

KSL Planning
Environment Agency

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

Date: 24 June 2022
Your Ref:
Our Ref : TV/2813/14374_Rev2
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 (Ref: KT/2020/127776/08-L01ENVPAC/1/KSL/00360). The EA has objected to the application for the following reason:

"The revised Structural Inspection Report does not sufficiently or accurately assess the residual life of the site's Tidal Flood Defences or provide a detailed proposal for future raising/remedial works.

Removing our objection:

The following points must be resolved:

- *The condition and residual life of the Tidal Flood Defences must be accurately and sufficiently assessed. We have included further detail on what we require from a further revision of the report below.*
- *The proposal should include a detailed plan for how defence levels will be raised to meet 2070 requirements with a 100 year design life. Based on our assessment of the submitted information, the tidal defences do not have sufficient residual life to meet the 100 year requirement or to support the load from further raising to 8.00mAOD. Therefore, a new defence with a crest of no less than 8.00mAOD should be constructed as part of this development.*
- *If the applicant can demonstrate that raising to the 2070 levels is not possible as part of this development, then it must be demonstrated that the existing defence can meet the 100 year design life requirement with remedial works. A full proposal for the raising of the Tidal Defences to meet the 2040 levels must be included and these works will form part of the application. Additionally, a full*

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proposal for subsequent raising to 8.00mAOD would have to be submitted and approved by ourselves.”

A full copy of the EA's objection is appended to this letter for reference.

Since the EA's objection in February this year (2022), the applicant has appointed CTP Consulting Engineers to undertake further investigative work in order to respond to the EA's comments. The '*Custom House River Wall Remedial Works Report*' appended to this document details the strategy proposed to meet the EA's requirements. The aim of this letter is not to repeat the content of CTP's report, but to summarise the findings and allow the EA to reconsider their position. As such, the EA should review the appended report in detail alongside this letter.

The further work undertaken by CTP demonstrates that, with remedial works, the defences within the applicant's ownership will have a design life of 100 years and therefore, it is not necessary to replace the entire flood defence. CTP has proposed an achievable solution which ensures that the EA's TE2100 raising requirements can also be met as part of this application and in the future.

Firstly, considering the existing steel sheet piled wall in the northwest of the site. This wall is to be replaced with a new wall with a minimum of 100 year design life and will be built to the TE2100 2070 level of 8.0mAODN¹. This work will take place as part of the development.

Remedial works are also proposed to the existing steel sheet pile wall along the northern boundary to extend the design life to 100 years and will be raised to the 2040 level of 6.9m AODN as part of the development ². Further details have also been provided to demonstrate that it is possible to raise the wall to the 2070 level in the future. The existing flood gate is also to be replaced with a new concrete wall and tied into the existing structure to provide a minimum of 100 year design life ³.

The applicant has followed all of the EA's advice throughout the multiple pre-application meetings and met the EA requirements where physically possible/practicable. Given the scale of the development (i.e. small scale redevelopment of an existing, currently disused site) it is simply not feasible to provide any further evidence at this planning stage of the application, nor would it be financially viable to include any further works than what is currently proposed. In any case, it is considered that the information provided within this latest submission is sufficient to demonstrate a workable solution is available and any further information relating to the proposals can reasonably be secured at detailed design stage by suitable worded planning conditions. Such an approach was taken for a nearby application at Clifton Slipways and therefore, it is considered reasonable that this application be treated in the same manner.

The proposal will offer a significant improvement from the current situation and by re-purposing the site into residential use it will be more straightforward and viable to undertake the proposed improvements, and to maintain the defences in the future. If the development site was to remain derelict, as would be the case if the EA were to maintain their objection to the application as it would not be financially viable to propose further works than currently proposed, the defences would be far more likely to drift into a state of disrepair.

Finally, from an environmental perspective and considering the carbon footprint associated with any works, it would clearly be beneficial to reuse and retrofit to the existing flood defences, rather than demolish and replace

¹ CTP Custom House River Wall Structural Inspection Report – Page 4

² CTP Custom House River Wall Structural Inspection Report – Page 6

³ CTP Custom House River Wall Structural Inspection Report – Page 8

the existing solid structure. Given that there is a workable solution to improve the existing defences and that there are a number of high profile campaigns that promote reuse and retrofit (such as RetroFirst and Environmental Audit Committees Report) it is considered that construction of a complete new defence would be unnecessarily detrimental to the environment.

To conclude, the applicant has once again worked to provide as much detail as could reasonably be expected at the planning stage and has clearly demonstrated that an appropriate strategy is available to meet the EA requirements. Any further details can be provided as part of the detailed design and secured through appropriate worded planning conditions.

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) GradCIWEM
Flood Risk Analyst

Documents Appended:

- EA Objection (February 2022)
- CTP Consulting Engineers "Custom House River Wall Structural Inspection Report"

Michael Keckes
Mile Property Group Ltd
27 Castle Street
Canterbury
CT1 2PX

Our ref: KT/2020/127776/08-L01
ENVPAC/1/KSL/00360
Your ref: 2813/KT
Date: 22 February 2022

Dear Michael

STRUCTURAL REPORT AND INTRUSIVE INSPECTION OF THE FLOOD DEFENCE. THE PROPOSALS FOR DEVELOPMENT ARE NOT FIXED, HOWEVER, IT IS INTENDED THAT THE GRADE II LISTED CUSTOMS HOUSE BUILDING AND OUTBUILDINGS WILL BE CONVERTED TO ACCOMMODATE 29NO. SELF-CONTAINED FLATS WITH ASSOCIATED PARKING, AMENITY AND LANDSCAPING.

CUSTOM HOUSE, THE TERRACE, GRAVESEND DA12 2DE

Thank you for sending the above reports for review. As discussed in our meeting of 10 February we require further detailed information and **maintain our objection** to the proposal. The revised Structural Inspection Report does not sufficiently or accurately assess the residual life of the site's Tidal Flood Defences or provide a detailed proposal for future raising/remedial works.

Removing our objection

The following points must be resolved:

- The condition and residual life of the Tidal Flood Defences must be accurately and sufficiently assessed. We have included further detail on what we require from a further revision of the report below.
- The proposal should include a detailed plan for how defence levels will be raised to meet 2070 requirements with a 100 year design life. Based on our assessment of the submitted information, the tidal defences do not have sufficient residual life to meet the 100 year requirement or to support the load from further raising to 8.00mAOD. Therefore, a new defence with a crest of no less than 8.00mAOD should be constructed as part of this development.
- If the applicant can demonstrate that raising to the 2070 levels is not possible as part of this development, then it must be demonstrated that the existing defence can meet the 100 year design life requirement with remedial works. A full proposal for the raising of the Tidal Defences to meet the 2040 levels must be included and these works will form part of the application. Additionally, a

full proposal for subsequent raising to 8.00mAOD would have to be submitted and approved by ourselves.

Please review the following specific requirements which have not been met in the revised Structural inspection Report:

Existing Flood Defence

- The calculations for the residual life of the existing flood defence only focus on the buried part of the sheet pile. Although this may be where the highest bending takes place, it does not mean the exposed section of sheet pile subject to more intense corrosion should not also be analysed. We require both sets of calculations for a holistic analysis of the residual life of the existing flood defence types on the site.
- A managed maintenance approach, involving regular interventions, is not desirable as it introduces a risk that the long term maintenance is not appropriately implemented throughout the lifetime of the development and a major intervention is consequently required. We need greater assurance that the flood defence will retain its condition throughout the lifetime of the development.
- No assessment of potential foreshore erosion and how this would affect the stability of the flood defence in the future.

Future Flood Defence

- The applicant is undertaking at least the 2040 defence raising, on the basis the existing defence is demonstrated to have a life of 100 years, also accounting for the performance of the defence with the proposed 2040 raising option – a revised report must detail which option will be chosen and demonstrate buildability.
- Many of the 2040 raising suggestions add load to the flood defence. It has not been demonstrated how the flood defence could take this additional load and how this would affect its performance in achieving an 100 year life without requiring a major intervention.
- Where the 2040 raising option employs space behind the flood defence (e.g. concrete upstand wall) we need to understand how much space will be taken up so this can be used in the assessment of space available behind the flood defence for the 2070 raising.
- Glass defences are more fragile and require greater maintenance requirements than conventional flood defences. We will only accept these short comings as a flood defence option where it has been justified to be the only option to mitigate any significant adverse impacts caused by flood defence raising. This is not the case at this site where multiple options have been proposed to be feasible.
- The 2040 and 2070 raising is being looked at completely separately – the 2070 raising proposal must account for any changes that have been made as part of the 2040 raise as this could impact the requirements for the 2070 raise.

