comments:
		<u>Sequence of Works.</u> All permanent works design will be undertaken by the Client engineer. <u>Sheet pile wall (highlighted in blue):</u> - To meet the 2070 requirement (8.00 AOD) a new sheet pile wall is to be installed behind the existing sheet pile wall seen in the sketch. Exact location to be confirmed by the permanent works engineer. Expected to be between 400 – 600mm behind. - All services will firstly be disconnected and relocated, and the existing generator is to be removed. - A silent piler rig (WP150 U Silent Piler) will be used due to the lack of access, seen in the photograph to the right. - Due to the rig requiring a stable seating/pressing environment to apply sufficient reaction forces, a reaction frame must first be assembled. - A 70t crane will then set up in the courtyard with sufficient outrigger mats, in the purple area highlighted in the sketches. - The crane will be used to lift the piling rig into position and once set up it will then be used to lift the new sheet piles up and over the existing wall to feed the piling rig. - The silent piling rig has the capability to self-move from pile to pile without crane assistance, as the installation procedure advances. - Once all piles have been installed to correct level, the piling rig will be lifted out by the crane and taken away from site. - Closure details will be provided by the permanent works engineer and installed to provide a water seal between the new and remaining walls. - Once this has been installed and approved the existing sheet pile wall will be removed by flame cutting techniques into manageable sizes and removed utilising the site craneage and disposed of via a registered waste site.



Ref:	Item:	Comments:
		<u>Reinforced concrete wall:</u> - The existing steel floodgate, together with its access and operational equipment, is to be removed (seen highlighted in orange). Then replaced with a new reinforced concrete wall which is to be constructed to the same height as the adjoining wall. - Prior to the removal of the existing floodgate a temporary flood defence barrier will be installed to prevent potential water ingress whilst the concrete wall is constructed. - Sufficient footings will then be excavated, as detailed by the permanent works engineer. - Steel bars will be doweled into both sides of the existing wall. - Steel reinforcement will be installed between the walls. - Shuttering will be erected on both sides of the wall, to the full height. - Concrete will then be mass poured into the shutters. - Sufficient time will be allowed for curing before the shutters are struck.  <u>Reinforced concrete capping beam:</u> - A new reinforced concrete capping beam is to be constructed along the full length of the existing river wall as part of the development, raising the height to the 2040 requirement of 6.9mAOD (seen highlighted in yellow). - Reinforcement will be doweled into the existing capping beam. - Shutters will be erected to the correct height. - Concrete will be poured into the shutters, forming the new capping beam. - Sufficient time will be allowed for curing before the shutters are struck.  Notes: - The full width of the access road within the courtyard will be always maintained. - Soft landscaping will be completed after the main body of works. Allowing for possible future developments as none of which will present a permanent obstacle. - All services along the river wall to be removed and relocated prior to works Fire Arrangements: - The site fire plan will be produced and displayed on site notice boards and in the office. - Suitable fire extinguishers will be set up in strategic locations within the site compound, high risk material locations and with high-risk site operations. - Fire extinguishers will be suitable for the material at risk and will be checked weekly and serviced if necessary. - The fire alarm will be an air horn and 999 must be called.

