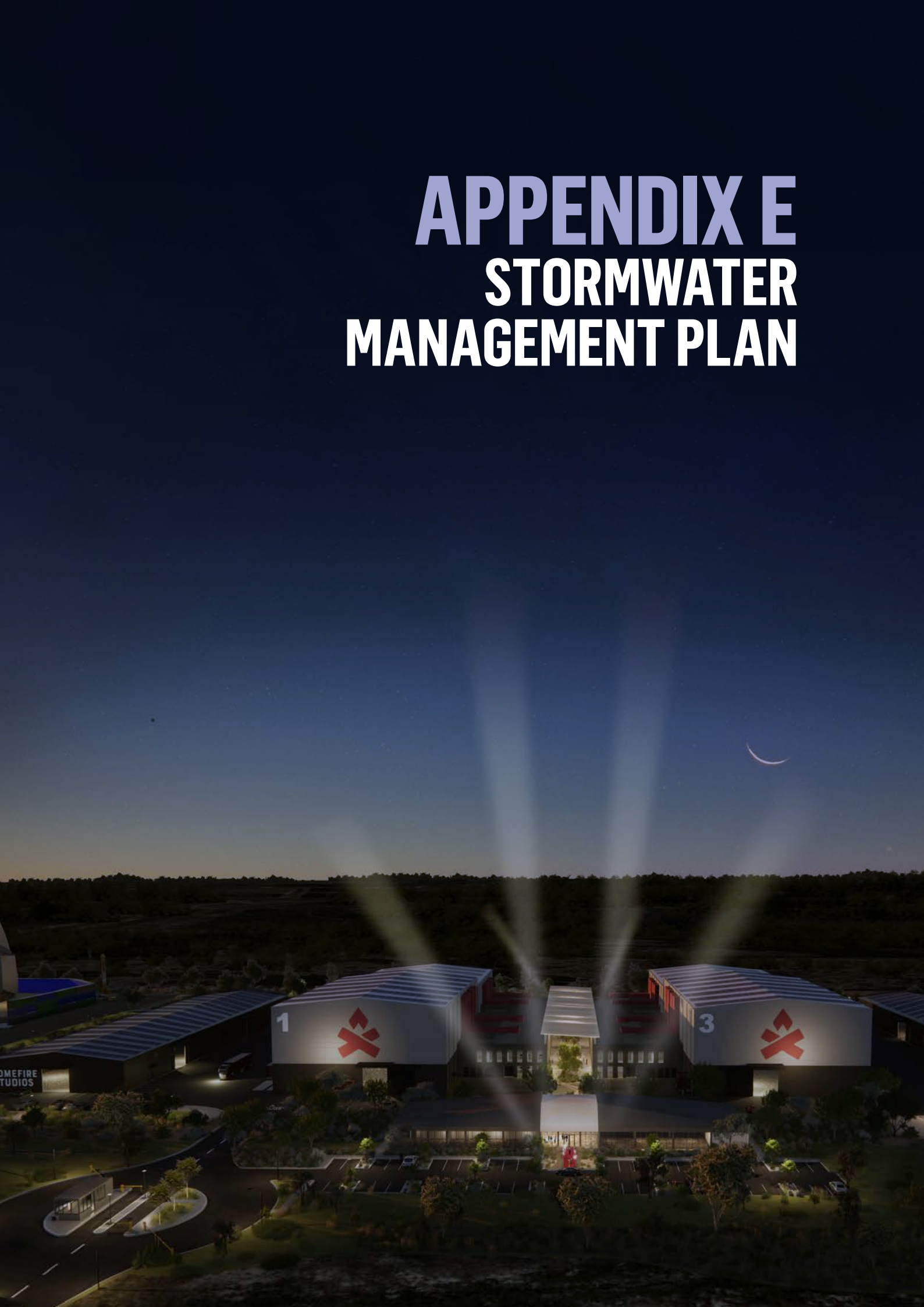
APPENDIX E
STORMWATER MANAGEMENT PLAN



Screen Production Facility, Malaga
Site Stormwater and Drainage Management Plan

Prepared for Home Fire Creative Industries
Issued for DA Review – Rev C

February 2023
Project Number P21062

OPPORTUNITIES THROUGH EXCELLENCE
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Contents

Document Control				
Revision	Date	Prepared	Reviewed	Approved
A	23/01/2023	Craig Brown	Jad Daet	Anthony Wood
B	09/02/2023	Craig Brown	Jad Daet	Anthony Wood
C	14/02/2023	Craig Brown	Jad Daet	Anthony Wood

1 Introduction

This Site Stormwater and Drainage Management Plan has been prepared in support of an application for development approval for the Screen Production Facility proposed at Lot 811 (No. 233) Drumpellier Drive, Whiteman. This Screen Production Facility comprises a total of four separate sound stage areas with dedicated workshops and supporting amenities and facilities. The objective of this project is to deliver, develop and operate a globally competitive film and television studio screen production facility within Western Australia, to develop the local screen industry and attract domestic and international screen productions to the State.

This document has been prepared consistent with the Site's approved District Water Management Strategy (DWMS) (Hyd2o, 2022). It provides an assessment of key site characteristics and an overarching plan for stormwater and groundwater management. It contains details of groundwater levels and the required characteristics of the Site's stormwater system based on modelling outcomes and specified downstream discharge requirements to which engineering drawing comply.

This Site Stormwater and Drainage Management Plan has been prepared to meet the requirements of the City of Swan, Department of Water and Environmental Regulation (DWER), and the Better Urban Water Management framework (WAPC, 2008).

1.1 General

The proposed Screen Production Facility (SPF) is to be located on Lot 811 (233) Drumpellier Drive, Whiteman (Site). The Site is an undeveloped lot situated north of Marshall Road, east of Beechboro Road, and is separated from the existing Whiteman Park to the north by the future Morley to Ellenbrook line being constructed as part of Metronet. The site is currently cleared and used for rural purposes.

The proposed development has been overlaid on an aerial of the existing site (refer Figure 1.1) and will generally comprise the following infrastructure:

4 x Sound Stages
4 x Annex Buildings
2 x Construction Workshops / Lockups
1 x Administration Office
1 x Backlot
1 x Boneyard

The SPF fronts Marshall Road to the south. In preparing this plan, Home Fire has consulted with the City of Swan who have advised that the duplication of Marshall Road is currently in design phase, with construction of the first stage forecast to be completed in FY25, subject to resolving outstanding issues relating to design, staging and funding of works. It is understood that the first stage of the duplication of Marshall Road is likely to run from Beechboro Road to Silver Swan Road, thereby including the entire southern boundary of the Site.

To facilitate the duplication of Marshall Road, and the construction of dual carriageways east and west bound, the existing road reserve will be increased to 50m in width from its current southern boundary. The draft design for the duplication of Marshall Road, including the increase in road reserve width, has been incorporated into the stormwater management plan for the Site, and consultation will continue with the City of Swan through the detailed design phase to ensure consistency between the two projects.

1.2 Report Purpose

This report outlines the stormwater drainage methodology of the existing and proposed Site, discussing site conditions, design criteria and stormwater systems, together with temporary construction groundwater controls.

This Site Stormwater and Drainage Management Plan acknowledges the future Marshall Road construction.

2. Site Conditions

2.1 Surface Hydrology

The Site is located in the area covered by the Swan Urban Growth Corridor Drainage and Water Management Plan (DWMP) (DoW, 2009) which provides overarching guidance to inform stormwater and land use planning in the area. This DMWP was used to inform the approved DWMS (Hyd2o, 2022) for the Site.

The Site is located within the Bennett Brook catchment with flow from west to east across the site. DoW (2009) shows the Site as located in sub-catchment WPSa (Figure 2.1). Based on detailed modelling, DoW(2009) provided guidance on allowable flow/discharge estimates for catchments.

WPSa covers an area of approximately 50 ha and was provided an allowable flow/discharge estimate of 0.2 m^3/s for the 1% Annual Exceedance Probability (AEP) event. This equates to a pro-rata discharge of 4 L/s/ha.

This rate has been used to inform the development of the DWMS (Hyd2o, 2022) and this Site Stormwater and Drainage Management Plan, with post development flows designed to meet predevelopment estimates.

While is it understood the State Government together with the City of Swan will undertake work to develop a wider drainage strategy for the precinct in the near future, this will not affect the ability for the site to develop in advance of this, with the principle of post development flow equalling predevelopment flows ensuring downstream environments are protected.

This approach has been confirm as being appropriate for the Site with the Department of Water & Environmental Regulations (DWER). Refer correspondence from DWER provided as Appendix A.

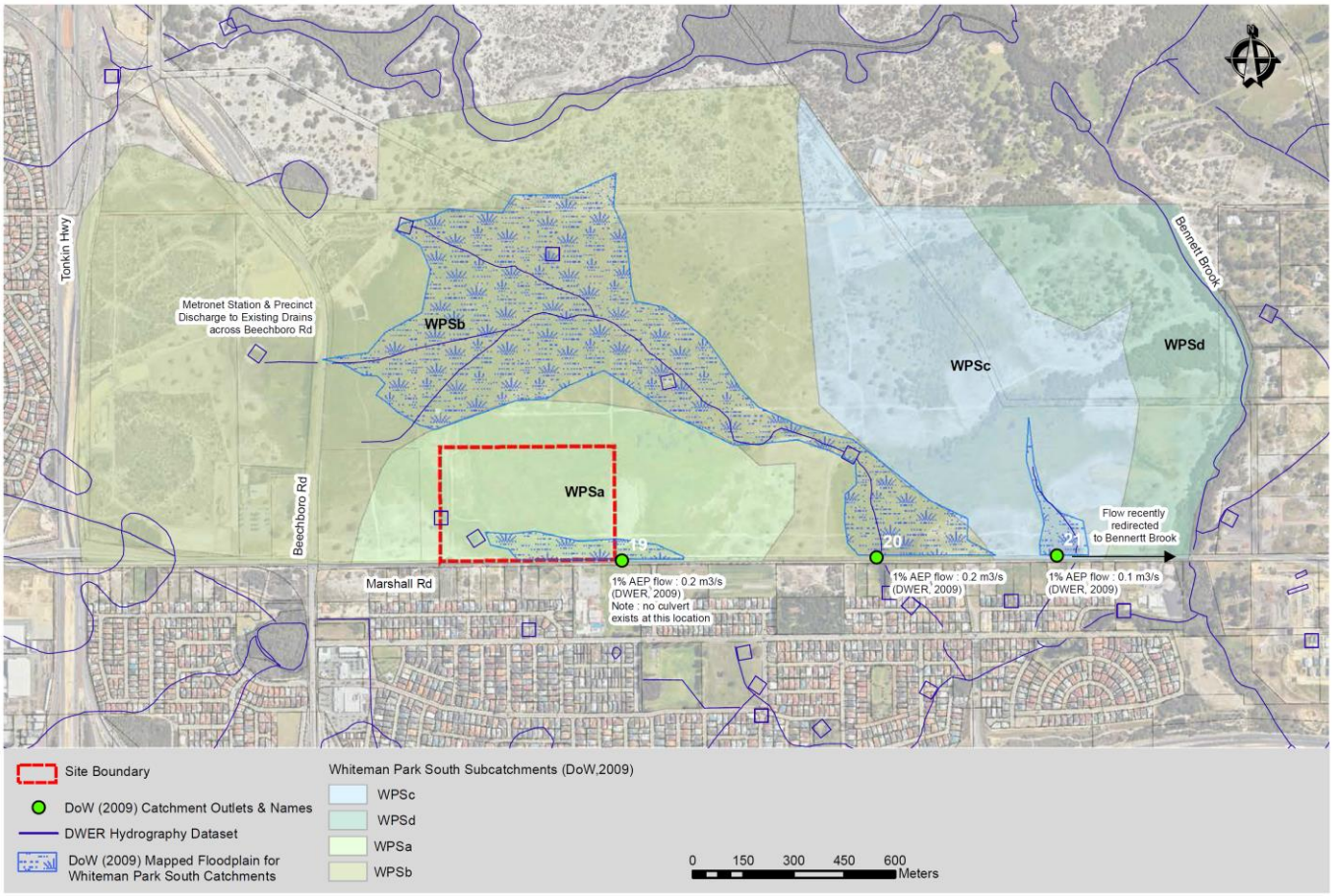

Figure 2.1: Surface Water Catchments, Flow Paths & Predevelopment Discharges

In 2018, the City of Swan engaged Urbaqua to undertake further stormwater modelling in the area.

It is understood the modelling was done specifically to inform stormwater management measures and upgrades on the northern side of Marshall Rd to alleviate flooding issues occurring in properties to its south and to safely convey flows to Bennett Brook. This included a new 525mm diameter RC pipe outlet east of the site to discharge controlled flow to Bennett Brook.

Modelling results as provided by the City of Swan are shown in Figure 2. These modelled flows far exceed those in DoW (2009), however based on discussion and consultation with DWER and the City of Swan, use of the DWER (2009) estimates to inform the stormwater design for the Site were considered more appropriate and conservative. Refer correspondence from DWER provided as Appendix A.

The City of Swan has however advised that all flows from the Site to Bennett Brook are to occur via flow paths on the northern side of Marshall Rd, and not flow to the south via existing culverts.