- The report states that the embedment depth of the sheet pile walls is not known. In this case, all calculations must be done for the worst case scenario i.e. shortest pile depth known until the embedment depth is confirmed.
- We require information on how the 2070 raising will be achieved in the space provided from the landward extent of the flood defence to the first building line. As there are two proposals, this should be shown for the proposal that requires the largest amount of space behind the flood defence to be constructed. i.e. what plant will be required and what are its dimensions, how can this manoeuvre safely within the space provided from the land, does the space for construction adhere to CDM requirements.
- Note: the 1.2m offset to the flood defences previously discussed was purely appropriate for inspection requirements, not for maintenance. Space needs to be demonstrated for minor maintenance repairs and major renewal of the flood defence.
- Note: if the flood defence has to be replaced as part of the development due to it not being demonstrated to provide 100 years, we will still require space behind the flood defence for a contingency flood defence option, a demonstration of what this option could be and the space required to construct it.
- The full extent, purpose and condition of the whaling beams should be detailed.

Environment enhancements

- The current proposals are very separate to the flood defence – we need to see environmental enhancements that are incorporated within the flood defence design. For example, if the flood defence is being replaced we would expect the flood defence design to incorporate a tidal terrace, unless there is evidence that this would not be possible, in which case a different ecological enhancement would need to be installed. Further information on this can be found at Estuary Edges.

Contamination

- We require confirmation of whether the material in front of the flood defence is contaminated or not.
- The composition of the foreshore material could exacerbate the sheet pile corrosion greater than what has been accounted for.

Stairs

- The 'Proposed Site & Lower Ground Floor Plan EA Requirements Drawings' indicates that the stairs will remain in place over the flood defence. Note, if the stairs are removed/replaced we would require the necessary raising (2070) to be completed underneath the stairs to avoid undue cost and difficulty in the future.

Floodgate

- It has not been confirmed in the report how the floodgate will be decommissioned as part of the development, but the drawing suggests it would be sealed. This option is a temporary decommission and requires

ongoing maintenance to ensure the seals do not allow water through the flood defence. Also a floodgate only has a design life of 50 years. We would therefore request it is replaced by the proposed reinforced concrete wall and tie into the existing wall to ensure there is no weakness in the flood defence for the development lifetime.

Ship impact

- We require a consideration for ship impact to the Tidal Thames defences to be included with a revised report.

Please revise and submit reports as required and should you request another meeting with us, we request that documents and plans are received by us at least 2 weeks prior to any meeting taking place. This is to give ample time for review of the detailed information and to review our position.

Please contact me should you wish to discuss the above.

Yours sincerely

Sophie Page

Mrs Sophie Page
Planning Specialist

Direct dial 020 8474 8030

Direct e-mail kslplanning@environment-agency.gov.uk

Cc Herringtons – Elena Corchon



Project Name: Custom House River Wall

Remedial Works Report

Date: May 2022

Project Number: A7752

Contents

Document Status and Signatures

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- 4.0 Existing flood gate & stairs

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Appendix A – Drawings of remedial works

Appendix B – Soil testing results

Appendix C – Further ultrasonic thickness readings

Appendix D – Knights Brown Construction methodology

Appendix E – Construction plant data sheets

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

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:	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.
- 1.2 This report goes into detail on the different existing wall types and how the remedial works can be carried out to ensure the structure lasts 100 years and can be raised. This should provide justification to enable the Environment Agency to remove their objection to the development planning permission.
- 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).

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.
- 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 The as built drawings of the structure have been obtained from the Environment Agency, these confirm the embedment depth of the sheet piled walls. This information has been used to analyse the existing structure under the worst 8.0m AOD condition. The existing wall has been calculated as being capable of withstanding the additional loadings from both the 2040 & 2070 increases to the wall height.
- 3.3 The initial raising of 6.9m AOD is to be carried out as part of the development by increasing the height of the existing reinforced concrete capping beam to 6.90m AOD. This will be done by drilling and fixing dowel bars into the existing capping beam, to create a key, and formwork shuttering around the existing capping beam, fixing new reinforcement and pouring concrete to create the higher capping beam. These works carried out as part of the development. With reinforcement designs provided during detailed design.
- 3.4 The 2070 raising works are to be carried out in the future, using a reinforced concrete upstand, to increase the wall height to 8m AOD. The flood wall is to be designed for the accidental flooding scenario; the combination of accidental actions is to be incorporated into the design in accordance with Eurocode design standards.
- 3.5 Both of these raising proposals, do not require any additional space behind the existing wall. Refer to drawings A7752-110 & 120 and sections A-A & B0B within Appendix A. The special requirements have been verified using the as built drawings. No additional space for additional support is necessary.
- 3.6 It is proposed to extend the life of the existing structure. To ensure the service life is extended to a minimum of 100 years it is proposed to provide a new concrete cover protection to the buried sheet piling, to protect the sheet piling from additional corrosion at the point of maximum bending moment. 2.5 metres down the steel sheet piles will have shear studs welded to them and then concrete poured to provide cover to the steel. The concrete protection will be designed to withstand the exposure condition of continual wetting and drying of seawater chlorides (concrete to be C35/45 class XS3).
- 3.7 The calculation of the structure considers the additional load on the structure and the expected life of the structure. The calculation considers both raisings (2040 & 2070).
- The 2040 & 2070 raisings are compatible with one another and are not looked at independently. The dowel bars will provide an adequate key into the existing structure.

- The as built drawings confirm the toe levels of the existing sheet piles.
 - The drawing plan in Appendix A shows space for plant access, contractors' temporary compound, and working access to carry out the 2070 raising
 - Access for the worst case inspection and maintenance requirements is provided as part of the post development plan. Refer to the drawing sections in Appendix A.
 - There is sufficient access behind the proposed wall for construction to both the replacement section of wall and the raising of the walls, refer to Appendix A
 - The extent and purpose of the wailing beams is shown on the as built drawings provided by the Environment Agency.
- 3.8 Drawings have been produced for the existing pre development and also the post development site plan, showing the construction access and temporary works access requirements, it also demonstrates the manoeuvrability of the plant, refer to Appendix A.
- 3.9 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 new exposed sheet piled wall & the raising of the existing concrete capping beam wall is detailed.

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 feedback received, the floodgate will be replaced with a new reinforced concrete wall. This will be tied into the surrounding structure, designed for a minimum of 100-year design life. Refer to the drawing in Appendix A for the marked-up plan, along with the buildability statement contained in Appendix D.

4.3 The 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 Corrosion

- 6.1 Additional corrosion readings have been obtained on site. A new sketch in Appendix C has been prepared to present this information
- 6.2 A new concrete cover to the sheet piling will be installed below ground to provide enhanced protection, this will negate the risk of corrosion rates worsening.

7.0 Buildability

- 7.1 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.

Appendix A – Drawings of remedial works

New Sheet piled wall to be constructed
500mm from existing steel sheet piled wall

Proposed Plant

Concrete Truck 6 Cubic meter

Overall width - excluding mirrors 2542mm
Overall width - including mirrors 3101mm
Overall length - 8235mm

6 Wheeled Arctic

Overall width - excluding mirrors 2500mm
Overall width - including mirrors 3050mm
Overall length - 8230mm

AC70- City Crane

Overall length 9963mm
Overall width 2550mm

WP150 Silent Piler

Length 2394mm
Width 1140mm

Project Datum
All levels and coordinates are related to the Ordnance Survey national grid by means of GPS using the Latic Smartnet RTK network. One survey control point has been fixed using GPS and then the survey orientated to an additional GPS points. No scale factor has been applied therefore only the fixed GPS point is a true Ordnance Survey position.