Ref:	Item:	Comments:
		The site emergency meeting point will be set up and displayed in the site fire plan and briefed to all operatives in their induction.
7	Reference to occupational health standards: COSHH, manual handling, noise exposure. Does the task introduce risks to occupational health, for example; Manual handling (detail on a Manual Handling Risk Assessment). Using substances hazardous to health (if a COSHH Assessment is not available obtain a MSDS and undertake an assessment and record on COSHH Assessment). Noise/vibration (determine or measure levels and undertake Risk Assessment, record on Vibration Register).	- Manual handling will be avoided where possible. - All plant to be regularly inspected to minimise excessive noise. - A silent piler rig will be used, which minimise's noise and vibrations. - Noise and vibrations to be monitored throughout the duration of the project. - All Plant will be managed in accordance with PUWER & LOLER regulation and company procedures. - All plant will be maintained and used in accordance with the manufacturer's instructions. - Defective or damaged plant will be removed from service and repaired or replaced. - All plant will have a copy of their declaration of conformity (if less than 12 months old) or certificate of thorough examination - All plant must be refuelled at a designated refuelling point where necessary and will be briefed to plant operators in the site induction. - All items of plant will have drip trays and plant nappies when not in use to prevent oil/fuel spills next to a water course. - Plant and equipment will be inspected daily and maintained in accordance with the manufacturer's guidance. - If a fuel or oil leak is noticed, the item of plant or equipment will be taken out of use and the oil/fuel will be contained. - Activities involving the use of handheld vibrating tools will be risk assessed to see if they can be avoided. - Low vibration tools will be used, and these will be well maintained, and an assessment of exposure will be carried out to ensure that the limit values are not exceeded. Compulsory for all personnel to wear minimum PPE requirements of: - High visibility clothing - Hard hat - Protective footwear - Eye protection - Gloves (Hearing protection and wet weather gear to be worn when required) - Any delivery drivers exiting their cab must wear full PPE on site. - All COSHH materials will be kept in the stores. - COSHH assessments will be completed for all COSHH materials/substances. All COSHH assessments will be briefed to the operatives along with the relevant RAMS. - All operatives will be briefed on the site spill procedure. - Any small items of plant will be refuelled on a drip tray with absorbent pad. - At the end of use or end of shift all COSHH materials will be return to a COSHH store. - Diesel will be stored in a double banded bowser, and a designated plant refuelling area will be set up with signs and barriers placed to demarcate its location.

Ref:	Item:	Comments:
		Any COSHH incidents will be reported and dealt with in accordance with company procedure and site requirements In the event of a spill: STOP: work immediately and prevent any more material spilling. If the pollutant is flammable eliminate any sources of ignition e.g., switch off plant. If the pollutant is silt, stop the activity which is causing silt generation CONTAIN: the spillage immediately using bunds of earth or sand, drip tray or spill kit contents as appropriate NOTIFY: Immediately report incident to the site manager/foreman, who will then report to the environmental representative (or project manager in their absence). Emergency procedures will be included on the site poster boards.
8	PERMITS TO WORK REQUIRED Does the task require additional controls using a Permit to Work? Permit to Dig Hot Work Permit Confined Space Entry Permit	A permit to lift will be required for all lifting operations in accordance with the company procedure, site lifting plan and LOLER Regulations. Any works that present a fire risk such as welding, cutting lances or disc cutting of metals requires a hot works permit. Any breaking of ground will require a permit to dig which will be issued in accordance with breaking ground method statement and company procedures. If using a ladder for access, a ladder permit is required.
9	QUALITY CONTROLS While undertaking the task detail any Quality Controls required i.e.: Records of Concrete Cube tests.	Engineering equipment will be checked, recorded weekly and certification of calibration will be kept in the site engineering file.
10	ENVIRONMENTAL CONTROLS Environmental controls that need to be put in place to safeguard the Environment: Ground Contamination Water Pollution- Protection of Species/Habitat Statutory Nuisances- noise/dust Waste Materials- Site Waste Management plan etc.	Waste should only be removed to an authorised facility under waste transfer note/consignment note and following receipt and check of waste carrier license and disposal/exemption permits. It is the intention to limit the production of non-recyclables wastes and their consequent removal from site as far as is reasonably practicable. Construction materials and wastes will be safely stored so that items do not blow across site and potentially into the river. - Spill kits will be located on site, in plant and by refueling points. These will be replenished as necessary. - Due to the proximity to a water course, extra care must be taken when refueling and using plant/machinery. - In the presence of marine wildlife, works will be temporarily paused and the relevant environmental agency and wildlife personnel will be contacted.