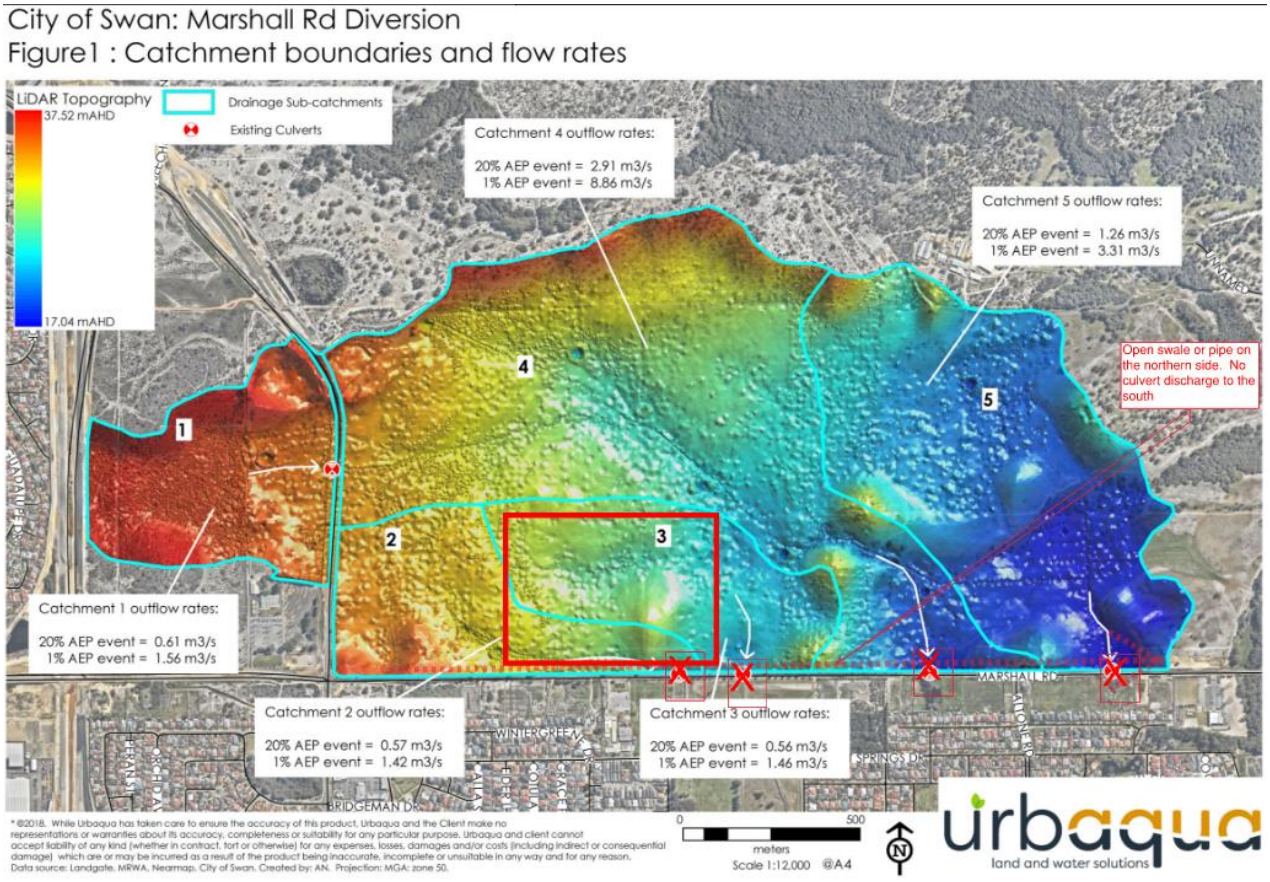

Figure 2.2: City of Swan Marshall Rd Stormwater Upgrade Modelling

2.2 Groundwater Levels

DWER's online Perth Groundwater Map, shows groundwater levels across the site ranging from approximately 27.5 mAHD to 22.5 mAHD with groundwater flow to the south-east. These contours are based on May 2003 data and are representative of a summer minimum condition.

DWER's online Perth Groundwater Map also contains maximum groundwater level contours, based on the maximum recorded historical groundwater level for all years of record. This mapping provides groundwater contours ranging from 30 mAHD to 23.5 mAHD across the site with a broadly easterly flow direction. DWER's mapping is above natural surface in many locations of the site and is considered conservative as groundwater rise would be limited by natural surface. These maximum levels were also recorded during wetter periods such as the early 1970's and are therefore not considered representative of current climate conditions

The DWMS (Hyd2o, 2022) detailed refined groundwater calculations and mapping for the Site based on the installation of 3 site bores in March 2022, and seven other existing bores located in proximity to the Site. A nearby DWER monitoring bore (MM38) east of the site on Marshall Rd was used to correlate site data to longer term records.

Groundwater mapping was then further refined as part of the process for this Site Stormwater and Drainage Management Plan, with the installation of 4 additional bores in December 2022.

A copy of the updated map is shown in Figure 3, with groundwater contours shown as an average annual maximum groundwater level (AAMGL).

These contours show the site AAMGL ranging from 26.7 mAHD in the west of the site to 23.2 mAHD along the eastern boundary. These contours are considered a more accurate representation of the Sites groundwater levels than DWER regional mapping to inform design.

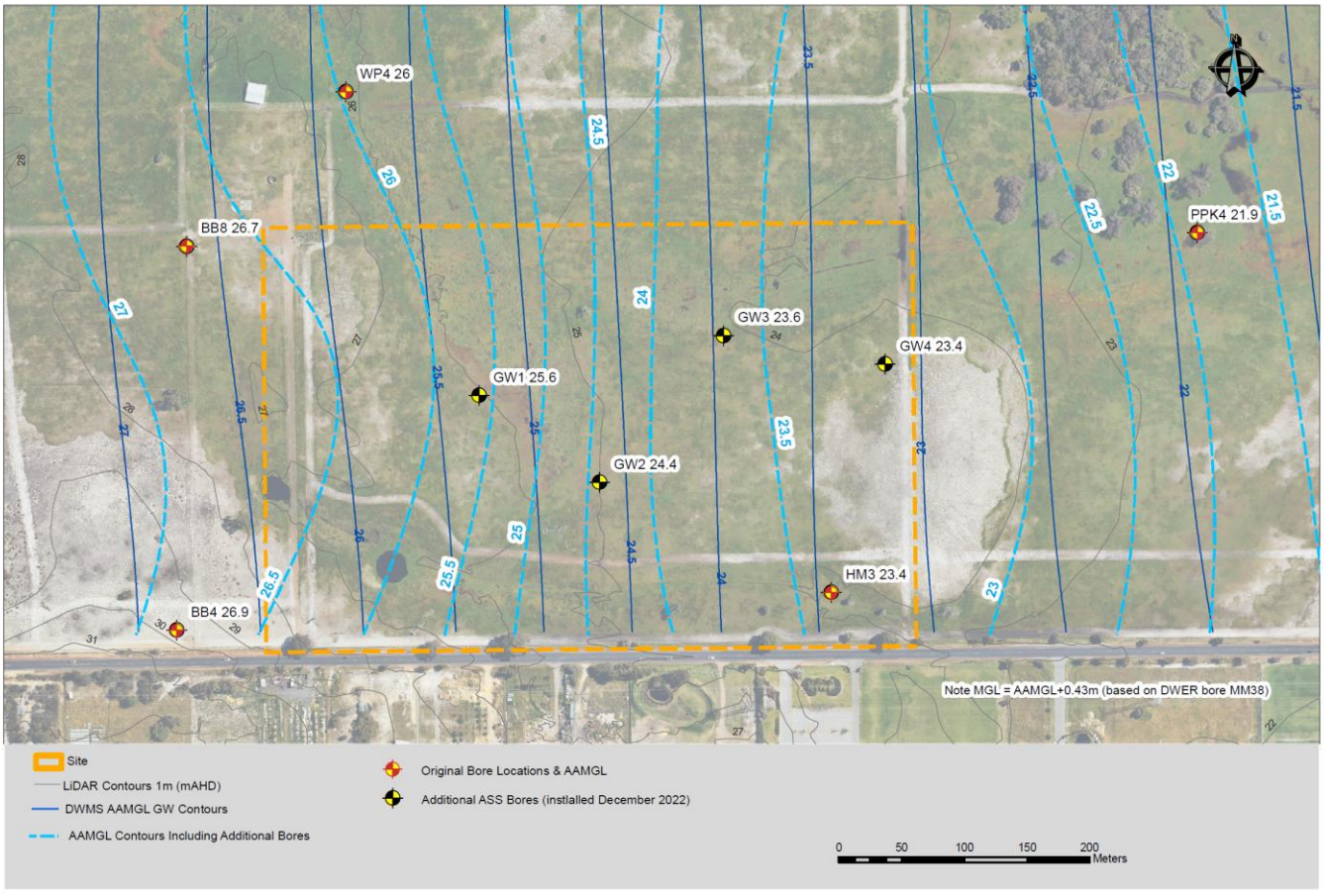

Figure 2.3: Groundwater Mapping (Average Annual Maximum Groundwater Level)

It is important to note the site's Maximum Groundwater Level's (MGL's) are estimated to be approximately 0.43 m above the AAMGL based on correlation with DWER bore MM38.

In 2022, peak winter water levels at the site and MM38 were recorded on 24 August 2022. The recorded groundwater level at MM38 of 20.77 mAHD was found to be 0.38 m above its AAMGL. This was only marginally below its maximum recorded level since 1990 of 20.82 mAHD.

Groundwater monitoring at the site is ongoing.

2.3 Soil Conditions

A ground investigation was undertaken by CMW Geosciences on the 2nd of March 2022. The resulting report, dated 13th April 2022, has been included in Appendix B. This comprised of a desktop study and site investigations.

Further investigations were undertaken to obtain factual data through additional geotechnical investigation which was undertaken on the 19th of April 2022. The resulting report has been included in Appendix C.

The reports note the following SPF site soil conditions:

The published geology map – Perth, 1:50,000 Scale, Environmental Geology Series, Western Australian Geological Survey, sheet 2034 II and part of 2034 III and 2134 III – shows the site to be underlain by:

- (S8) Bassendean Sand described as very light grey at surface, yellow at depth, fine to medium grained, subrounded quartz, moderately well sorted of aeolian origin; and,
- (Mgs1) Pebbly silt of the Guildford formation described as strong brown silt with common, fine to occasionally coarse grained, subrounded laterite quartz, heavily weathered granite pebble, some fine to medium grained quartz sand, of alluvial origin.

3. Stormwater Management

3.1 General

The catchment within the site boundaries is to be managed largely through the direction of stormwater, via overland and pipe flow to infiltrating bio-retention swales with sufficient capacity to retain first flush events. Typically, this is the first 15mm of rainfall on the developed area of the site.

The 1% AEP is directed from these bio retention swales to landscaped basins located in the southern and eastern portions of the SPF site, sized to accommodate expected volumes.

3.2 Design Criteria

The proposed stormwater network has been designed utilizing the following design criteria consistent with the approved DWMS for the site.

The following design criteria has been adopted with the intention to contain all storm events on site in and discharge via infiltration (bio-swales) or controlled discharge to the local network.

Table 3.2.1: Design Criteria

Item #	Bio-swale infiltration basins	Measurement
1	Piped Systems	1 in 10 Year ARI
2	Drainage Basins Storage before Overtopping	1 in 1 Year ARI (15mm)
3	Minimum Freeboard in Drainage Basins in 1 year event	100 mm
4	Run-off coefficient (impermeable surface)	0.95
5	Minimum Pipe Grade	0.3 %
6	Minimum Pipe Size	300 mm Diameter
7	Pipe Material	Reinforced Concrete (Class 2)

Item #	Drainage System Component/Special Requirement	Measurement
1	Piped Systems	1 in 10 Year ARI
2	Drainage Basins Storage before Overtopping	1 in 100 Year ARI
3	Minimum Freeboard in Drainage Basins in 100-year event	100 mm
4	Run-off coefficient (impermeable surface)	0.95
5	Minimum Pipe Grade	0.3 %
6	Minimum Pipe Size	300 mm Diameter
7	Pipe Material	Reinforced Concrete (Class 2)

3.3 Design Assumptions

The proposed stormwater drainage design has assumed the following assumptions:

Table 3.3.1: Design Assumptions

Item #	Assumption	Description
1	Pre-development flows	Swan Urban Growth Corridor Drainage and Water Management Plan (DoW, 2009) has been adopted as the criteria for pre-development flows. Compared to the City of Swan modelling this is conservative resulting in a requirement to contain larger stormwater volumes on site (in stormwater basins) prior to discharge at reduced rates, as per the City of Swan modelling.

Item #	Assumption	Description
2	Site Stormwater Discharge	Stormwater discharge from the SPF site has been designed to 4 L/s/ha in line with the DoW requirement. This will be via a controlled outlet connected to the proposed Marshall Road widening “V” drain.
3	Site Stormwater Discharge in the Marshall Road widening has not been constructed	In the event the Marshall Road widening and “V” drain have not been constructed prior to the SPF stormwater discharge, flows will be directed to the existing Marshall Road drainage swale.

3.4 Stormwater Management

3.4.1 Construction Works Temporary Drainage Methodology

During construction the site will retain its catchment for up to and including the 5-year ARI. Collection of stormwater occurs via surface flow to temporary basins where the stormwater will be allowed to store and ultimately infiltrate or be directed to temporary drainage channels. Temporary drainage is to be undertaken by the contractor who will be instructed to allow for the aforementioned event during construction.

The as part of the construction process, temporary drainage will be required for the preparation of ground surfaces.