Topographical Survey Legend		
BEB Bellsh Beacon	FH Fire Hydrant	RL Ridge Level
BH Borehole	FL Flood Light	RS Road Sign
BS Bench Level	FP Flag Pole	RTW Retaining Wall
Bd Brack	GB Grit Box	RTW Rain Water Pipe
BP Brack Pillar	GL Gas Inspection Cover	SEG Sewer Entry Gully
BRW Brack Wall	GM Gas Meter	SS Structural Slab Level
BW Block Wall	GV Gas Valve	STN Survey Station
CBF Chain Link Fence	IC Inspection Cover	STW Stone Wall
CL Cover Level	IC (IC/Combined/F/500/5/50mm)	SV Stop Valve(V)/Water(G)/Gas
CLF Chain Link Fence	IC Invert Level	SV Stop Valve(V)/Water(G)/Gas
Conc Concrete	IB Invert Level	TAC Tackling
COP Concrete Paving Fence	JB Junction Box	TCS Telephone Call Box
CPO Concrete Post	LP Lamp Post	TEP Telegraph & Electric Pole
CPS Concrete Paving Slab	MB Multi Rooted Tree	THL Threshold Level
CRW Concrete Retaining Wall	MC Service Marker	TIC Telecom Inspection Cover
CW Concrete Wall	MP Metal Railing Fence	TM Ticket Machine
DC Drainage Channel	NP Name Plate	TL Traffic Light
DIL Disinfectant	OB Open Board Fence	TLR Traffic Light Control Box
DP Down Pipe	PB Post Box	TP Telegraph Pole
DPC Damp Proof Course	PF Post & Chain Fence	TTL Top Of Wall Level
EIC Electric Inspection Cover	PM Parking Meter	UTL Unable To Lift
ER Earth Road	PWF Paving Fence	WIC Water Inspection Cover
EP Electric Pole	PRF Post & Rail Fence	WM Water Meter
ER Earth Road	PWF Paving Fence	WMF Wire Mesh Fence
FB Flow Bed	PWF Post & Wire Fence	WTL Water Level
FL Finished Floor Level	RE Roofing Eave	VP Vent Pipe

Tree Species		
AC Acer	FR Fruit	LN London Plane
AL Alder	HA Hawthorn	LO Locust
AS Ash	HB Hornbeam	MA Maple
BE Beech	HC Horse Chestnut	MG Magnolia
CE Cedar	HY Holly	CA Oak
CH Cherry	HZ Hazel	PI Pine
CY Cypress	LA Larch	PO Poplar
DE Dead	LB Laburnum	RD Rowan
EL Elm	LI Lime	SB Silver Birch
		SC Sweet Chestnut
		SP Spruce
		ST Sycamore
		U Underside
		WA Walnut
		WB Whitebeam
		WI Willow
		YV Yew

Line Types	
Steps / Ramps	Building Face
Top / Bottom of Banking	Drop Kerb
Bushes / Vegetation	Kerb
Change of Surface	Wall / Structure
Detail	Single Gate
Overhead Structure	Double Gate
Telecom Overhead	Banking
Telecom & Power Overhead	Survey Station
Power Overhead	

All levels and dimensions are quoted in metres. Tree heights are quoted based on an estimation taken from the ground and have not been accurately confirmed.
Whilst every effort is made to identify tree species and sizes, no responsibility can be taken for the accuracy of this information and an Arborologist should be consulted for confirmation.
Eave levels are taken at the bottom of the lowest roof tile.
It is recommended that all invert levels and pipe sizes be checked prior to construction.
Drawing correct at time of survey and to scale.
Any setting out works should be undertaken using Omega Geomatics Ltd survey control only.

Measured Building Survey Legend	
ACL Arch Center Level / Height above floor	ASL Arch Spring Level / Height above floor
CH Window Cill to Window Head Dimension	CLG Ceiling Level / Height above floor
DLH Door Head Level	F.C Floor to Window Cill Dimension
FL Floor Level	RU Ramp Up
RU Ramp Up	SCLG Suspended / False Ceiling Level / Height above floor
SL Slab Level	TH Threshold Height above floor
SU Skirting Up	THL Threshold Level
TH Threshold Height above floor	TWL Top of Wall Level
THL Threshold Level	USB Underside of Beam Level / Height to underside above floor
TWL Top of Wall Level	USJ Underside of Joist Level / Height to underside above floor
USB Underside of Beam Level / Height to underside above floor	WACL Window Arch Center Level
USJ Underside of Joist Level / Height to underside above floor	WASL Window Arch Spring Level
WACL Window Arch Center Level	WCL Window Head Level
WASL Window Arch Spring Level	WHL Window Head Level
WCL Window Head Level	WHL Window Head Level

Sloping Roof	Building Line / Wall Line
Sloped Ceiling (Points up)	Detail
Arched / Vaulted Ceiling	Roof
	Overhead Detail
	Partitions
	Glazing

All building measurements are taken to existing finishes or faces which are constant and represent an average face or wall line. All levels and dimensions are quoted in metres.
All window head and window cill levels are internal measurements.
Ceiling height measurements are taken to a point which best represents the general room height.

Revision	Amendments	Date	Rev'd	Chk'd
Created by	SP	11/05/2022		STRUCT

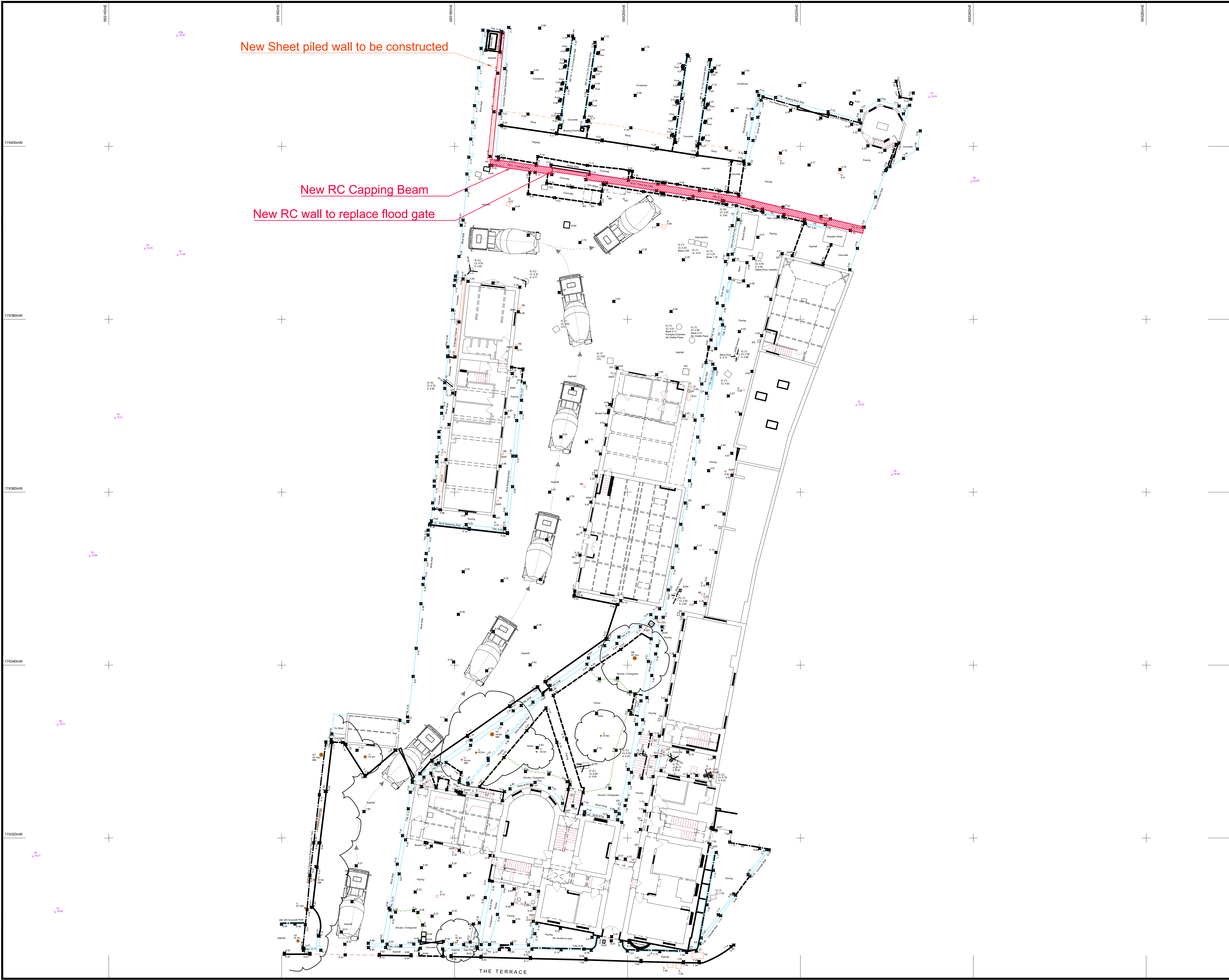


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Project Title:
Customs House

Drawing Title:
North Wall replacement to 8.0m AOD

Drawing Number:
A7752-100
Scale:
1:200 @A1
Unless Noted Otherwise
Revision



Project Datum

All levels and coordinates are related to the Ordnance Survey national grid by means of GPS using the Latic Smartnet RTK network. One survey control point has been fixed using GPS and then the survey orientated to an additional GPS point. No scale factor has been applied therefore only the fixed GPS point is a true Ordnance Survey position.