Ref:	Item:	Comments:
11	First Aid and Emergency Arrangements. In addition to the general site first aid and emergency arrangements are any additional first aid or emergency requirements required for the task.	First Aider to be always on site. - First Aiders: TBC First aid kit & eye wash kit will be available in site welfare. Local A&E Department: Darent Valley Hospital, Emergency Department, Darenth Wood Rd, Dartford, DA2 8DA Hospital route will be displayed on site notice board.
12	Control for the safety of third parties While undertaking the task detail any controls that are to be put in place to safeguard others affected by the work.	The site compound itself is not accessible by the public and supervision will ensure no members of the public enter the works areas via the main gate. Sign posting will be erected where necessary, to ensure the local public are made aware of the works within the site.
13	Details of temporary services required. List any temporary services required to undertake the task.	Temporary sea defense barrier to be installed once the existing floodgate is removed.
14	Are any lifting operations to be undertaken?	• Permits to lift required. • Lift to be supervised by KB staff to reduce risk of operatives and any members of the public from being injured. • Plant and equipment used for lifting must be maintained and managed in accordance with PUWER regulations.
15	Arrangements for dealing with waste.	Any waste material to be recorded in accordance with the waste management strategy and disposed of accordingly.
16	Attachments.	

Ref:	Item:	Comments:
17	Additional Information	The site will be left secure, and all plant and tools safely locked away at the end of each shift, a review will be carried out weekly to assess the security on site. All deliveries will be recorded. The project manager/site manager and the site engineer are to monitor the day to day works and ensure that the works are being carried out in accordance with the method statement. The site engineer or other suitable person is to provide a weekly tour of the works for the visiting client project manager or his representative In addition to this, the programme will be monitored on site to ensure the works stay on programme and release the site to follow on trades as quickly as possible. Works will be inspected in accordance with the approved ITP Future Works to raise the crest level to 8AOD (Before year 2070) Find attached below a plan indicating the expected work areas for a return visit after the development is complete to extend the walls to meet the 2070 requirement, using the same method as for the Reinforced concrete capping beam raising described in section 5 above as well as using the same equipment. The full width of the access road within the courtyard will be always maintained. Soft landscaping will be completed after the main body of works, none of which will present a permanent obstacle to complete the 2070 raising.

Ref:	Item:	Comments:
		Future Works Access Plan Proposed Working Area for Installation Plant Proposed Compound Maintained Access Route

The signatories confirm that this Method Statement and attached Risk Assessments / COSHH Assessments have been briefed to understood and the task shall be undertaken as described.

Method Statement Number: -

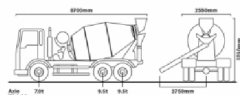
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Position:

Appendix E – Construction plant data sheets

Truck information

6m³ Truckmixer



Length = 8.7m

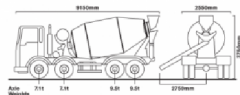
Height = 3.75m

Width = 2.55m

Chute = 2.75m

A fully loaded 6m³ truck will weigh approximately 26 tonnes, depending on the type of concrete.

8m³ Truckmixer



Length = 9.15m

Height = 3.75m

Width = 2.55m

Chute = 2.75m

A fully loaded 8m³ truck will weigh approximately 32 tonnes, depending on the type of concrete.

We understand that our 6m³ and 8m³ trucks aren't always suitable for deliveries requiring small volume orders or with restricted access. Which is why Hanson Concrete offers a mini mix operation under the brand Supamix. This is a dedicated small contract delivery service for Hanson Premix customers available from Supamix plants based across the North East, Yorkshire and Cumbria.

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WP150 Silent Piler System



Description:

The WP-150 is specific plant designed to reduce the level of noise, vibration and risk during the installation of sheet piles.

With the option of pre-augering the ground prior to the installation work commencing, and water jetting during the installation process, the "Silent Piler" is capable of negotiating through a wide variety of soil conditions.