The intention is to temporarily control local groundwater levels during the construction process by providing an open drainage channel network. Perimeter channels will be located to the west, north and south of the main earthwork pad for the buildings.

Flows discharging from the Site, via these drains, as a result on construction work dewatering are predicted to be:

- 7-day duration – 15.6 l/sec
- 14-day duration – 12.6 l/sec
- 30-day duration – 10.6 l/sec
- 120-day duration – 8.6 l/sec

The anticipated outflow location will be in the South West corner of the Site. These flow rates are well below the nominated DWER pre-development flows for the site.

Dewatering

The as part of the construction process dewatering will be required for the installation at of depth services.

An Acid Sulphate Soil Management Plan and dewatering strategy will be developed to manage effectively manage Acid Sulphate soils and dewatering as required.

3.4.2 Ultimate Works Drainage Methodology

Existing earthwork levels fall from the western boundary of the site to the eastern boundary. To enable development of the proposed building on the site, a levelled building pad has been provided at approximately RL 26.60 which is above the predominant west to east natural site fall.

In accordance with Water Sensitive Urban Design, stormwater in the 1 year 1 hour (15mm) is directed towards the respective bio-swales, via piped and overland flow, adjacent paved and building areas. This is made possible through the utilization of flush kerbing, allowing stormwater to flow through medians and verges otherwise made impassable through the introduction of raised kerbing.

Rather than utilizing the typical mulch landscaping, which could potentially wash away during larger storm events, stone aggregate will be specified which will further act to help protect the swales from scour.

Where, due to the design layout or existing conditions, it has not been possible to utilise surface flow to direct stormwater, a piped network with grated inlets will be constructed to direct stormwater to the appropriate basins. This pipe network has been designed for the 1 in 100-year ARI, allowing increased serviceability to the carpark and

road network in storm events. The pipe network will be constructed utilising class 2 reinforced concrete pipe at a minimum 0.3% grade.

Events exceeding first flush events are directed to basins designed to retain stormwater from events up to and including the 100-year ARI on site. Infiltration in these basins is limited by the high groundwater within the site. These basins have been provided with a controlled outlet which discharges to the local drainage network, with flows restricted to pre-development flows nominated by the Department of Water.

We note these predevelopment flows, and resultant discharges from site to the local drainage network, are far reduced from the City of Swan predevelopment flows and conservative in relation to the City of Swan modelling.

The 1 in 100-yearARI basins will not contain a filter medium. The basins will contain landscaping.

The freeboard criteria nominated above, ensures that road pavement adjacent basins are kept dry and allows a tolerance for larger events or unforeseen issues in the network such as blockages.

3.4.3 Drainage Basins

Two distinctive drainage basins have been provided:

- First Flush Basins - located adjacent pavement areas and hardstands.
- 1% AEP (1/100 year) Basins.

First Flush Basins

First flush basins are sited within the earthworks pad area immediately adjacent pavement areas to collect, treat and infiltrate first flush events. These basins are provided with the appropriate soil stripping profiles ensuring pollutants and contaminants remain on-site and are filtered through the sand during infiltration into the groundwater aquifer.

As these basins are located on the building pad, the basins are clear of existing groundwater and can accommodate an infiltration rate of 5m/day.

1% AEP (1/100 year) Basins.

These basins are designed to capture extreme events. The basins are located close to existing groundwater levels and as such infiltration is severely limited. These basins have been designed to store flows and empty trough a restricted outfall. Infiltration has been ignored.

The drainage basins are interconnected beneath the proposed entry road via a balancing pipe.

All stormwaters will empty from the basins in less than 96 hours for all events up to the 100yr ARI based on a maximum allowable depth of 0.35m and using the equation in the Stormwater Management Manual for Western Australia - Section 9 - Chapter 3.1.

4. Water Sensitive Urban Design

4.1 General

Water sensitive urban design has been incorporated into the works through the aforementioned design philosophies. Minimizing reliance on pipe networks, increasing overland flow and opportunities for on-site storage and infiltration all act to protect the local environment by reducing off-site discharge and promoting opportunities to filter contaminants.

4.2 Adjacent Wetlands/Waterways

The impacts on the adjacent wetlands/waterways due to stormwater from the development have been mitigated through the utilisation of onsite storage for events up to and including the 100-year ARI.

Plant species within the basins and landscaped areas will further assist in the filtration of pollutants from stormwater during the first flush events.

4.3 Adopted Principles

Table 4.3.1: Key Principles

Item #	Item	Description
1	Stormwater Storage	On-site detention of events up to and including the 100-year ARI
2	Stormwater Infiltration	Utilization of infiltration basins to filter potential contaminants – First Flush
3	Maximise Overland Flow	Where possible utilize overland flow in lieu of pipework
4	Landscaping	Utilisation of landscaping which will reduce scour and wash away of debris. Refer to Landscape drawings for specific plant densities and soil preparation.

Appendix A – DWER Correspondence

Edward Neville

Subject: FW: Homefire Studios Malaga

From: Agnidhar Bhandari <agnidhar.bhandari@dwer.wa.gov.au>
Sent: Monday, 30 January 2023 8:46 AM
To: Sasha Martens <sasha@hyd2o.com.au>
Subject: RE: Homefire Studios Malaga

Hi Sasha,

Thank you for your email. It appears that the Urban Water Branch of the department has not received any formal submission of the recent Urbaqua/City of Swan modelling outcomes associated with this area. So, the status of these modelling outcomes is unknown. Please be advised that the *Swan urban growth corridor drainage and water management plan* (DoW 2009) is the currently available document for the site to this scale until any updated drainage and water management plan for the area is developed.

Regards

Agni Bhandari

A/Supervising Engineer
Urban Water
Science and Planning | Department of Water and Environmental Regulation
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Fax (08) 6364 6516 | Email agnidhar.bhandari@dwer.wa.gov.au
Website: www.dwer.wa.gov.au | Locked Bag 10 Joondalup DC WA 6919
Australia

From: Sasha Martens <sasha@hyd2o.com.au>
Sent: Thursday, 26 January 2023 11:02 AM
To: Agnidhar Bhandari <agnidhar.bhandari@dwer.wa.gov.au>
Subject: Homefire Studios Malaga

Hi Agni,

Just following up from our conversation the other day, please not that yesterday we receive formal approval of our DWMS for this site which was referred to Jim Mackintosh for consideration by DPLH as part of the scheme amendment submission.

Even so I still think if would be good for closure if we had some specific written advice as discussed which indicates our approach which has been to adopt pre development flows for our modelling consistent with those of DWER's published Swan Urban Growth Corridor DWMP. As discussed designing on this basis is effectively a conservative approach for out site and its discharge post development compared to what would be permitted under the more recent Urbaqua/City of Swan modelling outcomes.

Feel free to give me a call if you need to discuss.

Regards,
Sasha

Sasha Martens
Principal Engineering Hydrologist

hyd2o hydrology

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Appendix B – Geotechnical Report – CMW April 2022

31 March 2022

PROPOSED BUILDING DEVELOPMENT HOME FIRE STUDIO, MALAGA.

GEOTECHNICAL INVESTIGATION REPORT

Home Fire Creative Industries Pty Ltd c/- Hesperia

PER2022-0024AC Rev 0

PER2022-0024AC Rev 0		
Date	Revision	Comments
31 March 2022	0	Geotechnical Investigation Report

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Figure

Appendices

1 INTRODUCTION

CMW Geosciences Pty Ltd (CMW) was authorised by Edward Neville of Total Project Management c/- Home Fire Creative Industries Pty Ltd by way of a Letter of Engagement dated 02 March 2022 to undertake a geotechnical desktop study and subsequent field investigation for a proposed Home Fire Film Studio - Stage 3AA located at Malaga, WA.

The scope of work is outlined in our Cost Time and Resource Schedule (CTR), referenced *PER2022-0024AA Rev 1.*

The purpose of this report is to describe the investigation completed, the ground conditions encountered and to provide recommendations with respect to geotechnical aspects of the proposed Home Fire Studio development including potential geotechnical risks, site preparation, excavatability, foundation design parameters, site classification and permeability characteristics, as detailed in our proposal letter.

2 DESKTOP STUDY

2.1 Site Description, Topography & History

From the plans provided, we understand the site is situated at the southern boundary of Whiteman Park, north of Marshall Road and east of Beechboro Road North at the intersection of Tonkin Highway and Reid Highway. The expansion of the Morley to Ellenbrook rail network will run to the north of the site and the new Malaga Station being built adjacent to the home fire site.

The 61 ha proposed site is gently sloping towards the south from approximately RL 23m AHD along the eastern boundary to approximately RL 29m AHD along the western boundary. The topography is undulating in areas with some lower-lying flood plains characteristic of paleochannels within the area where surface levels decrease.

Historical aerial photographs of the area indicate the site has been used for agricultural purposes with the first development occurring prior to 1965 comprising the construction of a shed with a second development occurring prior to 1970. Sometime between 1995 and 2000 the second development was demolished with the first being removed sometime after January 2022.

2.2 Proposed Development

The 61 ha site proposed for the Home Fire Studio development consists of two Phases: Phase 1, a 19 ha area which will comprise 4 x 1,850m^2 sound stages, a 3,500m^2 workshop, 500 car bays, 20,000 m^2 backlot and 2,750m^2 of offices.

Phase 2 is 42 ha and will be a future expansion site of the original film studio (Phase 1). We have not been provided with plans for this phase of the development.

2.3 Geology

The published geology map – Perth, 1:50,000 Scale, Environmental Geology Series, Western Australian Geological Survey, sheet 2034 II and part of 2034 III and 2134 III – shows the site to be underlain by:

(S_8) Bassendean Sand described as very light grey at surface, yellow at depth, fine to medium grained, subrounded quartz, moderately well sorted of aeolian origin; and,

(Mgs_1) Pebbly silt of the Guildford formation described as strong brown silt with common, fine to occasionally coarse grained, subrounded laterite quartz, heavily weathered granite pebble, some fine to medium grained quartz sand, of alluvial origin.

Based on the known history of the site and surrounding land levels, some superficial depths of fill could be anticipated as a result of previous developments on the site.

2.4 Hydrogeology and Hydrology

The Department of Environment's Perth Groundwater Atlas, Second Edition, indicates that historical minimum and maximum recorded groundwater levels beneath the site to be between approximately RL 23m AHD and RL 29m AHD, which equates to an approximate depth of between <1m and 3m below existing ground levels.

Expressions of groundwater were observed on site as small ponds across the site, indicating the close proximity of the water to the existing surface. Bennet Brook is also present to the east of the site running in a north south direction.

2.5 Acid Sulphate Soils

Based on the published acid sulphate soils map from the Australian Government National Map part of the site closest to the boundary of the proposed site has a low to moderate risk of ASS occurring within 3m of natural soil surface (or deeper) occurring on site. For the central portion of the site there is no known risk.

3 EXISTING GEOTECHNICAL DATA

A series of hand auger boreholes were drilled along the Morley to Ellenbrook rail alignment along the northern boundary of the Phase 2 area. A total of 3 investigation locations denoted P3-HA32, P3-HA33 and P3-HA34 spaced relatively equidistant along the rail alignment were completed as part of a previous investigation.

The investigation locations are shown in Table 1 below together with a summary of the encountered ground conditions and the depth to groundwater recorded in the relevant hand auger borehole.

Table 1: Summary of Previous Investigation Locations

Location ID	Refusal depth (mbgl)	Ground Conditions Encountered in the Borehole at Surface	Depth to Groundwater Encountered in the Borehole (mbgl)
P3-HA32	1.8	**Bassendean Sand:** described as SAND (SP): loose, fine to medium grained, rounded to sub-rounded, quartz, grey speckled black, trace/with organic silt (aeolian).	0.9
P3-HA33	1.7		0.9
P3-HA34	1.7		1.05

4 CURRENT FIELD INVESTIGATION

Following a dial before you dig search, and onsite service location, the field investigation was carried out between 8th and 9th March 2022. All fieldwork was carried out under the direction of CMW Geosciences Pty Ltd in general accordance with AS1726 (2017), Geotechnical Site Investigations. The scope of fieldwork completed was as follows:

- A walkover survey of the site to assess the general landform and site conditions and adjacent structures;
- 20 test pits, denoted TP01 to TP20, were excavated using a JCB 8.5 tonne backhoe fitted with a 300mm wide toothed bucket to a target depth of up to 3m, or prior refusal, below existing

ground levels to investigate the underlying ground conditions, excavatability and the possible presence of uncontrolled fill. Representative bulk samples were collected for subsequent laboratory testing. Engineering logs of the test pits and associated photographs are presented in Appendix A;

- Perth Sand Penetrometer (PSP) tests were carried out adjacent to each test pit location in general accordance with AS1289. 6.3.3, to depths of up to 2.1m, or prior refusal, to provide soil density/consistency of the subsurface conditions within the zone of influence of shallow foundations. Graphical results of the PSP plots are presented on the test pit logs in Appendix A;
- 8 Electric Friction Cone Penetrometer Tests (CPTu's), denoted CPT01 to CPT08, were advanced to a maximum investigation depth of 15m, using CPT equipment fitted to a 22-tonne Mercedes trucked rig to assess the deeper soil profile beneath the site. CPTu's were split evenly to target both Phase 1 and Phase 2 areas of the development. CPT plots prepared by the subcontractor (CPTWest) are presented in Appendix B;
- Four hand auger boreholes, denoted HA01 to HA04, were drilled to a depth of 1.5m below existing ground levels to facilitate in-situ permeability testing. Results of the permeability test are presented in Appendix C.