Topographical Survey Legend

BEB Bellisha Beacon	FH Fire Hydrant	RL Ridge Level
BH Borehole	FL Flood Light	RS Road Sign
BS Bench Level	FP Flag Pole	RTW Retaining Wall
BO Boulder	GB Gas Box	RTW Rain Water Pipe
BP Brick Pillar	GC Gas Casing	SEG Silt Entry Gully
BRW Brick Wall	GM Gas Meter	SS Structural Slab Level
BU Bush	GV Gas Valve	STN Survey Station
BW Block Wall	HT Height (m feature)	STW Stone Wall
CB Chain Link Fence	IC Inspection Cover	SV Stop Valve (Water/Gas)
CL Cover Level	IC (C) Combined (F/Su/S) Stop Valve	SV Stop Valve (Water/Gas)
CL Chain Link Fence	IL Invert Level	SV Stop Valve (Water/Gas)
Conc Concrete	JB Junction Box	TAC Tactile Paving
CP Concrete Paving	LP Lamp Post	TCS Telephone Call Box
CPO Concrete Post	MB Multi Rooted Tree	TEP Telegraph & Electric Pole
CPS Concrete Paving Slab	MC Service Marker	TEL Threshold Level
CRW Concrete Retaining Wall	MS Metal Railing Fence	TIC Telecom Inspection Cover
CV Concrete Wall	NP Name Plate	TM Ticket Machine
DC Drainage Channel	OB Open Board Fence	TL Traffic Light
DIL Disinfectant	OB Open Board Fence	TL Traffic Light Control Box
DP Down Pipe	OB Open Board Fence	TP Telegraph Pole
DPC Damp Proof Course	OB Open Board Fence	TP Top of Wall Level
EIC Electric Inspection Cover	OB Open Board Fence	UTL Unable To Lift
ER Earth Road	OB Open Board Fence	WIC Water Inspection Cover
EP Electric Pole	OB Open Board Fence	WM Water Meter
ES Earth Road	OB Open Board Fence	WMF Wire Mesh Fence
FL Flow Bed	OB Open Board Fence	WTL Water Level
RE Road	OB Open Board Fence	VP Vent Pipe

Tree Species

AC Asar	FR Fruit	LN London Plane	SC Sweet Chestnut
AL Alder	HA Hawthorn	LO Locust	SP Spruce
AS Ash	HB Hornbeam	MA Maple	ST Stump
BE Beech	HC Horse Chestnut	MG Magnolia	SY Sycamore
CE Cedar	HY Holly	OA Oak	U Underside
CH Cherry	HZ Hazel	PI Pine	WA Walnut
CY Cypress	LA Larch	PO Poplar	WB Whitebeam
DE Dead	LB Laburnum	RD Rowan	WI Willow
EL Elm	LI Lime	SB Silver Birch	YE Yew

Line Types

Steps / Ramps	Building Face
Top / Bottom of Banking	Drop Kerb
Bushes / Vegetation	Kerb
Change of Surface	Wall / Structure
Detail	Single Gate
Overhead Structure	Double Gate
Telecom Overhead	Banking
Telecom & Power Overhead	Survey Station
Power Overhead	

All levels and dimensions are quoted in metres. Tree heights and canopy spreads are surveyed as a mean size and shown to scale. Tree heights are quoted based on an estimation taken from the ground and have not been accurately confirmed.

Whilst every effort is made to identify tree species and sizes, no responsibility can be taken for the accuracy of this information and an Arborologist should be consulted for confirmation.

Leave levels are taken at the bottom of the lowest roof tile.

It is recommended that all invert levels and pipe sizes be checked prior to construction.

Drawing correct at time of survey and to scale.

Any setting out works should be undertaken using Omega Geomatics Ltd survey control only.

Measured Building Survey Legend

ACL Arch Center Level / Height above floor	ASL Arch Spring Level / Height above floor
CH Window Cill to Window Head Dimension	CLG Ceiling Level / Height above floor
DLH Door Head Level	F.C Floor to Window Cill Dimension
FL Floor Level	R.U Ramp Up
SCLG Suspended / False Ceiling Level / Height above floor	SL Sill Level
SU Skips Up	TH Threshold Height above floor
THL Threshold Level	TWL Top of Wall Level
USB Underside of Beam Level / Height to underside above floor	USJ Underside of Joist Level / Height to underside above floor
WACL Window Arch Center Level	WASL Window Arch Spring Level
WCL Window Cill Level	WHL Window Head Level

Proposed Plant

6 Cubic meter Concrete Truck

Overall width - excluding mirrors 2542mm
Overall width - including mirrors 3101mm
Overall length - 8235mm

6 Wheeler Arctic

Overall width - excluding mirrors 2500mm
Overall width - including mirrors 3050mm
Overall length - 8230mm

Revision

Revision	Amendments	Date	Rev'd	Chk'd
SP		11/05/2022		STRUCT

ctp consulting engineers international

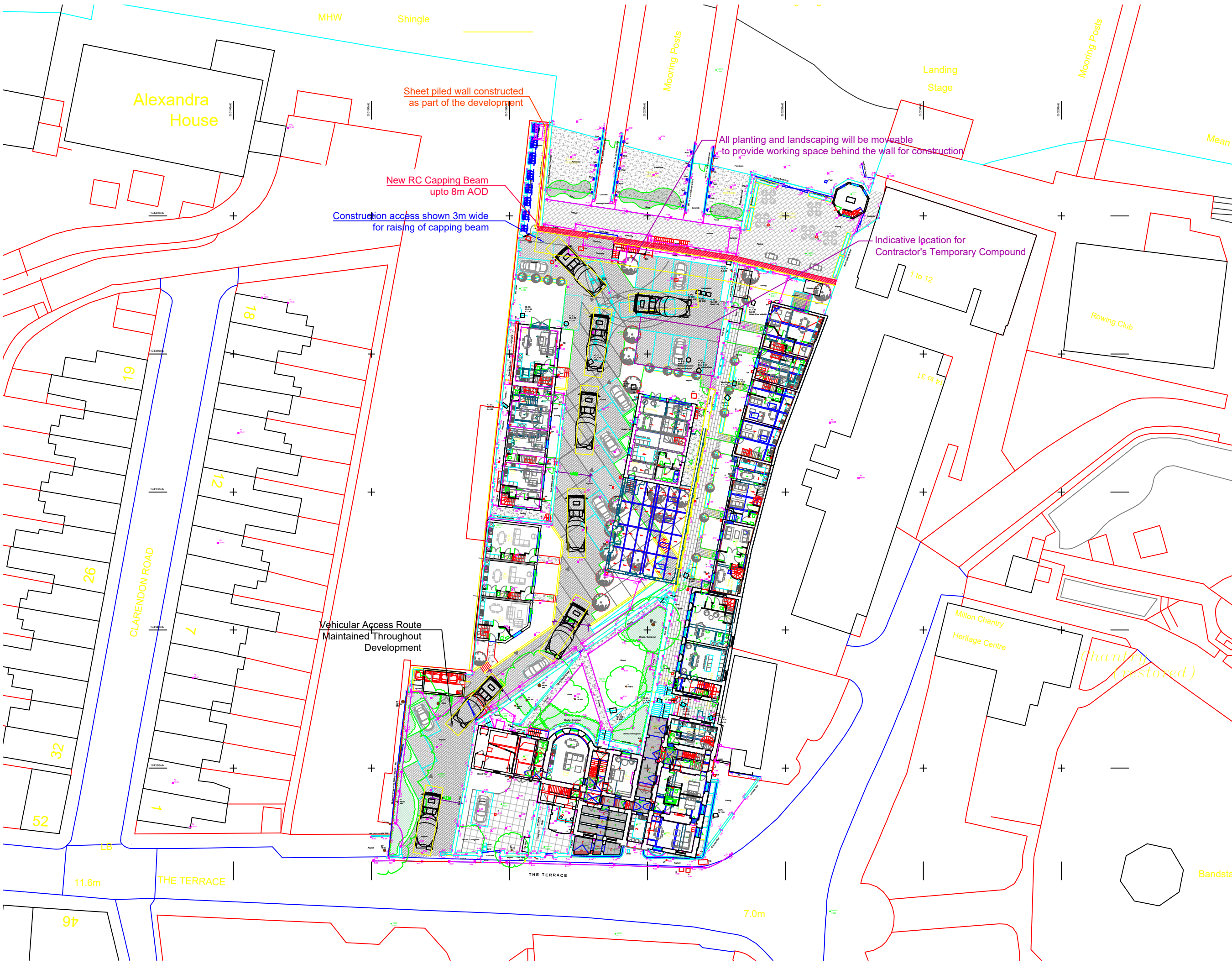
Suffolk House 154 High Street
Sevenoaks Kent TN13 1XE UK
UK: +44 (0)1732 740195
www.ctp-lp.com