Benefits:

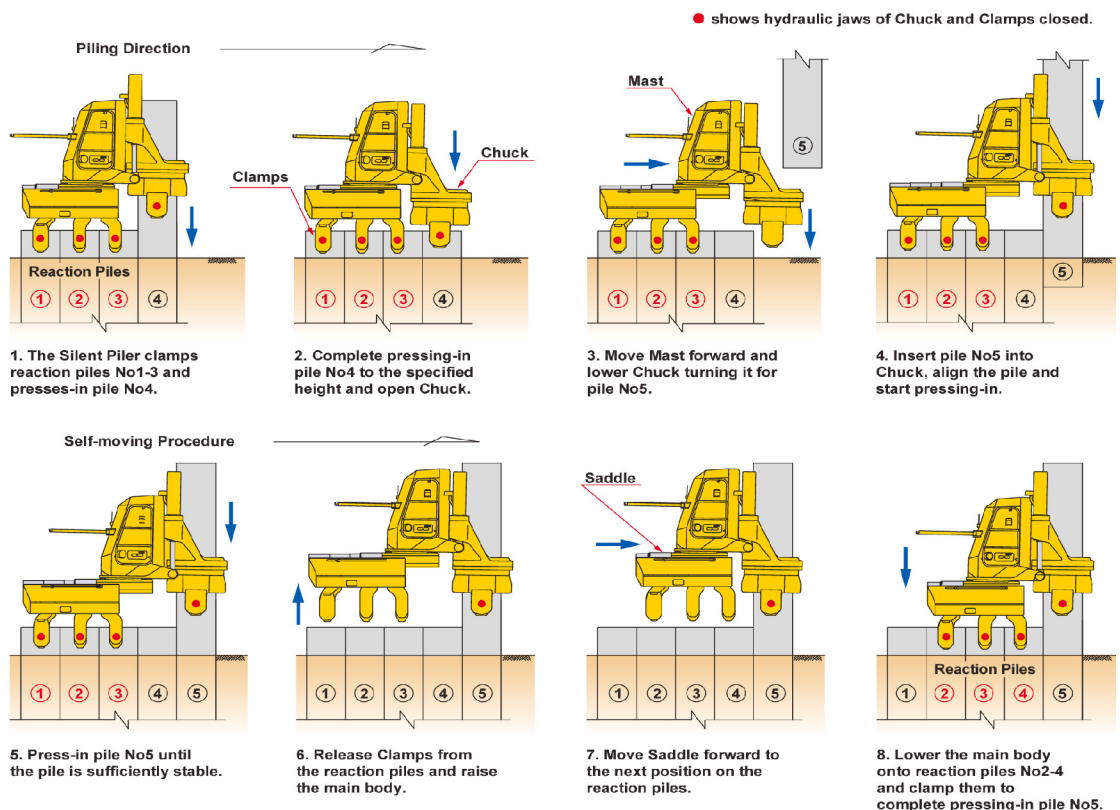
The benefits of the WP-150 are numerous. As well as the reduction in noise and vibration due to the piler's ability to *push* piles into the ground, the piler's capability to work close to the ground without the need of trestles and wailings greatly reduces the risk of injury. Additionally the piler's capacity to move itself along the top of the first piles installed reduces the need for craneage and brings the total cost of construction down.