The approximate locations of the respective investigation sites referred to above are shown on the attached Site Investigation Plan (Figure No. 1). Where possible, surface elevations were taken from a feature survey plan conducted by MNG Locate 16 March 2022. Test locations were chosen by CMW to provide adequate coverage of the site and to ensure representative soil samples could be taken for laboratory testing. Test locations were measured using a hand-held GPS to an accuracy of ±5m.

5 LABORATORY TESTING

Laboratory testing was carried out generally in accordance with the requirements of the current edition of AS1289 (where applicable). Where a test was not covered by an Australian standard, a local or international standard was adopted and noted on the laboratory test certificate.

All testing was scheduled by CMW and carried out by Western Geotechnical and Laboratory Services, a NATA registered Testing Authority.

A summary of the number and type of laboratory tests conducted, and the test method followed is presented in Table 2 below.

Table 2: Laboratory Test Schedule Summary

Type of Test	Test Method	Quantity
Particle Size Distribution	AS1289.3.6.1	6
Organic Content	ASTM D 2974-14	6
Modified Compaction	AS1289.5.2.1	5
California Bearing Ratio (soaked)	AS 1289.6.1.1	5

6 GROUND MODEL

6.1 Subsurface Conditions

The ground conditions encountered and inferred from the test pit and CPT investigation were considered to be generally consistent with the published geology for the area and can be generalised according to the following subsurface sequence:

TOPSOIL: SILTY SAND	loose to medium dense, fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics., overlying;
SAND (SP)	loose to very dense, fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).

The distribution of these units is summarised in Table 3.

Table 3: Summary of Encountered Soil Stratigraphy

Description	Depth to base of layer (m BGL)			Depth to base of layer (m AHD) *	
	Minimum	Maximum	Average	Minimum	Maximum
FILL: SILTY SAND	0.15	0.15	0.15	28.5	24.25
SAND (SP)	>15.0**			>8.5	

Note:

* m AHD based on average surface elevation across the site from the feature survey plan.

** Base of SAND not encountered during the investigation.

Note: Uncontrolled fill was not encountered within any of the test pit locations however it may still be present in the locations where the previous agricultural developments have been cleared. We have not been provided with any engineering completion reports that deems the material in these areas to be engineered fill.

6.2 Groundwater

A review of the Perth Groundwater Atlas suggests that ground water levels range from between 23 and 25m AHD, a cross the site. This equates to between 1 and 3m BGL.

During the investigation, which was completed in early autumn conditions (March 2022), groundwater was encountered within 14 of the test pits and all CPTu locations. A summary of the encountered groundwater levels is presented in Table 4 below.

Table 4: Summary of Encountered Groundwater Levels					
Location ID	**Easting**	**Northing**	**Surface Elevation (m AHD)**	**Groundwater (mbgl)**	**Groundwater Elevation (m AHD)**
CPTu 1	398741.06	6475185.78	26.57	1.0	25.57
CPTu 2	399072.34	6475158.45	24.34	1.21	23.13
CPTu 3	399083.51	6475356.71	23.89	0.89	23.0
CPTu 4	398744.39	6475350.84	27.11	1.29	25.82
CPTu 5	398464.41	6475458.18	27.90	1.4	26.0
CPTu 6	398607.91	6475850.53	27.35	1.5	25.85
CPTu 7	399030.4	6475856.67	23.54	1.0	22.54
CPTu 8	398994.83	6475545.68	25.01	1.5	23.51
TP01	398927	6475096	25.00	1.4	23.6
TP03	398669	6475305	27.00	2.0	25.0
TP04	398873	6475256	26.00	0.8	25.2
TP06	398893	6475403	25.20	1.5	23.7
TP07	399115	6475486	24.40	1.8	22.6
TP09	398925	6475690	-	1.3	-
TP10	398799	6475878	-	1.4	--
TP11	398760	6475785	-	1.3	
TP12	398600	6475734	-	0.8	-
TP14	398408	6475676	-	1.6	-
TP16	398570	6475577	-	1.3	-
TP17	398728	6475473	27.00	1.7	25.3
TP18	398790	6475603	-	1.6	-
TP20	399106	6475827	-	1.0	-
Note: mbgl = meters below ground level.					

6.3 Permeability

The results of the in-situ falling head infiltration tests carried out were used to estimate the soil coefficient of permeability in accordance with the methods described in CIRIA Report No. 113 (falling head test).

Table 5 summarises the results obtained. The test certificate is attached in Appendix C.

Table 5: Summary of Infiltration Tests					
Standpipe ID	**Screen Depth (m bgl)**	**Screened Formation**	**Test Method**	**Approximate Infiltration Rate**	
				(m/sec)	**(m/day)**
HA01	0 to 1.5	Slotted	Falling Head	2.12*10-04	18 to 19
HA02	0 to 1.5	Slotted	Falling Head	2.16*10-04	18 to 19
HA03	0 to 1.5	Slotted	Falling Head	3.68*10-04	31 to 32
HA04	0 to 1.5	Slotted	Falling Head	3.26*10-04	2 to 3
Note: The infiltration rate of HA04 was much lower than the other three permeability tests likely due to the high groundwater table at this location (1.3 mbgl).					

7 LABORATORY TEST RESULTS

A summary of the geotechnical laboratory test results undertaken by CMW are presented in Table 6 below.

Table 6: Summary of Laboratory Tests Results						
Location ID	**TP01 0.0 – 0.2m**	**TP01 0.6 – 1.0m**	**TP02 0.5 – 1.0m**	**TP12 1.0 – 1.2m**	**TP13 0.2 – 0.5m**	**TP17 0.2 – 0.5m**
Gravel, %	0	0	0	0	0	0
Sand, %	96	98	99	95	96	98
Fines, %	4	2	1	5	4	2
OC, %	3	17.7	0.2	4.3	0.6	2.0
MMDD, t/m^3	1.69	-	1.66	1.66	1.68	1.69
OMC, %	15	-	14.5	20.5	15.0	15.0
CBR, %	8	-	8	9	10	11
Note: Gravel, Sand and Fines percentages are by weight, OC = Organic Content, OMC = Optimum Moisture Content, MMDD = Modified Maximum Dry Density, CBR = California Bearing Ratio.						

A copy of the laboratory test certificates is provided in Appendix D.

8 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

8.1 Groundwater

Shallow groundwater is present across the entirety of the proposed development site. This will present a risk to both permanent and temporary works including excavation, bearing capacity of footings and construction/excavation issues with the potential need for dewatering.

For the purposes of permanent design a design groundwater level of between 0 m and 0.5m below ground level in line with the Perth groundwater atlas should be adopted as shown in Figure 02. A

further hydrogeological assessment may be required if the groundwater levels become critical to the design.

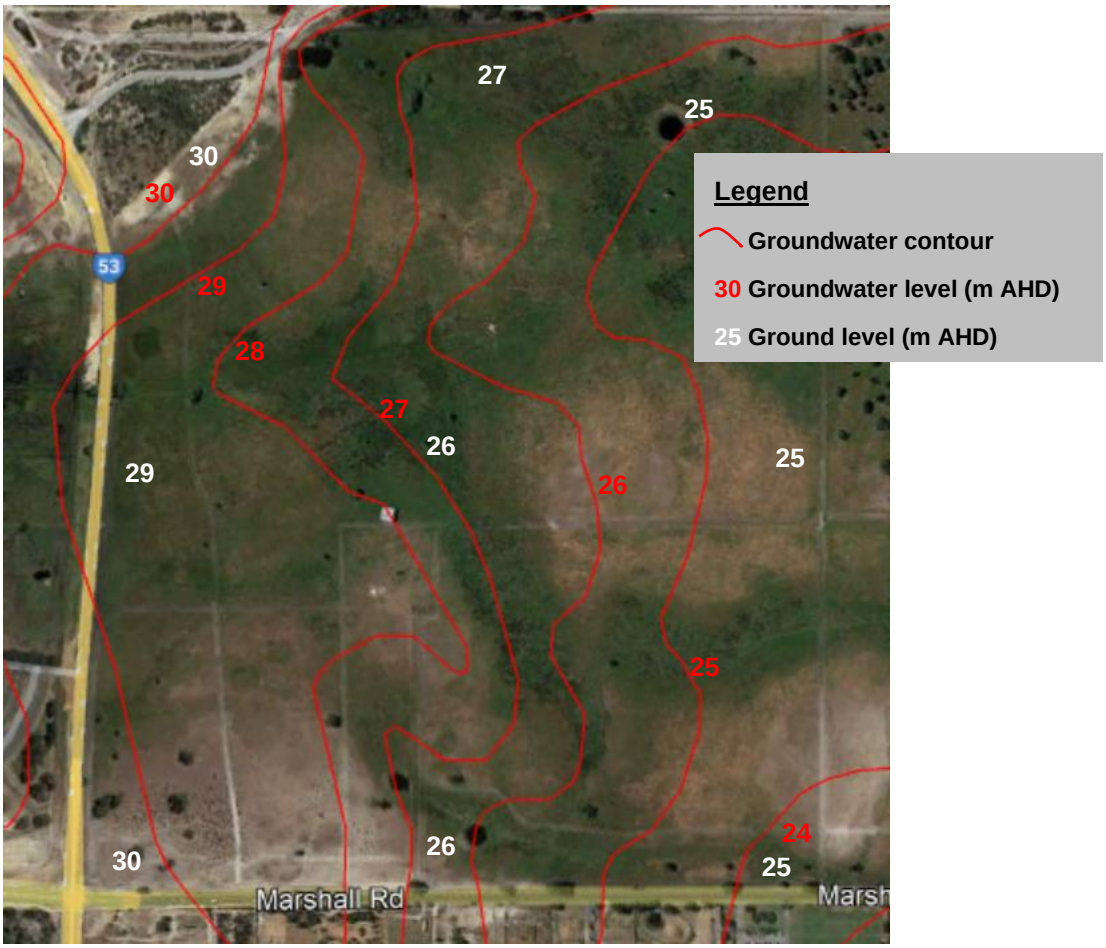


Figure 2: Maximum groundwater contours compared with surface elevation

Figure 02 illustrates the maximum ground water contours indicated in red taken from the Perth Ground water atlas. The measurements are in elevation m AHD. Ground level elevations are indicated by the white numbers. Figure 02 shows that maximum groundwater levels are within 1m of ground level in across the site and reach ground level in places.

The civil design will need to take into account the close proximity of the groundwater and the potential difficulties infiltrating groundwater and impact of the civil design on the groundwater regime.

8.2 Retention Systems

We understand that retaining walls may be required as part of the development.

Design parameters for permanent and temporary retaining walls are summarised in Table 7.

Table 7: Retaining Wall Design Parameters								
Soil Unit	**Ɣ (kN/m³)**	**Ø' (deg)**	**K_0**	**E' (MPa)**	**No wall friction**		**Wall friction = 2/3Ø**	
					K_a	**K_p**	**K_a**	**K_p**
ENGINEERED FILL	18	34	0.441	40	0.283	3.537	0.254	8.952
SAND (loose to medium dense)	18	32	0.470	30	0.310	3.250	0. 310	3.320
SAND (medium dense to dense)	18	34	0.441	40	0.283	3.537	0.254	8.952

Notes:
1. Refer to Table 3 for definition of soil unit levels.
2. Ɣ – soil unit weight; Ø' - angle of internal soil friction; K_0 - coefficient of earth pressure at rest, K_a - coefficient of active earth pressure, K_p - coefficient of passive earth pressure; E' – long term Young's modulus.
3. Values of K_0 are based on initial conditions following construction of the walls.
4. The retaining wall designer must adopt the above set of K_a and K_p parameters relevant to the actual construction method adopted.
5. The above parameters are based on the condition of a horizontal ground surface behind the retaining structure. Applicable surcharge loads behind the wall must also be considered in the design.

Retaining structures should be designed in accordance with AS 4678-2002 "*Earth Retaining Structures*" or an alternate approved factor of safety approach. Should any fill be placed against the permanent basement retaining wall after construction, it is expected that the compaction induced pressures will be much greater than the above active earth pressures. The compaction equipment used to compact backfill behind the wall must be carefully selected and preferably light-weight compaction equipment should be used. The load on the retaining wall due to compaction equipment may be estimated from Figure J5 in AS4678-2002 *"Earth Retaining Structures"*.

It is noted that some ground movement will occur behind temporary or permanent retaining walls. By definition, movement of the wall must occur to fully mobilise the active and passive earth pressure coefficients provided in Table 7 above. The extent of this movement is dependent on the height of retaining wall, type of wall selected and construction methodology. This must be considered during the design and construction of the retaining walls to ensure adjacent facilities are not adversely affected.

Any ground anchors associated with retaining wall construction should be designed based on the above effective stress soil parameters and using appropriate design standards such as BS8081.