Project Title: Customs House

Drawing Title: 2040 Raising to 6.9m AOD

Drawing Number: A7752-110

Scale: 1:200 @A1
Unless Noted Otherwise



Project Datum

All levels and coordinates are related to the Ordnance Survey national grid by means of GPS using the Leica SmartNet RTK network. One survey control point has been fixed using GPS and then the survey orientated to an additional GPS points. No scale factor has been applied therefore only the fixed GPS point is a true Ordnance Survey position.

Topographical Survey Legend

BEB Bellsh Beacon	PH Fire Hydrant	RL Ridge Level
BH Borehole	PL Flood Light	RS Road Sign
BL Back Level	RT Retaining Wall	RWP Rain Water Pipe
BO Bollard	G Gully	SS Side Entry Gully
BP Brick Paving	GC Gas Inspection Cover	SI Sign
BPav Brick Paving	GP Gas Pipe	STN Survey Station
BW Brick Wall	GV Gas Valve	STW Stone Wall
CBF Close Board Fence	H Height (in meters)	SU Step Up
CL Cover Level	IC Inspection Cover	SV Stop Valve/Water/Gas
CLF Chain Link Fence	IC(C) Combined Foul/Silt/Bom	SVF Soil Vent Pipe
COC Concrete	IB Junction Box	TAC Traffic Paving
CPF Concrete Paving Fence	LB Large Ball Valve	TCL Telephone Call Box
CPD Concrete Paving	MA Mail Box	TLC Telegraph & Electric Pole
CRW Concrete Retaining Wall	MS Service Manhole	TLC Teleson Inspection Cover
CW Concrete Wall	MP Main Board Fence	TM Traffic Marker
DC Drainage Channel	NP Name Plate	TL Traffic Light
DLS Discharge	OP Open Board Fence	TLCB Traffic Light Control Box
DP Down Pipe	PS Post Box	TP Telegraph Pole
DPC Damp Proof Course	PFC Post & Chain Fence	TW Top Of Wall Level
EIC Electric Inspection Cover	PMF Parking Meter	UTL Unable To Lift
EL Eave Level	PWF Panel Fence	WIC Water Inspection Cover
EP Electric Pole	PRF Post & Rail Fence	WM Water Meter
FB Bath Room	PSL Plaster Wall Level	WML Wire Mesh Fence
FB Floor Board	PPF Post & Wire Fence	WVL Water Level
FL Finished Floor Level	RE Roofing Eave	WV Vent Pipe

Tree Species

AC Acer	FR Fruit	LN London Plane	SC Sweet Chestnut
AL Alder	LO Locust	SP Spruce	ST Stump
AS Ash	MA Hornbeam	MA Magnolia	ST Stump
BE Beech	MC Horse Chestnut	MD Magnolia	ST Stump
CE Cedar	HY Holly	OA Oak	U Underplated
CH Cherry	HZ Hazel	PI Pine	W Willow
CY Cypress	LA Larch	PO Poplar	WB Whitebeam
DE Dead	LB Laburnum	RD Rowan	WV Willow
EL Elm	LI Lime	SB Silver Birch	YE Yew

Line Types

Steep / Ramp	Fence
Top / Bottom of Banking	Building Face
Change of Surface	Drop Mark
Change of Surface	Keel
Detail	Mail / Structure
Overhead Structure	Single Gate
Overhead Structure	Double Gate
Telecom & Power Overhead	Banking
Power Overhead	Survey Station

All levels and dimensions are quoted in metres. Tree griffes and canopy spreads are surveyed as a mean size and shown to scale. Tree heights are quoted based on an estimation taken from the ground and have not been accurately confirmed.

Whilst every effort is made to identify tree species and sizes, no responsibility can be taken for the accuracy of this information and an Arborologist should be consulted for confirmation.

Eave levels are taken at the bottom of the lowest roof tile.

It is recommended that all invert levels and pipe sizes be checked prior to construction.

Drawing correct at time of survey and to scale.

Any setting out works should be undertaken using Omega Geomatics Ltd survey only.

Measured Building Survey Legend

ACL Arch Center Level / Height above floor	SL Slab Level
ASL Arch Spring Level / Height above floor	SLU Slab Up
C-H Window Cill to Window Head Dimension	TH Threshold Level
CLG Ceiling Level / Height above floor	THL Threshold Height above floor
CH Door Head Height above floor	US Underside Level / Height above floor
DHL Door Head Level	USB Underside of Beam level / Height to underside above floor
FL Floor Level	USU Underside of Joist level / Height to underside above floor
F-C Floor to Ceiling	WACL Window Arch Center Level
SCG Suspended / False Ceiling Level / Height above floor	WALL Window Arch Spring Level
SL Slab Level	WCL Window Cill Level
SLU Slab Up	WHL Window Head Level
TH Threshold Level	
THL Threshold Height above floor	
US Underside Level / Height above floor	
USB Underside of Beam level / Height to underside above floor	
USU Underside of Joist level / Height to underside above floor	
WACL Window Arch Center Level	
WALL Window Arch Spring Level	
WCL Window Cill Level	
WHL Window Head Level	

Proposed Plant

Concrete Truck 6 Cubic meter

Overall width - excluding mirrors 2542mm
Overall width - including mirrors 3101mm
Overall length - 8235mm

6 Wheeled Arctic

Overall width - excluding mirrors 2500mm
Overall width - including mirrors 3050mm
Overall length - 8230mm

AC70. City Crane

Overall length 9963mm
Overall width 2550mm

Building Line / Wall Line

Shaping Roof	Detail
Shaped Ceiling (Points up)	Shops
Arched / Vaulted Ceiling	Overhead Detail
	Partitions
	Glazing

All building measurements are taken to existing finishes or faces which are constant and represent an average face or wall line. All levels and dimensions are quoted in metres.

All window head and window cill levels are internal measurements.

Ceiling height measurements are taken to a point which best represents the general room height.

Revision

Revision	Amendments	Date	Rev'd	Chkd
SP		11/05/2022		STRUCT

ctp consulting engineers international

Suffolk House 154 High Street
Sevenoaks Kent TN13 1XE UK
UK: +44 (0)1732 740195
www.ctp-ep.com

Project Title:

Customs House

Drawing Title:

2070 Raising to 8.0m AOD

Drawing Number:

A7752-120

Scale:

1:500 @A3
Unless Noted Otherwise

Appendix B – Soil testing results



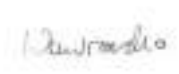
Jake Wade
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i2 Analytical Ltd.
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Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS
t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

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

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					

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				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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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					
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

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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		
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 30oC.