Sheet Piling, Construction
& Professional Design
Services

Unit 7,
The Oaks Business Village
Revenge Road,
Lordwood,
Kent,
ME5 8LF

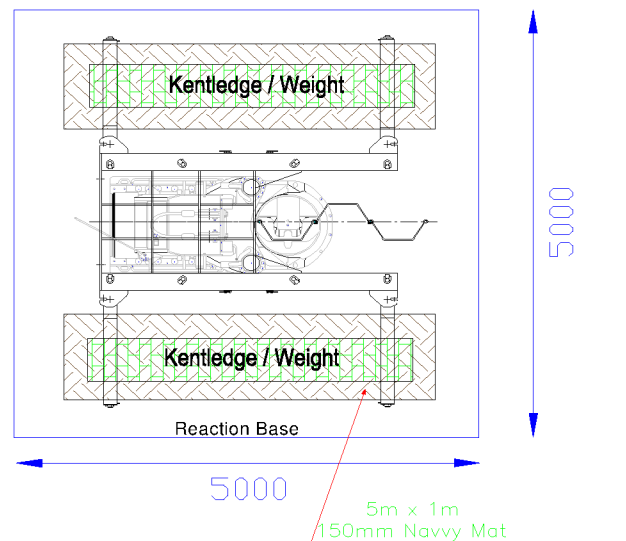
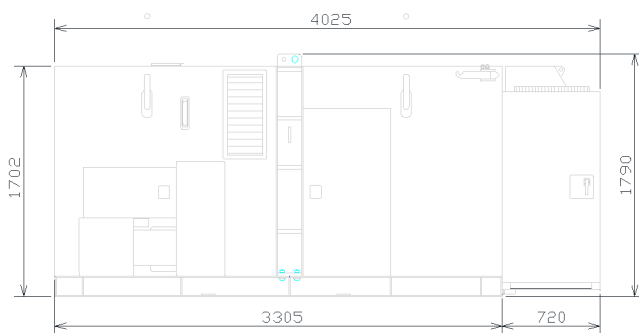
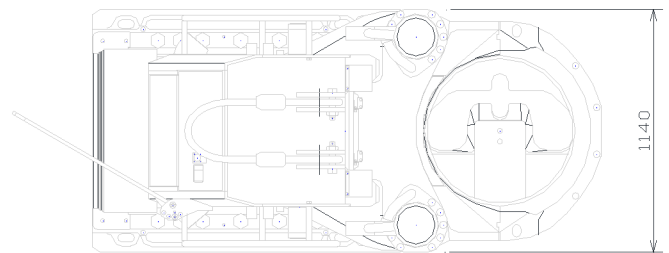
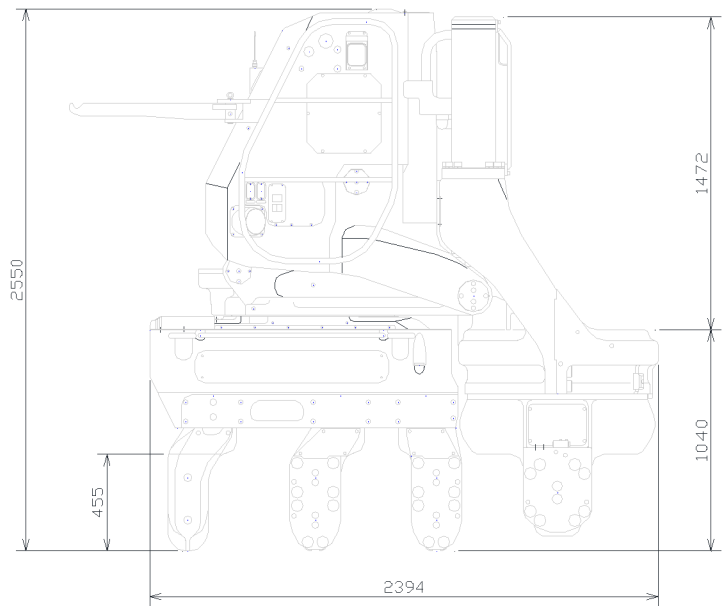
TEL: 01622 794460
FAX: 01634 863016
Enquiries@berryrange.com
www.berryrange.com



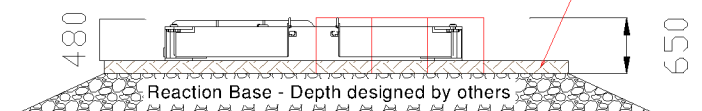
WP150 Silent Piler System

STILL WORKER	WP-150
MAX. Pressing-in Force	1,500kN
MAX. Drawing-out Force	1,600kN
Stroke	800mm
Pressing-in Speed	1.8-23.0 m/min
Drawing-out Speed	1.9-18.0 m/min
Tilting Device	± 5 degrees
Mast Rotation	180 degrees
Applicable sheet piles	U Profile 400mm, 500mm, 600mm
Operation System	Wireless radio-control and Cable remote-control
Moving System	Self-moving
Weight	9,500kg

HYDRAULIC POWER UNIT	TE-200
Power	Diesel Engine 4-cycle, Water-Cooled Direct Injection Turbo
Output Rating	147.1kw/1,800min ⁻¹
Pump	Variable-Capacity Pump
Pressure Rating	40MPa max.
Fuel Oil tank	350 Litres
Hydraulic Oil tank	550 Litres
Weight	5300kg