8.3 Earthworks

Recommendations associated with this work are summarised as follows:

- Where present below design subgrade levels, any topsoil or otherwise unsuitable material must be removed and cut to waste. This material will need to be removed or remediated (i.e. proof compacted) prior to construction as per the following recommendations;
- Excavations to design subgrade levels are expected to encounter predominantly loose to medium dense Bassendean Sand that should be readily excavated using conventional earthmoving plant and that most of the material excavated will be disposed of off-site or, alternatively, be available for re-use on site as engineered fill;

- Any uncontrolled fill material remaining beneath floor slabs or footings shall be excavated, screened to remove oversize (>100mm) and recompacted to achieve at least 7 blows per 300mm penetration with a PSP excluding the top 150mm, which is generally equivalent to a dry density ratio of at least 95% based on Modified Compaction (AS1289 5.2.1). Any loose, weak, cohesive or organic materials observed during this proof roll shall be removed and replaced with compacted clean fill.
- At the completion of any excavation to design levels, including foundation excavations, the upper 300mm of the exposed subgrade must be moisture conditioned and compacted to achieve at least 7 blows per 300mm penetration with a PSP excluding the top 150mm, which is equivalent to a dry density ratio of at least 95% based on Modified Compaction (AS1289 5.2.1). Any loose, weak, cohesive or organic materials observed during this proof roll shall be removed and replaced with compacted clean fill;
- Any fill material should comprise clean granular material with <10% fines content and maximum particle size of 100mm. It must be moisture conditioned with a water cart and compacted in layers not exceeding 300mm to achieve at least 7 blows per 300mm penetration with a PSP. The onsite sand material meets this requirement, subject to screening for oversize;
- Any temporary cut batters in natural sand may be excavated to a gradient of up to 1V:1.5H (approximately 34 degrees);
- The sandy nature of the site soils means that they will dry quickly where exposed which will lead to significant rutting under construction vehicle loads. Therefore, across the building platform, consideration to the placement of a 150 mm thick blinding layer of crushed limestone gravel or similar should be made following sand subgrade compaction.
- Excavations may require local dewatering to lower groundwater and to achieve compaction levels identified above.

The technical and control requirements for Engineered Fill, including site observation and compaction testing, are outlined in AS3798. We recommend that this work is completed under the direction and control of a suitably experienced Geotechnical Engineer familiar with the contents of this report. CMW would be pleased to perform this function if required.

8.4 Strip Foundations

The design of available foundation bearing pressures for isolated strip footings at this site has been carried out using the Terzaghi bearing capacity equation. Subject to completing the earthworks and foundation preparation recommendations provided herein, shallow strip or pad footings founded within medium dense sand may be designed on the basis of the maximum allowable bearing pressures provided in Table 8. Given the shallow depth of groundwater across the site, we recommend that footings should be designed to a formation level of at least 500mm above the groundwater to negate the requirement for construction dewatering.

Table 8: Summary of Shallow Footing Design Bearing Pressure			
Embedment Depth (m)	**Footing Width (m)**	**Footing Length (m)**	**Allowable Bearing Pressure (kPa)**
0.3	0.5 Strip		95
	1 Strip		140
	1	1	120
	2	2	190
0.5	0.5 Strip		130
	1 Strip		170
	1	1	150
	2	2	220
1	0.5 Strip		210
	1 Strip		250
	1	1	240
	2	2	250

These values are based on a geotechnical strength reduction factor of 0.5 and an average load factor of 1.5 (Factor of Safety = 3.0). It should be noted that these bearing pressures assume isolated vertical, non-eccentric loads.

Subject to the earthworks and foundation preparation works being undertaken as described herein, it has been calculated that the total elastic settlement of the footing configurations and design pressures outlined in Table 8 above is unlikely to exceed approximately 20 to 25mm. Differential settlements are unlikely to exceed approximately one half of these values.

8.5 Site Classification

Although not directly relevant to the Home Fire Studio development proposed for this site, a site classification of Class A is recommended subject to the foundation preparation recommendations provided in Section 8.3 above.

8.6 Soak wells

On-site soak wells may be designed on the basis of a soil coefficient of permeability of 10 m/day subject to being located a distance of at least 3m away from any building foundations. This does not allow for any clogging, silting or other design aspects of the soak wells.

Due to the shallow nature of groundwater across the site soak wells may not be viable. Shallow groundwater and the potential for mounding around soakwells must be considered in design.

8.7 Floor Slabs

On the basis that appropriate levels of compaction are maintained during site preparation, as described in Section 8.3 above, an average long-term Young's Modulus value of 30MPa is considered appropriate for the soils below at grade floor slabs with respect to the design of a proposed slab-on-ground.

8.8 Pavement CBR

Based on the laboratory test results, it is recommended that pavements be designed on the basis of a subgrade CBR value of 9%.

This design CBR value is subject to the exposed subgrade being moisture conditioned and compacted in accordance with the recommendations provided in Section 8.3 above. It is recommended that QA / QC testing be undertaken on subgrade materials during construction.

9 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use by Home Fire Creative Industries Pty Ltd c/- Hesperia in relation to the Home Fire Studio, Malaga project in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than Home Fire Creative Industries Pty Ltd c/- Hesperia and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

For and on behalf of
CMW Geosciences Pty Ltd

Reviewed by:

Mitchell Owen
Project Engineering Geologist

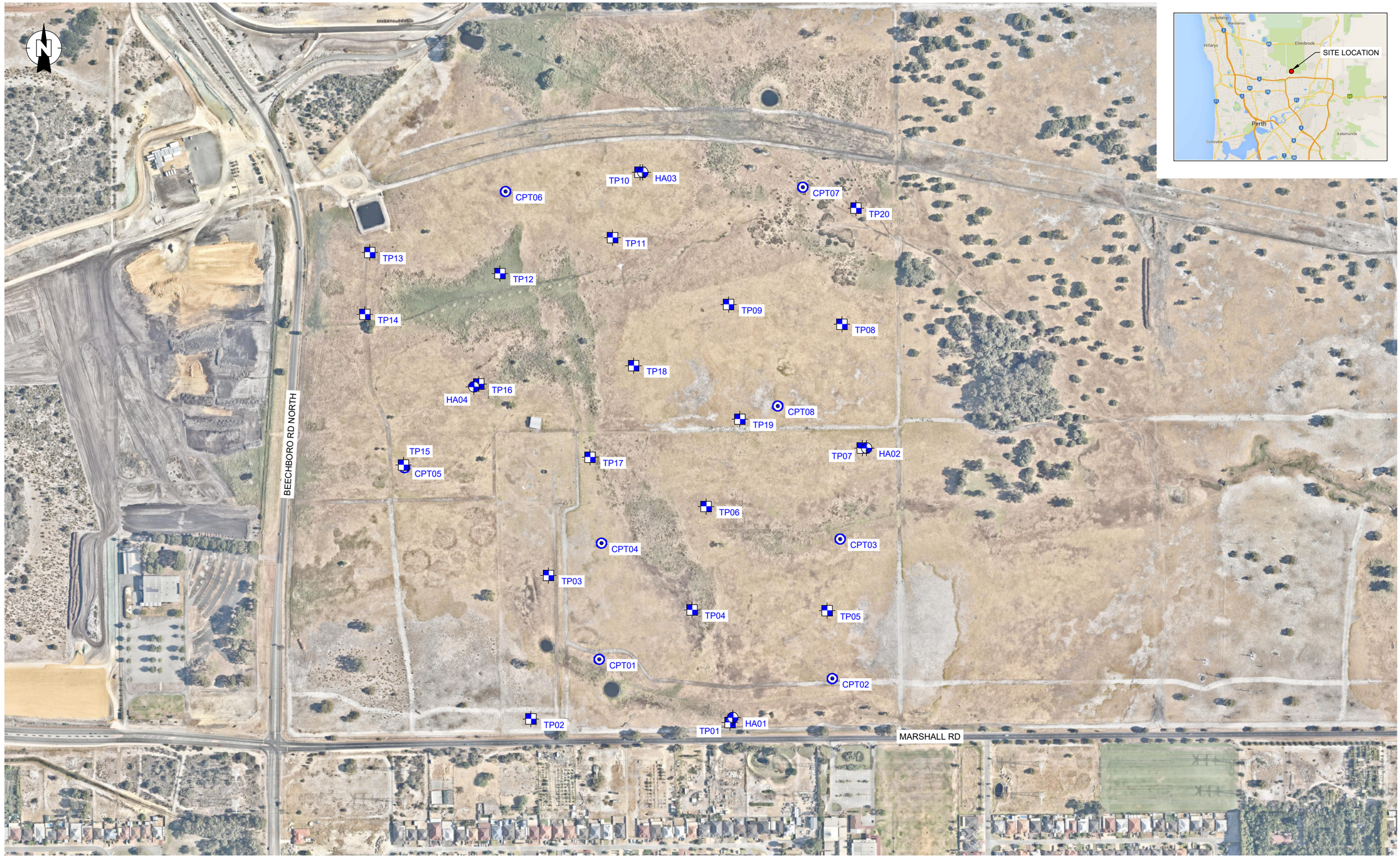
Jonathan Liang
Principal Geotechnical Engineer

Distribution: 1 copy to Home Fire Creative Industries Pty Ltd c/- Hesperia (electronic)
Original held by CMW Geosciences Pty Ltd

10 REFERENCES

- Appendix 4, Control of Groundwater for Temporary Works (CIRIA Report No. 113)
- AS 1289, *Methods of testing soils for engineering purposes,* Standards Australia, Sydney
- AS 1726, *Geotechnical Site Investigations,* Standards Australia, Sydney, 2017
- AS 2870, *Residential slabs and footings,* Standards Australia, Sydney, 2011
- AS 3798 (inc. amendment 1), *Guidelines on earthworks for commercial and residential developments,* Standards Australia, Sydney, 2007
- AS 4678 (inc amendments 1 & 2), *Earth retaining structures,* Standards Australia, Sydney, 2002
- BS 1377-9:1990 Methods for test for soils for civil engineering purposes. In-situ tests.
- U.S. Corps of Eng., Waterways Exp. Sta., Vicksburg, Miss., 1951
- *Perth Groundwater Atlas,* Second Edition, Perth: Department of Environment, 2004
- *Perth, Sheet 2034 II and part of 2034 III and 2134 III ,* Perth Metropolitan Region Environmental Geology Series, Geological Survey of Western Australia, 1986
- Terzaghi, K. (1943). Theoretical soil mechanics. 1st ed. New York: J. Wiley and Sons, Inc.
- WA Online Atlas, Shared Land Information Platform – ASS Risk Map, https://www2.landgate.wa.gov.au/bmvf/app/waatlas/.

Figure 1
Site Investigation Plan



LEGEND:

- HA01 HAND AUGER (HA) LOCATION
- CPT01 CONE PENETROMETER TEST (CPT) LOCATION
- TP01 TEST PIT (TP) LOCATION

NOTES:

1. AERIAL FROM NEARMAP 30.01.22

1:5000 0 50 100 150 200 250 m

CMW Geosciences

CLIENT: HOME FIRE CREATIVE INDUSTRIES PTY LTD		DRAWN: DE	PROJECT: PER2022-0024
PROJECT: HOME FIRE STUDIO MALAGA, WA		CHECKED: MO	DRAWING: 01
		REVISION: A	SCALE: 1:5000
TITLE: SITE INVESTIGATION PLAN		DATE: 14.03.22	SHEET: A3 L

Appendix A
Test Pit Logs, Photographs and PSP Plots

TEST PIT LOG - TP01

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398927m N.6475096m
Elevation: 25 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.0 - 0.5	1	24.8	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD to D	4, 4, 3	
	0.6 - 1.0	2				SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			4, 3, 3	
				1		*... at 1.00m, becoming brown*	M to W		2, 2	
▼			23.5			Test pit terminated at 1.50 m	W	L to MD	4, 4, 5, 6, 6	
				2						
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.4 m BGL.

TEST PIT LOG - TP02

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398644m N.6475101m
Elevation: 28.65 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.5 - 1.0	1	28.5	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	4, 2, 3, 2, 3, 3	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		2, 2, 3, 4, 5	
			26.8	2		Test pit terminated at 1.90 m			4, 5	
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP03

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW | Position: E.398669m N.6475305m | Plant: JCB 8.5t backhoe
Checked by:MO | Elevation: 27 m | Contractor: ANH Contracting | Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			26.8	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3, 2, 2, 2, 2, 2	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).				
						... at 0.85m, becoming dark brown; with fines; trace rootlets				
				1					7	
							M to W	MD to D	15	
									18	
▼				2			W			
			24.8			Test pit terminated at 2.20 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 2.0 m BGL.

TEST PIT LOG - TP04

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

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1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398873m N.6475256m
Elevation: 26 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼			25.8	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		2	
				1			W		3	
									2	
									2	
			24.5			Test pit terminated at 1.50 m			3	
				2						
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 0.8 m BGL.

TEST PIT LOG - TP05

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.399065m N.6475255m
Elevation: 24.5 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			24.4	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3, 3, 3, 2, 2, 3	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		2, 1, 2, 2, 3, 5	
						... at 1.90m, becoming dark brown, coffee rock, highly cemented				
			22.5	2		Test pit terminated at 2.00 m			9	
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP06

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398893m N.6475403m
Elevation: 25.2 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			25.0	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	4, 2, 3, 2, 3, 4	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		3, 2, 2	
▼			23.6				W		4, 9, 9, 9	
				2		Test pit terminated at 1.60 m				
				3						
				4						

Perth Sand Penetrometer (Blows/150mm) scale: 5, 10, 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.5 m BGL.

TEST PIT LOG - TP07

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.399115m N.6475486m
Elevation: 24.4 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			24.2	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3, 4, 4, 3, 4, 4	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		2, 2, 2, 2, 4	
▼							W		6	
			22.4	2		Test pit terminated at 2.00 m			11	
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.8 m BGL.