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 - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

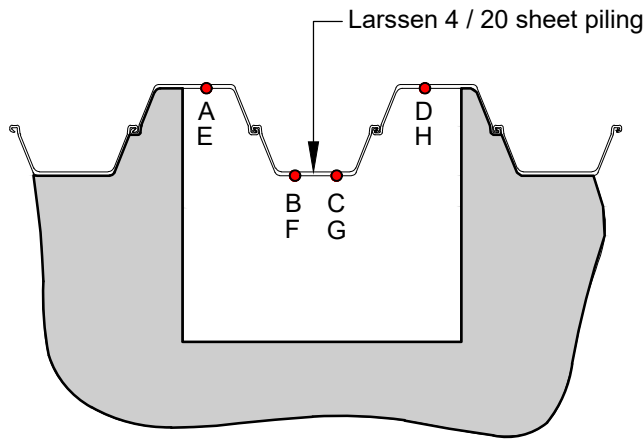
Appendix C – Further ultrasonic thickness readings



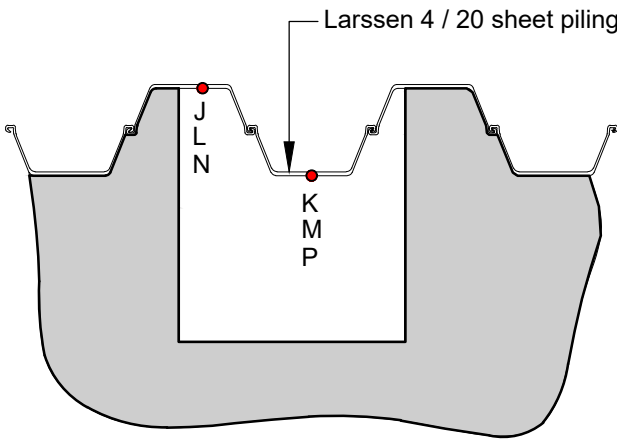
TP1 Photo



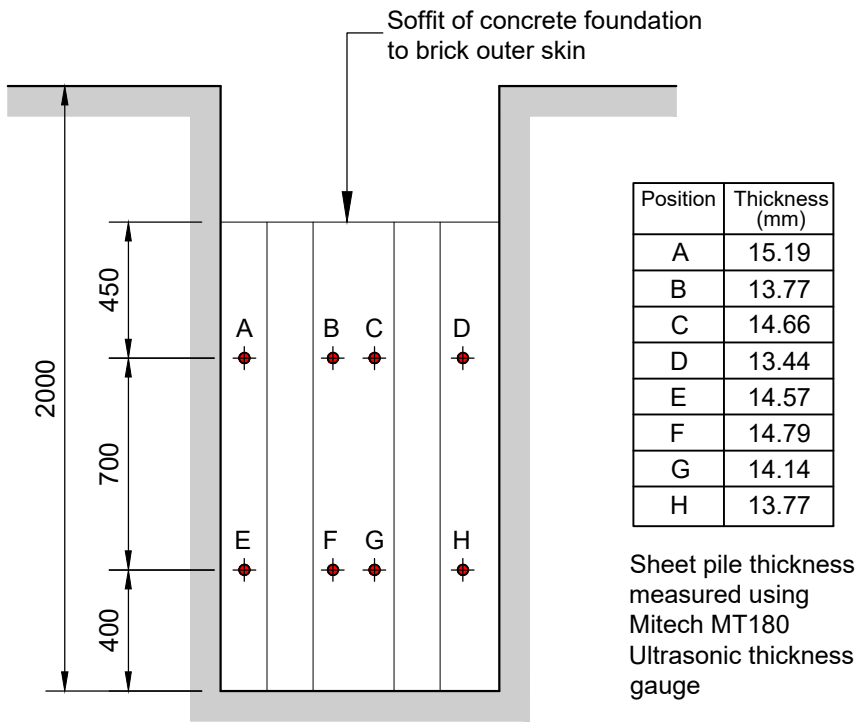
TP2 Photo



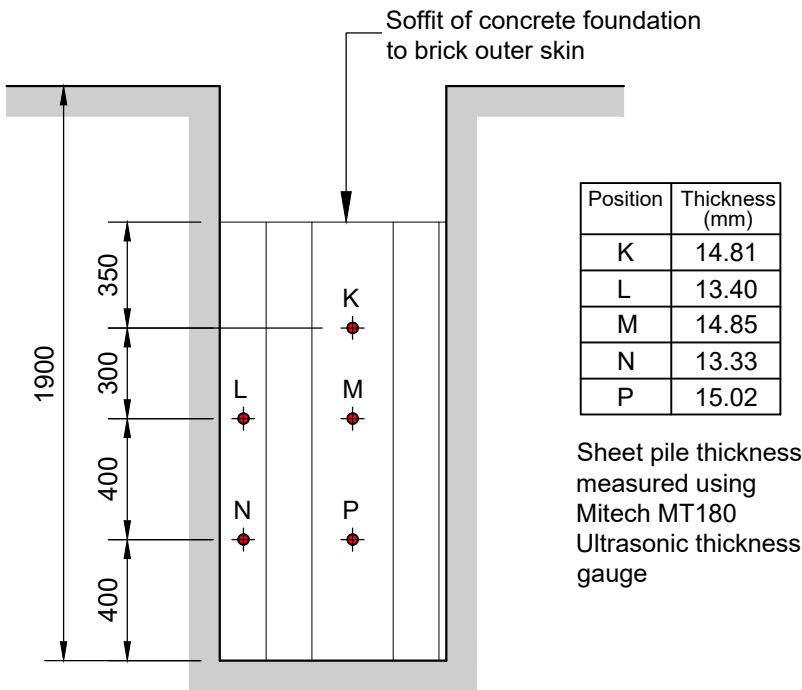
PLAN ON TRIAL PIT 1 (TP1)
Scale 1:25



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

1. DO NOT SCALE THIS DRAWING. WORK TO FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. This drawing is to be read in conjunction with all relevant Architect's, Engineer's and Specialist's drawings and their respective Specifications.
3. All work to comply with the relevant British Standards, Codes of Practice and the Building Regulations.
4. 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

CUSTOM HOUSE RIVER WALL
GRAVESEND, KENT.

TRIAL PITS TP1 & TP2

P1 Issued for Information				RB	
Revision	Amendments	Date	Rev'd	Chk'd	Discipline
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.  An aerial photograph of a site, likely a residential or commercial area. A green rectangular area is highlighted, representing the site welfare units. A yellow line, representing Heras fencing, is drawn around the perimeter of the site, with a red line indicating the main gate. The site is surrounded by residential buildings and a parking lot with several cars.

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 doveled 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 doveled 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: -

[illegible]

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:

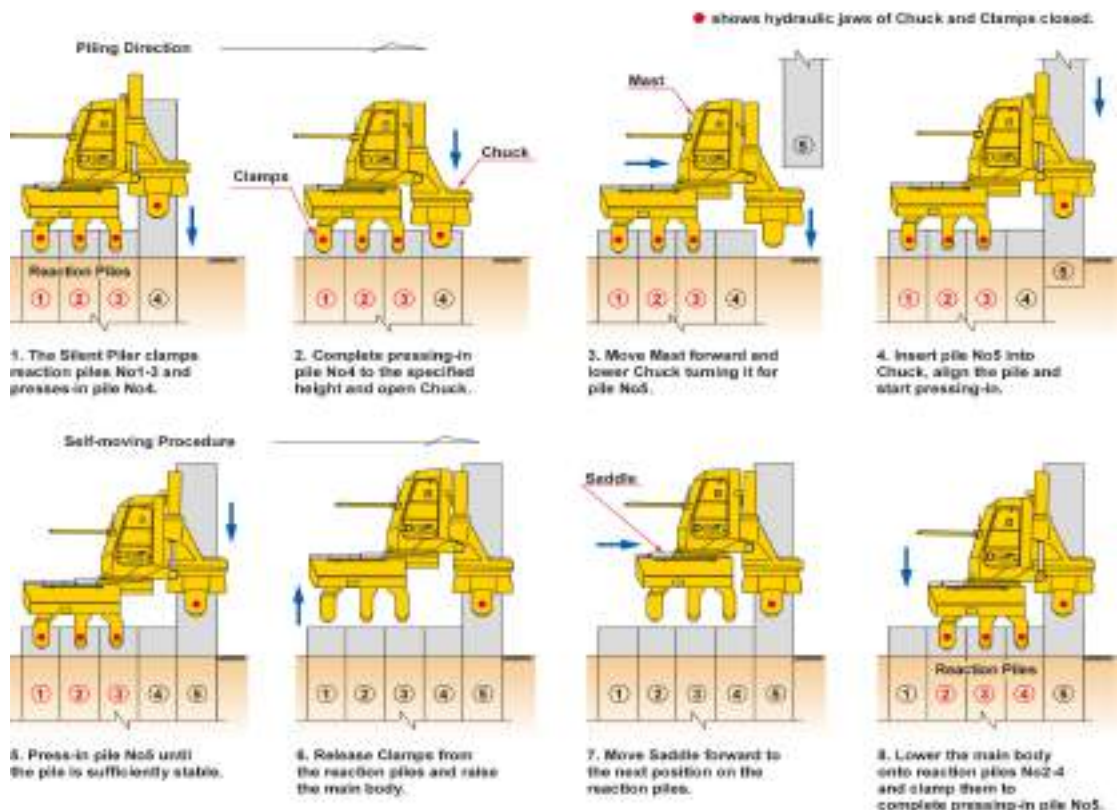
The benefits of the WP-150 are numerous. As well as the reduction in noise and vibration due to the piler's ability to *push* piles into the ground, the piler's capability to work close to the ground without the need of trestles and wailings greatly reduces the risk of injury. Additionally the piler's 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