Reaction Stand	WP-150	WP-100
Dimension	Length 3,200mm Width 1,900mm Height 475mm	Length 3,200mm Width 1,900mm Height 475mm
Weight	1,700kg	1,400kg





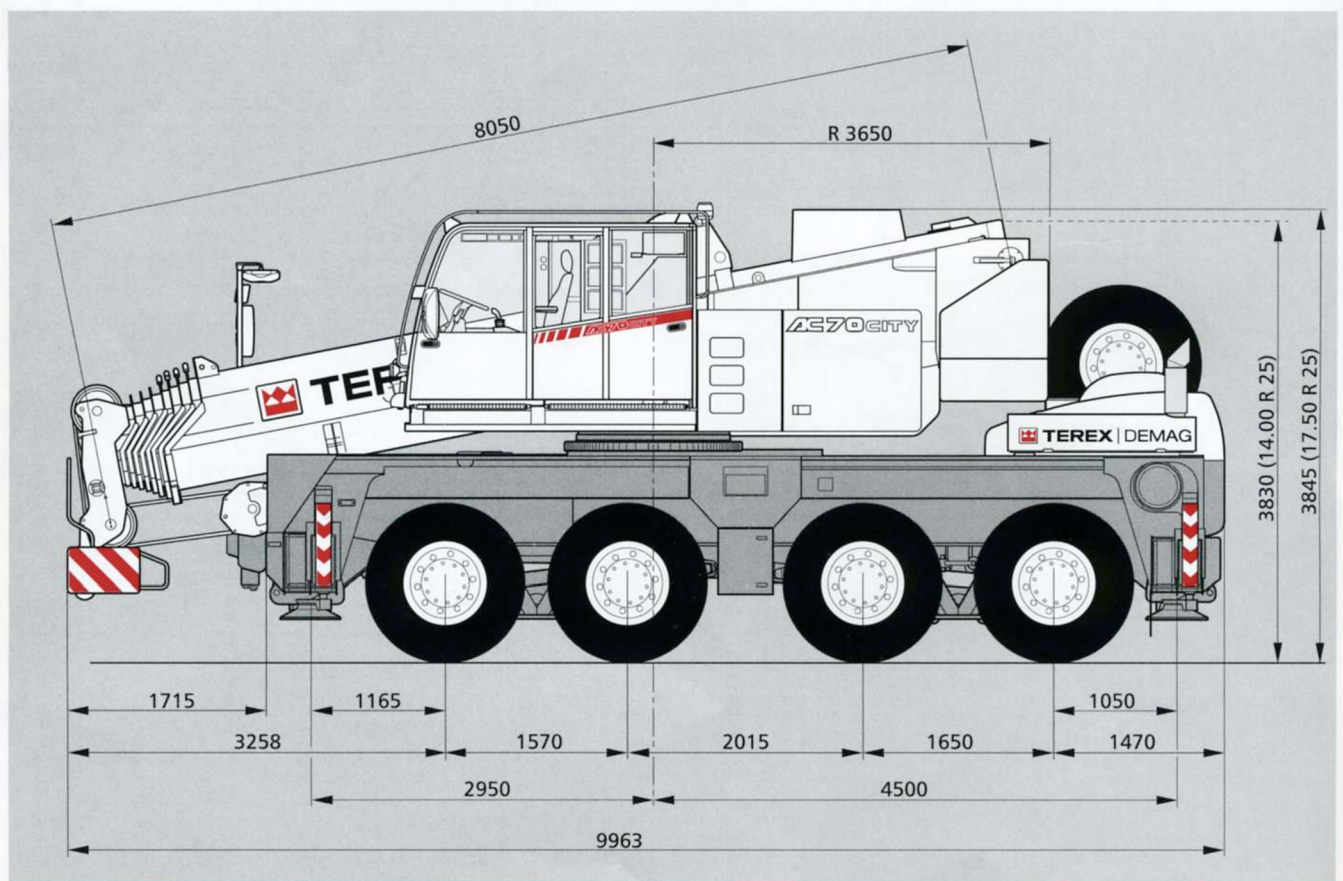
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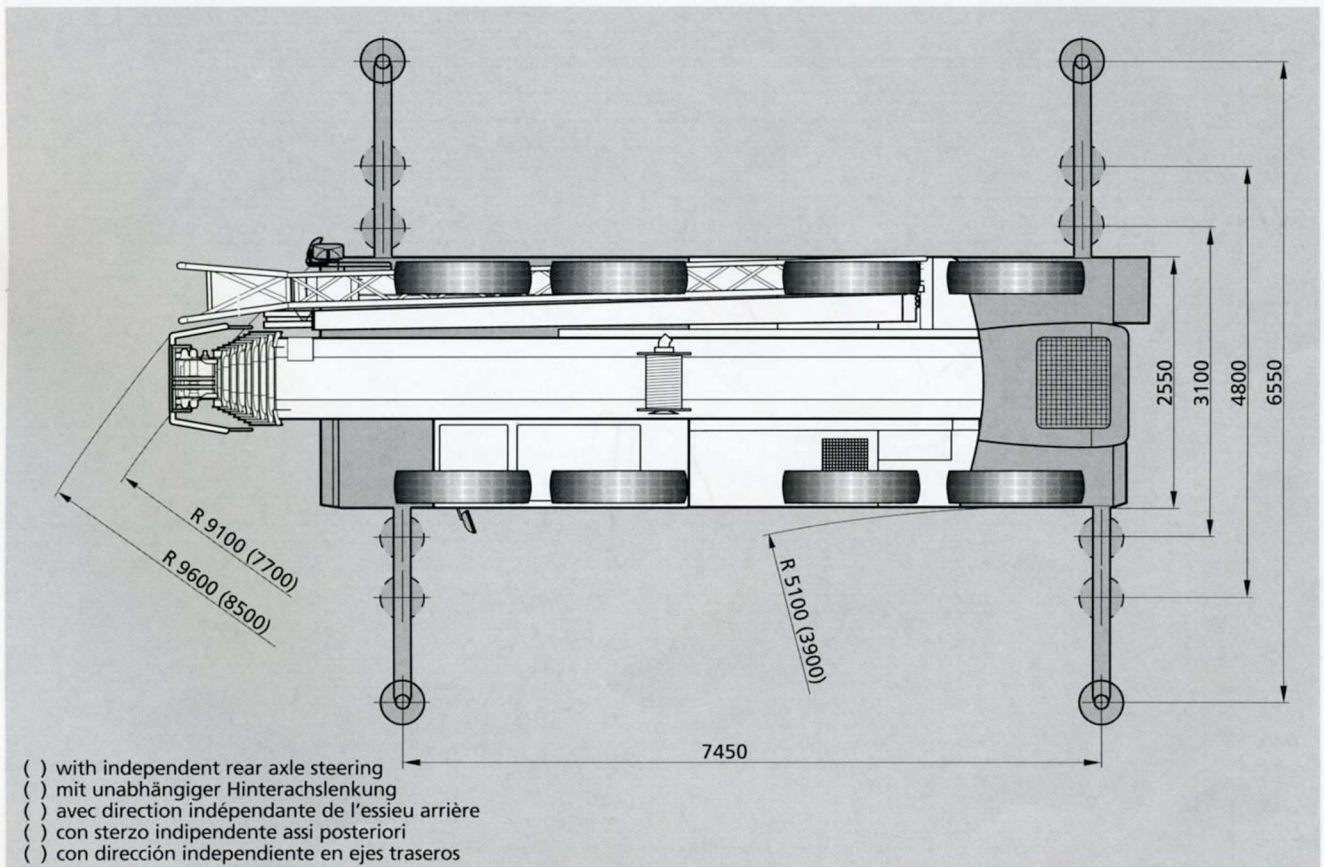