TEST PIT LOG - TP08

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.399086m N.6475662m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	2	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			3	
									2	
									3	
									3	
				1					3	
									2	
									2	
						... at 1.50m, becoming grey mottled black			2	
							M to W		3	
						... at 1.70m, becoming brownish grey			6	
				2		Test pit terminated at 2.00 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP09

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398925m N.6475690m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3, 3, 2, 3, 2, 2	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).				
						... at 1.00m, becoming pale brown to black	M to W	VL	1, 1, 1	
							W	MD	3, 6, 6, 7	
						Test pit terminated at 1.80 m				
				2						
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.3 m BGL.

TEST PIT LOG - TP10

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398799m N.6475878m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	D	4	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			4	
									4	
							M to W		4	
				1					4	
									4	
								L to MD	2	
									2	
									2	
							W		4	
									5	
									6	
				2		Test pit terminated at 2.00 m			9	
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.4 m BGL.

TEST PIT LOG - TP11

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW | Position: E.398760m N.6475785m | Plant: JCB 8.5t backhoe
Checked by:MO | Elevation: | Contractor: ANH Contracting | Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	4	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			3	
							M to W		2	
				1					2	
▼									2	
									2	
								VL	1	
									1	
						... at 1.50m, becoming dark brown, coffee rock, highly cemented	W	MD to D	10	
									4	
				2					5	
									10	
						Test pit terminated at 2.50 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.3 m BGL.

TEST PIT LOG - TP12

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398600m N.6475734m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼	1.0 - 1.2	1		1		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD to D	3	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			3	
									2	
							M to W		8	
									10	
									10	
							W		9	
									9	
									9	
									10	
									10	
									5	
				2					10	
						Test pit terminated at 2.20 m				
				3						
				4						

Perth Sand Penetrometer (Blows/150mm) scale: 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 0.8 m BGL.

TEST PIT LOG - TP13

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398415m N.6475764m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.2 - 0.5	1		1		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics. SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	D to M	MD to D	5, 4, 4, 4, 4, 5	
				2			M to W		5, 5, 6, 7, 9, 13	
						Test pit terminated at 2.10 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP14

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW | Position: E.398408m N.6475676m | Plant: JCB 8.5t backhoe
Checked by:MO | Elevation: | Contractor: ANH Contracting | Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M		7	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			6	
									5	
									6	
									8	
				1			M to W	MD to D	10	
									8	
									3	
									7	
									8	
							W		6	
									7	
				2		Test pit terminated at 2.00 m			7	
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.6 m BGL.

TEST PIT LOG - TP15

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398463m N.6475462m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M		3, 4, 3, 3, 3, 3	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).		MD	3	
						... at 1.00m, becoming brownish grey to dark grey	M to W		2, 3, 6, 7, 10, 8	
				2		Test pit terminated at 2.50 m				
				3						
				4						

Perth Sand Penetrometer (Blows/150mm) scale: 5, 10, 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP16

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398570m N.6475577m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				1		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD	2	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			2	
						... at 0.50m, becoming dark grey to black, with fines			2	
							M to W		2	
						... at 1.00m, becoming pale brown to brown, organic smells			3	
				2					4	
									4	
							W		8	
						Test pit terminated at 2.50 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.3 m BGL.

TEST PIT LOG - TP17

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398728m N.6475473m
Elevation: 27 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.2 - 0.5	1	26.8	0		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD to D	5, 4, 3, 3, 3, 3	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).				
						... at 1.00m, becoming dark grey to dark brown	M to W		3, 3, 6, 8, 9, 9	
				2			W		10	
			24.5			Test pit terminated at 2.50 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.7 m BGL.

TEST PIT LOG - TP18

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398790m N.6475603m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				0		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	4	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			3	
									3	
									4	
									3	
				1			M to W		2	
									3	
									2	
									3	
									6	
									8	
							W		9	
				2		... at 1.90m, becoming dark brown to black			10	
						Test pit terminated at 2.20 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.6 m BGL.

TEST PIT LOG - TP19

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398941m N.6475527m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD	4, 3, 3, 5, 5, 4	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		3, 3, 4, 5, 5, 4, 4	
				2		Test pit terminated at 2.30 m				
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP20

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.399106m N.6475827m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	D	5	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			4	
									3	
									3	
						... at 0.80m, becoming brown	M to W		2	
				1					2	
								L to MD	2	
									2	
									3	
							W		6	
									10	
								D	12	
				2						
						Test pit terminated at 2.30 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

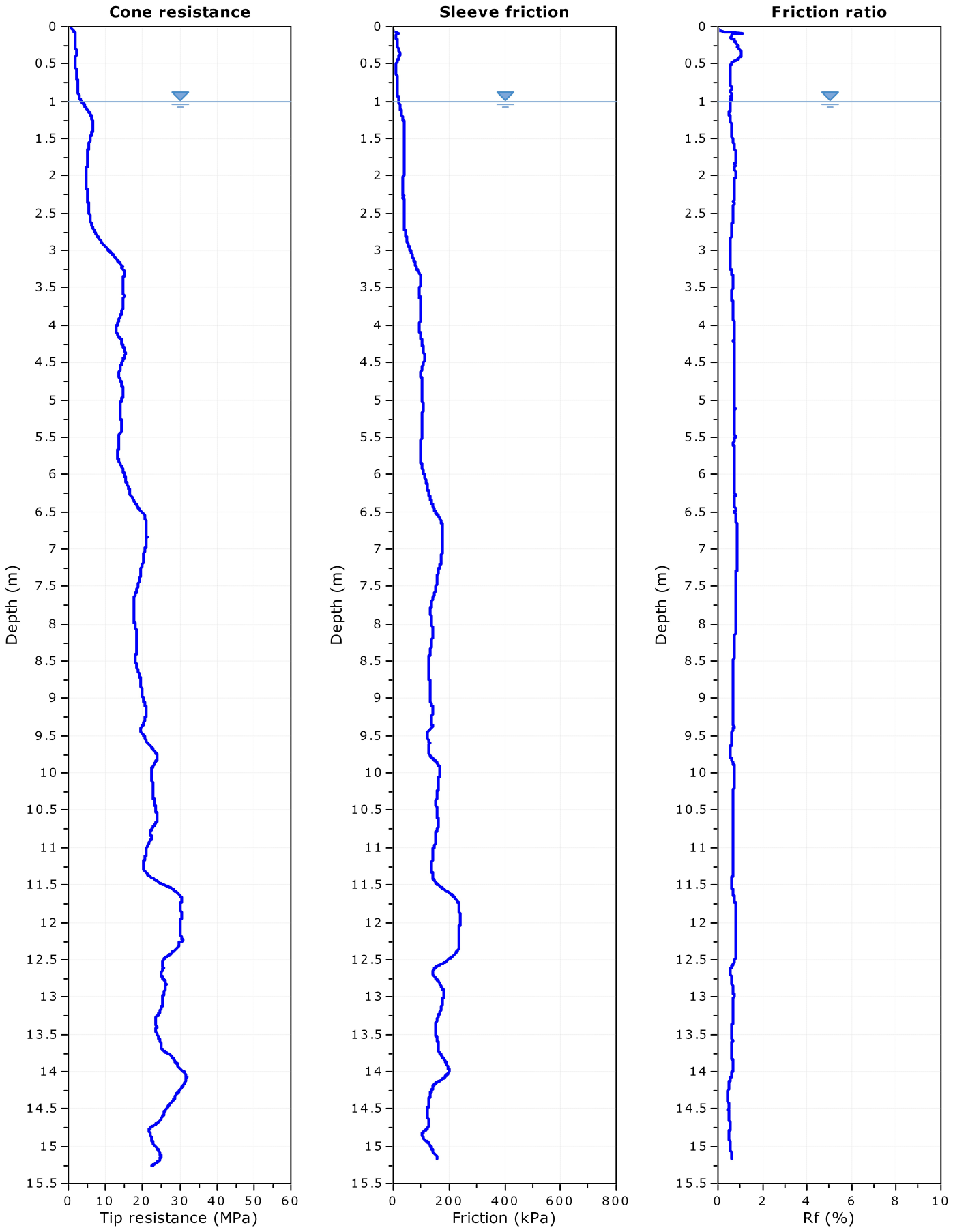
Remarks: Backfilled. Groundwater encountered at 1.0 m BGL.

Appendix B
CPTu Plots

info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 1
Total depth: 15.27 m, Date: 8/03/2022
Surface Elevation: 26.57 m
Coords: X:398741.06, Y:6475185.78
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



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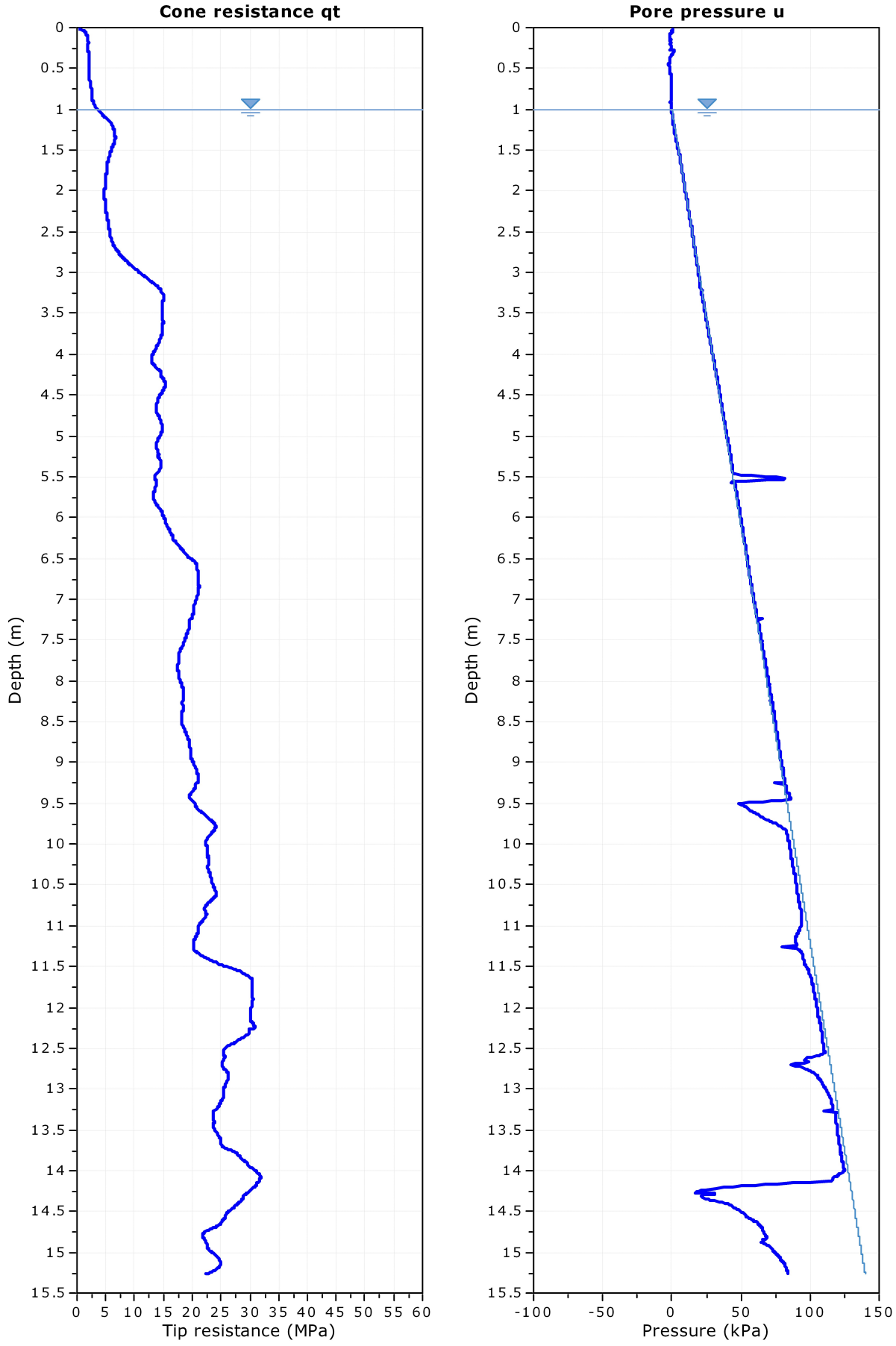
CPTu 1
Total depth: 15.27 m, Date: 8/03/2022
Surface Elevation: 26.57 m
Coords: X:398741.06, Y:6475185.78
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