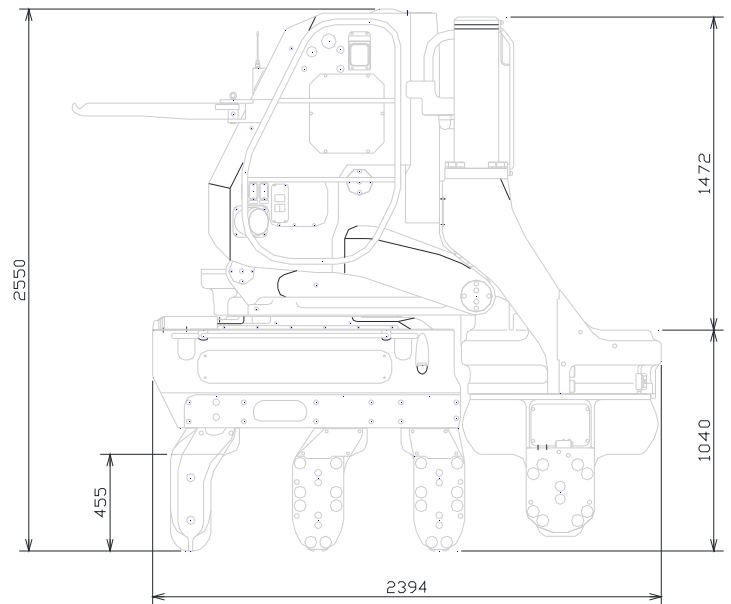
Unit 7,
The Oaks Business Village
Revenge Road,
Lordswood,
Kent,
ME5 8LF

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

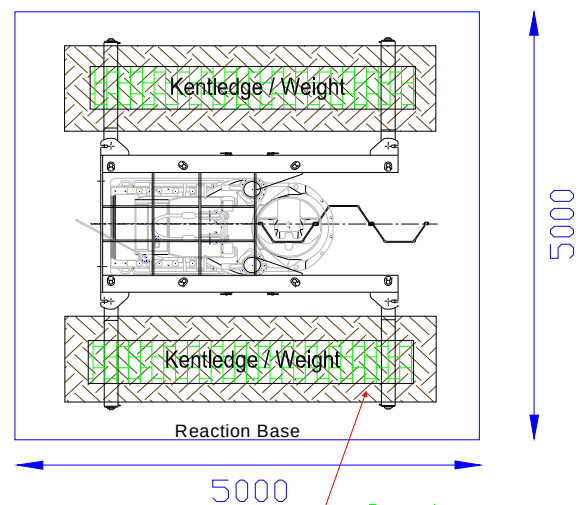
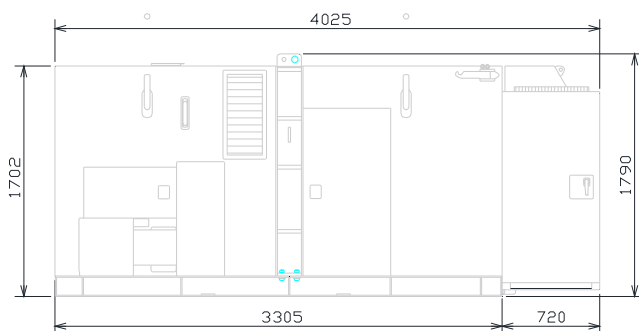
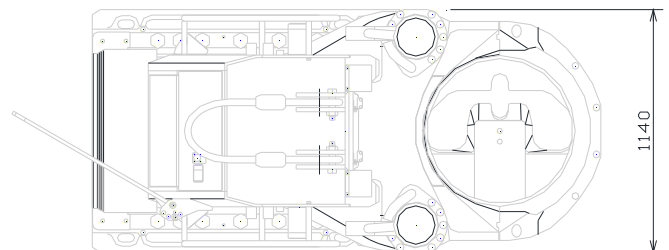


WP150 Silent Piler System

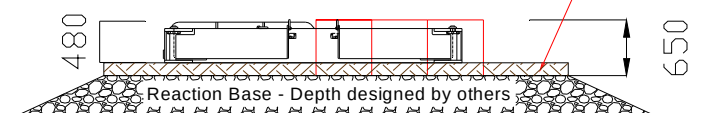
STILL WORKER	WP-150
MAX. Pressing-In Force	1,500kN
MAX. Drawing-out Force	1,600kN
Stroke	800mm
Pressing-in Speed	1.8-23.0 m/min
Drawing-out Speed	1.9-18.0 m/min
Tilting Device	± 5 degrees
Mast Rotation	180 degrees
Applicable sheet piles	U Profile 400mm, 500mm, 600mm
Operation System	Wireless radio-control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