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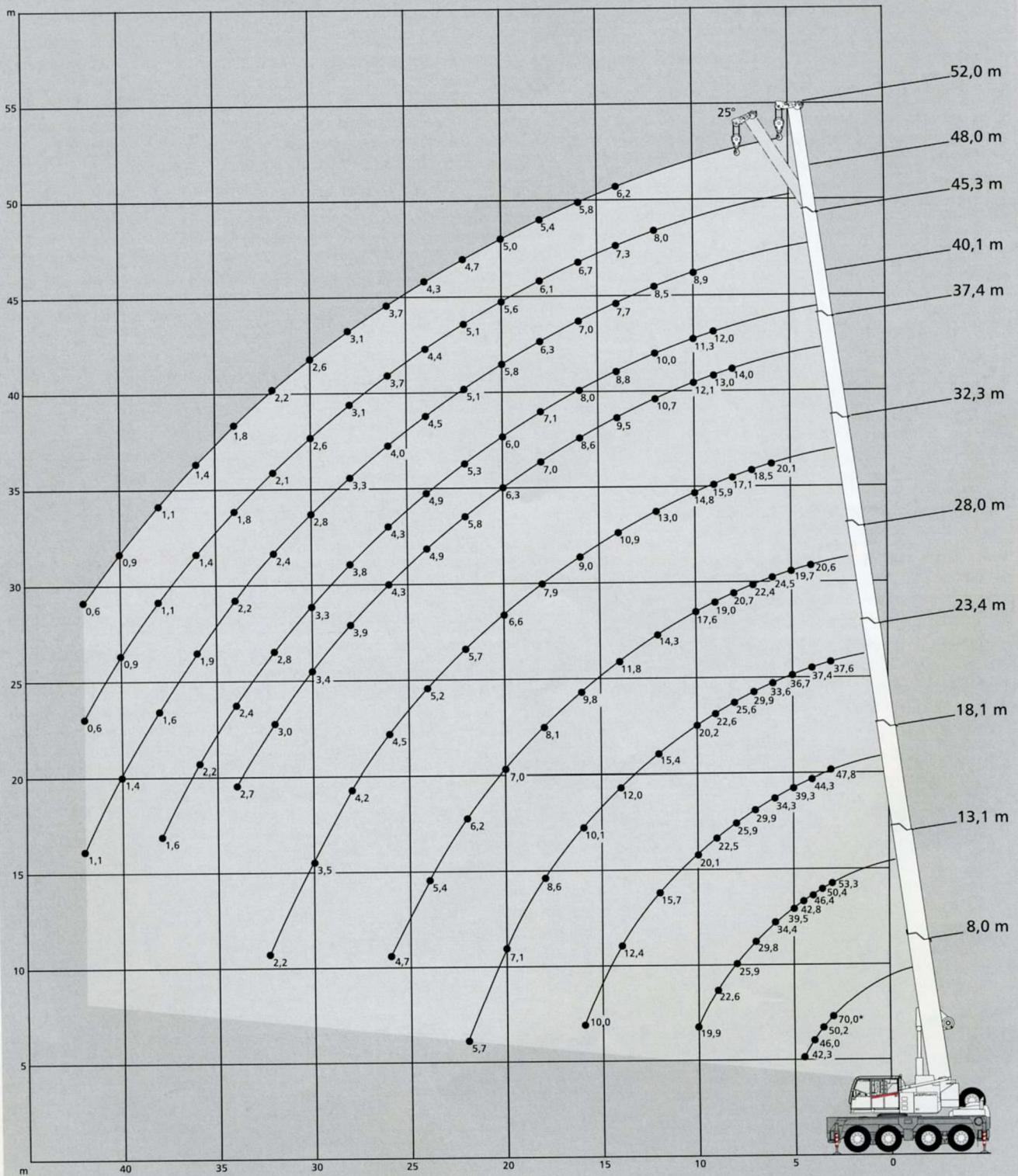
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Dimensions · Abmessungen · Encombrement
Dimensioni · Dimensiones





Working ranges main boom · Arbeitsbereiche Hauptausleger ·
Portées flèche principale · Campo di lavoro braccio base ·
Rangos de trabajo de pluma principal



* over front · nach vorne · sur l'avant · sul davanti · hacia delante



Runner for workshop applications · Montagespitze für Hallen-
einsätze · Potence pour utilisation en atelier ·
Runner per lavori all'interno · Runner para trabajos en interiores