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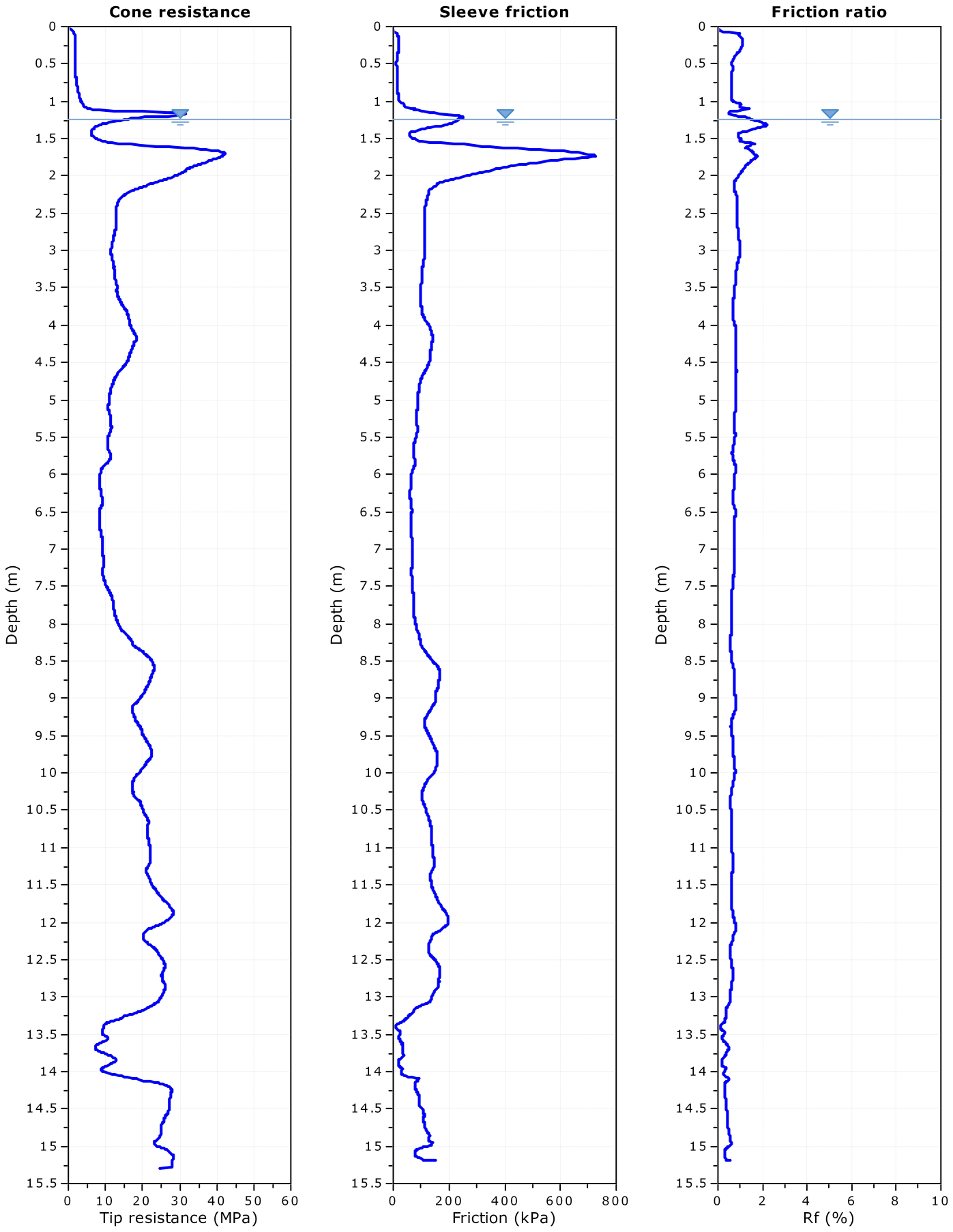
CPTu 2
Total depth: 15.29 m, Date: 8/03/2022
Surface Elevation: 24.34 m
Coords: X:399072.34, Y:6475158.45
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



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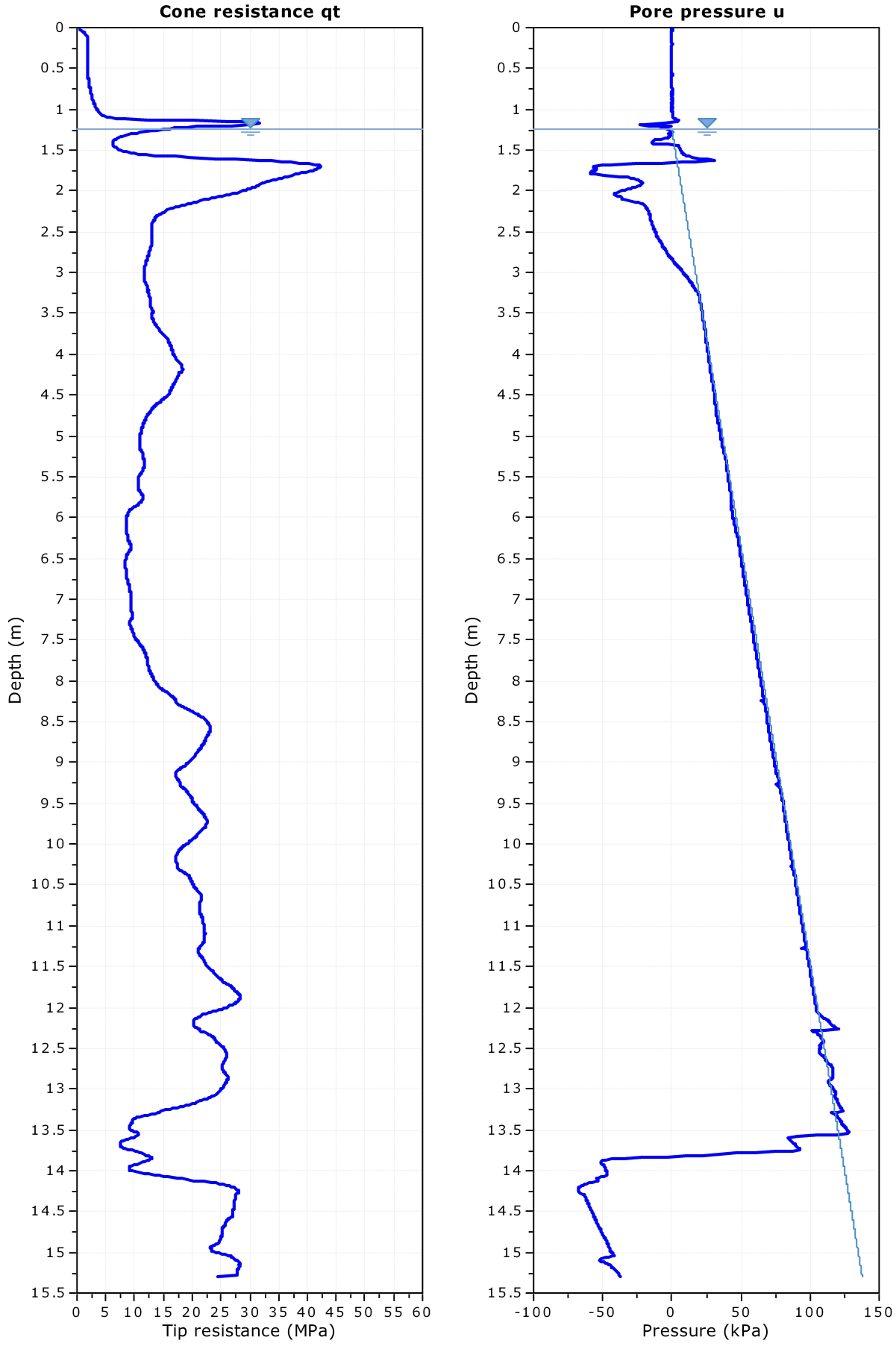
CPTu 2
Total depth: 15.29 m, Date: 8/03/2022
Surface Elevation: 24.34 m
Coords: X:399072.34, Y:6475158.45
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



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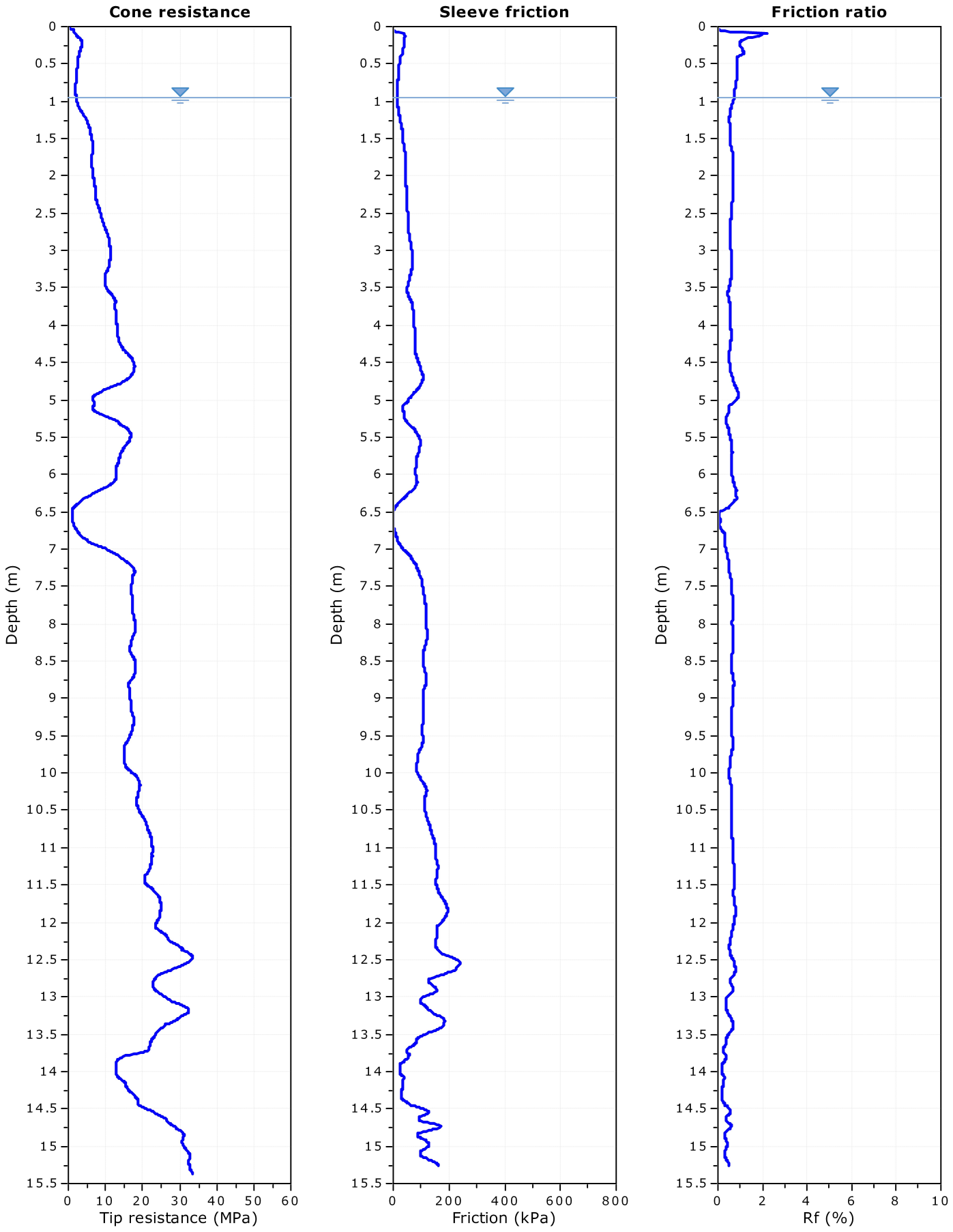
CPTu 3
Total depth: 15.37 m, Date: 8/03/2022
Surface Elevation: 23.89 m
Coords: X:399083.51, Y:6475356.71
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



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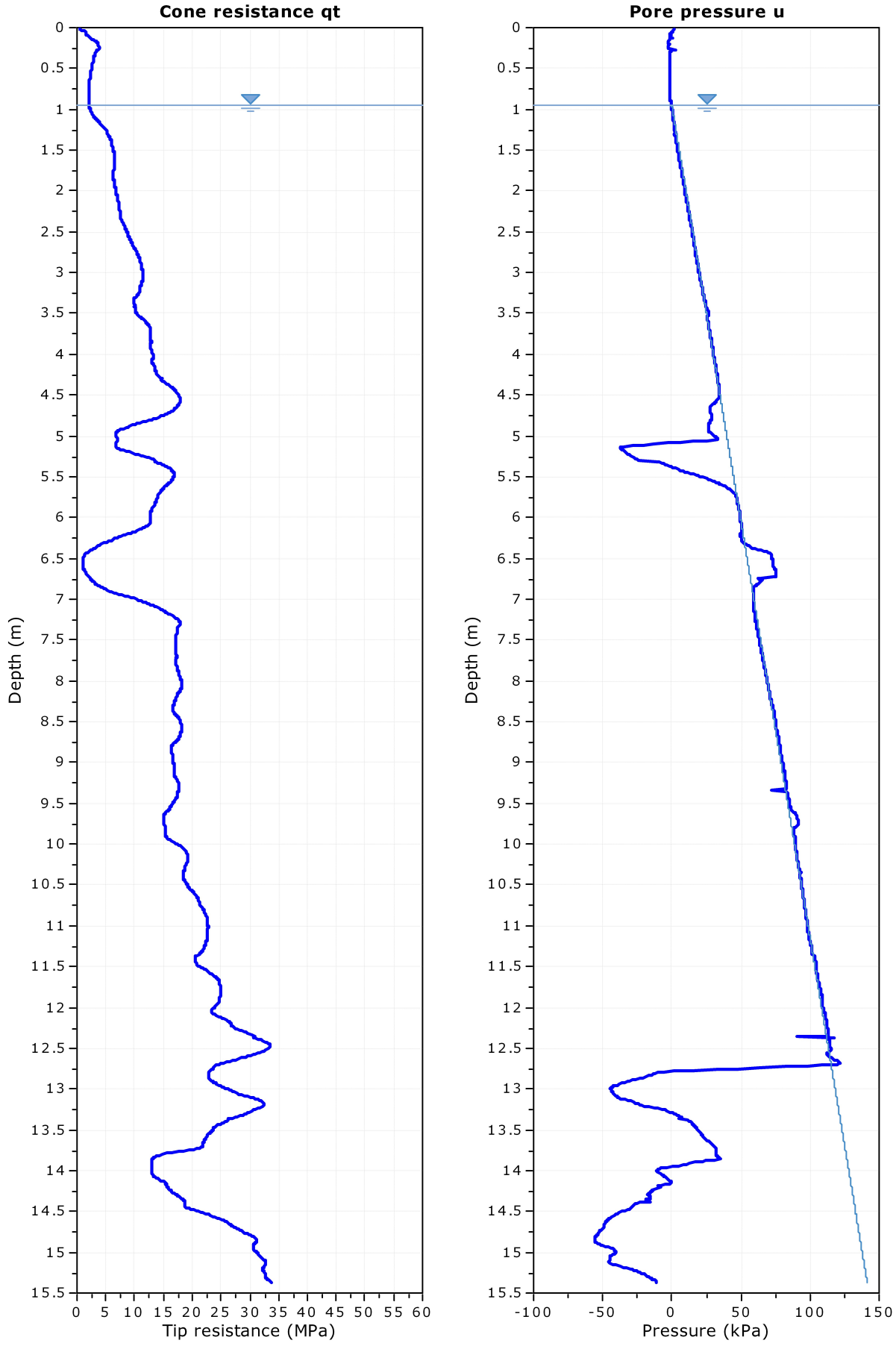
CPTu 3
Total depth: 15.37 m, Date: 8/03/2022
Surface Elevation: 23.89 m
Coords: X:399083.51, Y:6475356.71
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