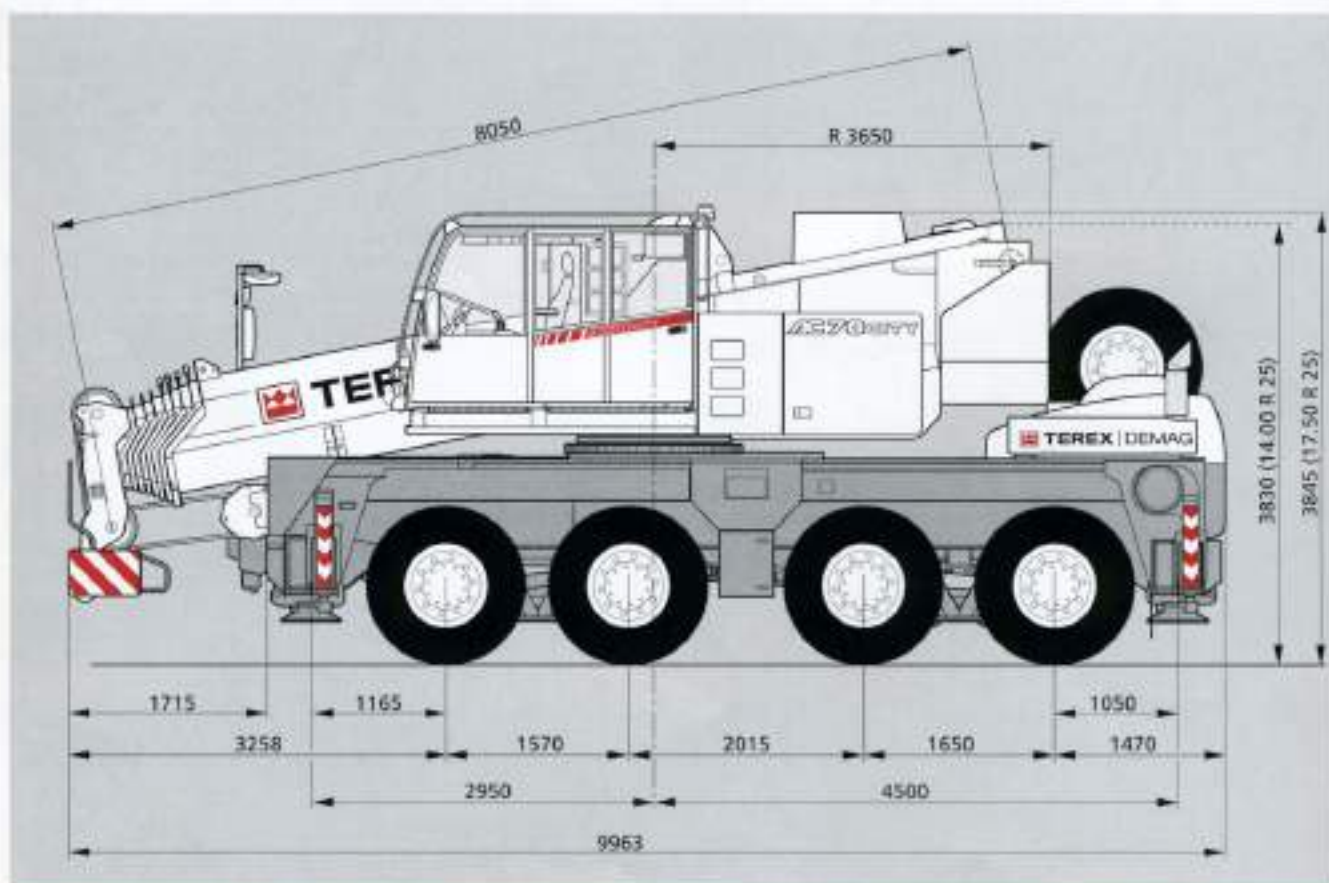
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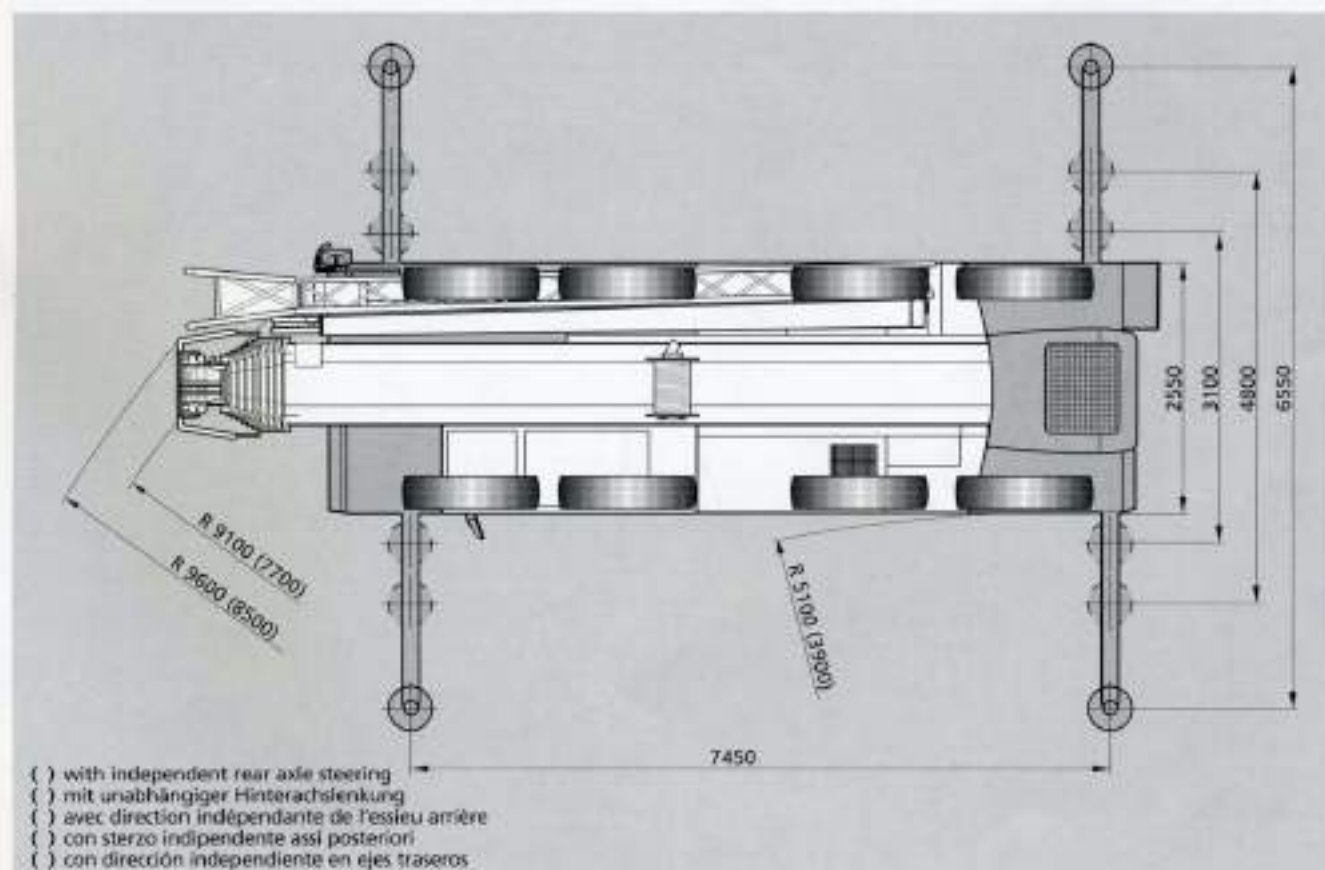
AC70CITY



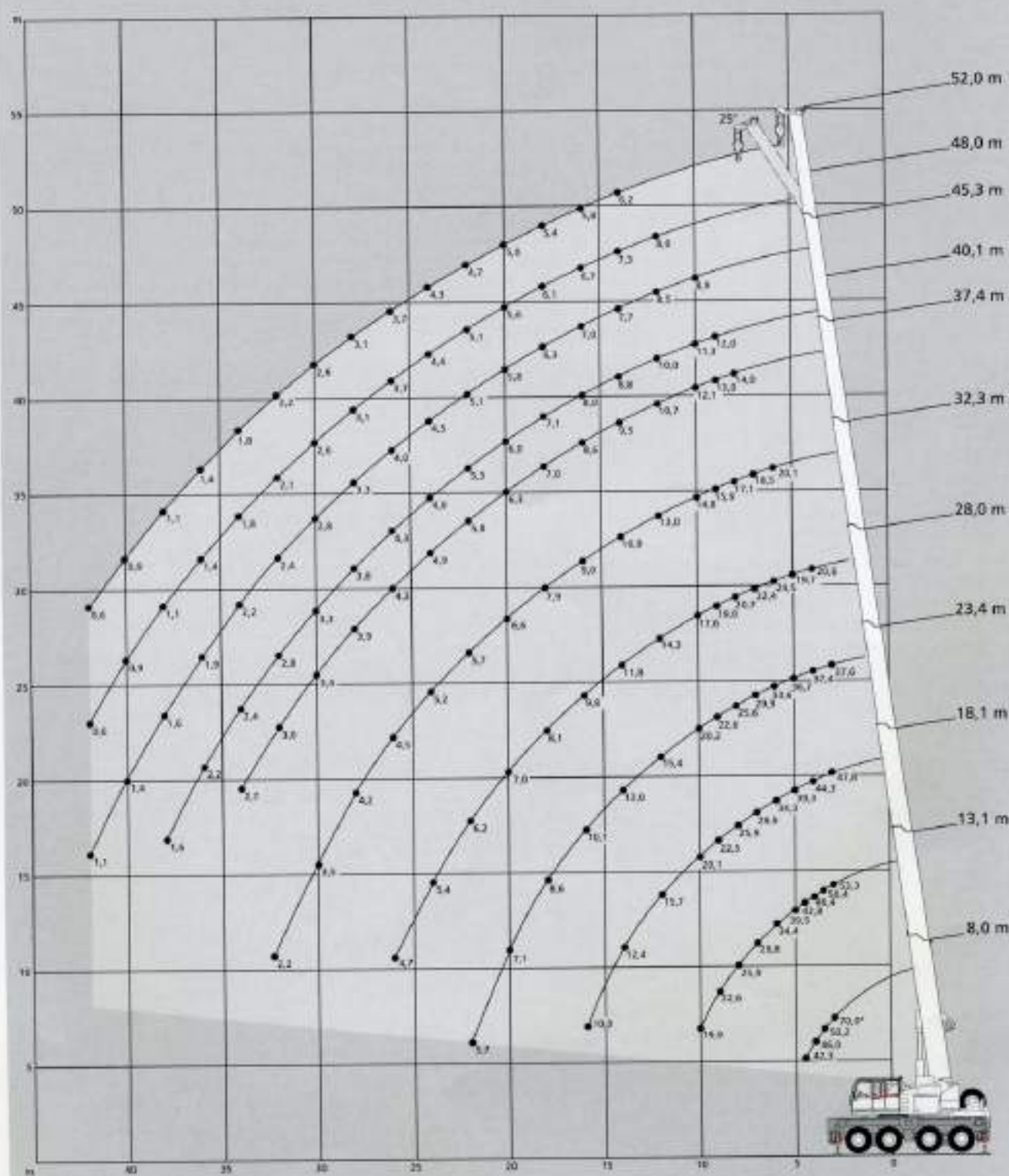
70t

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