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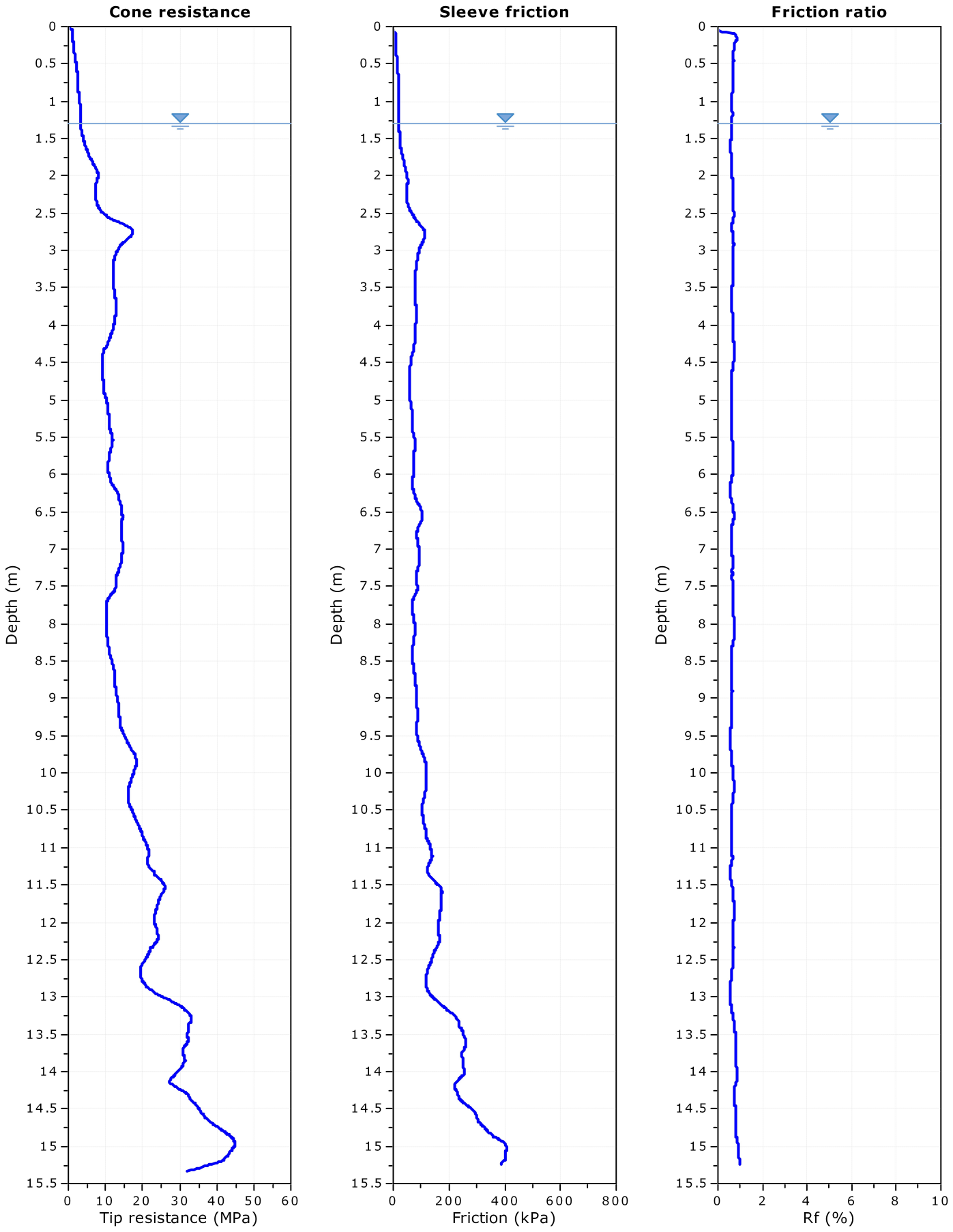
CPTu 4
Total depth: 15.34 m, Date: 8/03/2022
Surface Elevation: 27.11 m
Coords: X:398744.39, Y:6475350.84
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



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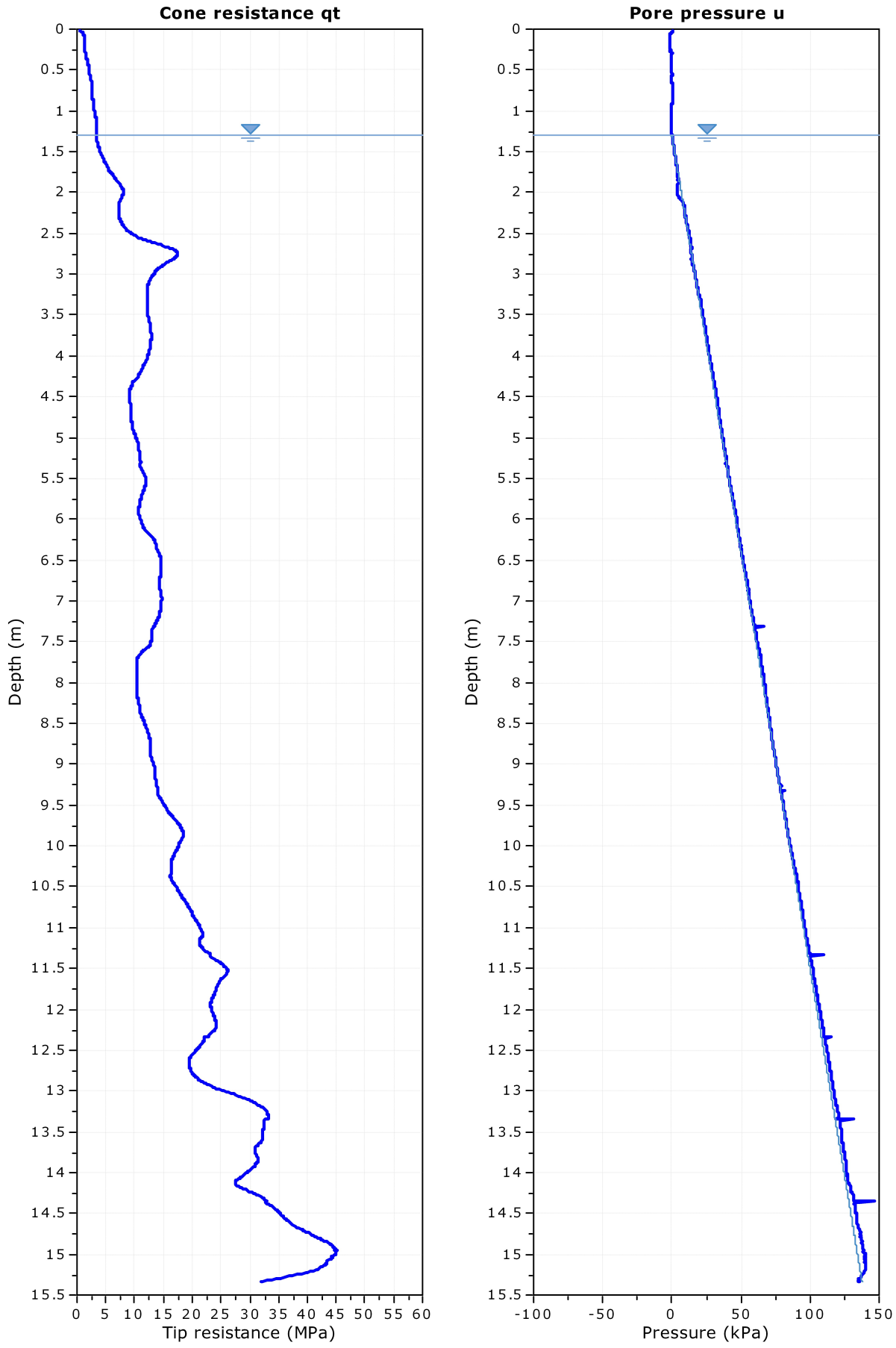
CPTu 4
Total depth: 15.34 m, Date: 8/03/2022
Surface Elevation: 27.11 m
Coords: X:398744.39, Y:6475350.84
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



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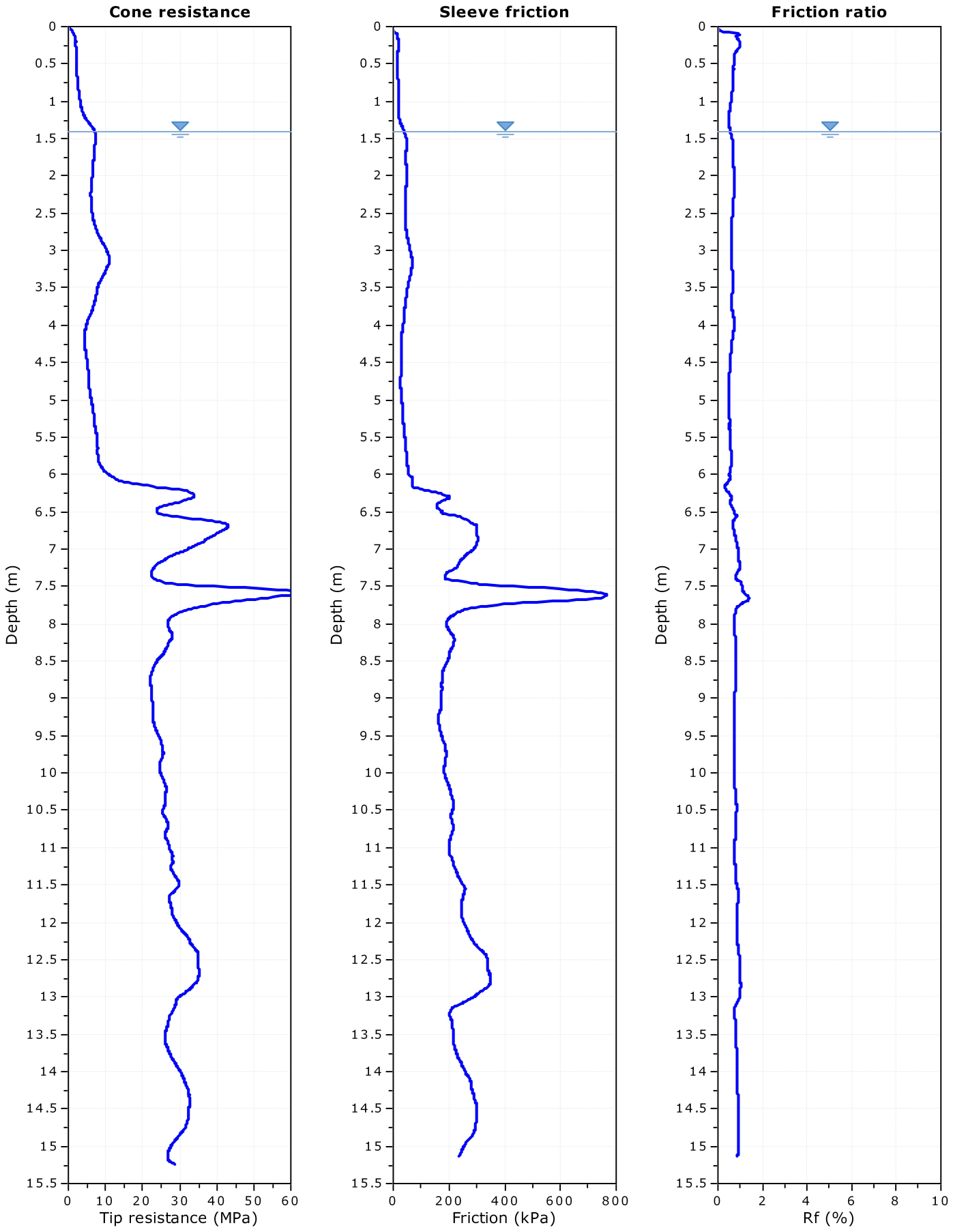
CPTu 5
Total depth: 15.24 m, Date: 8/03/2022
Surface Elevation: 27.90 m
Coords: X:398464.41, Y:6475458.18
Cone Operator: Andrew

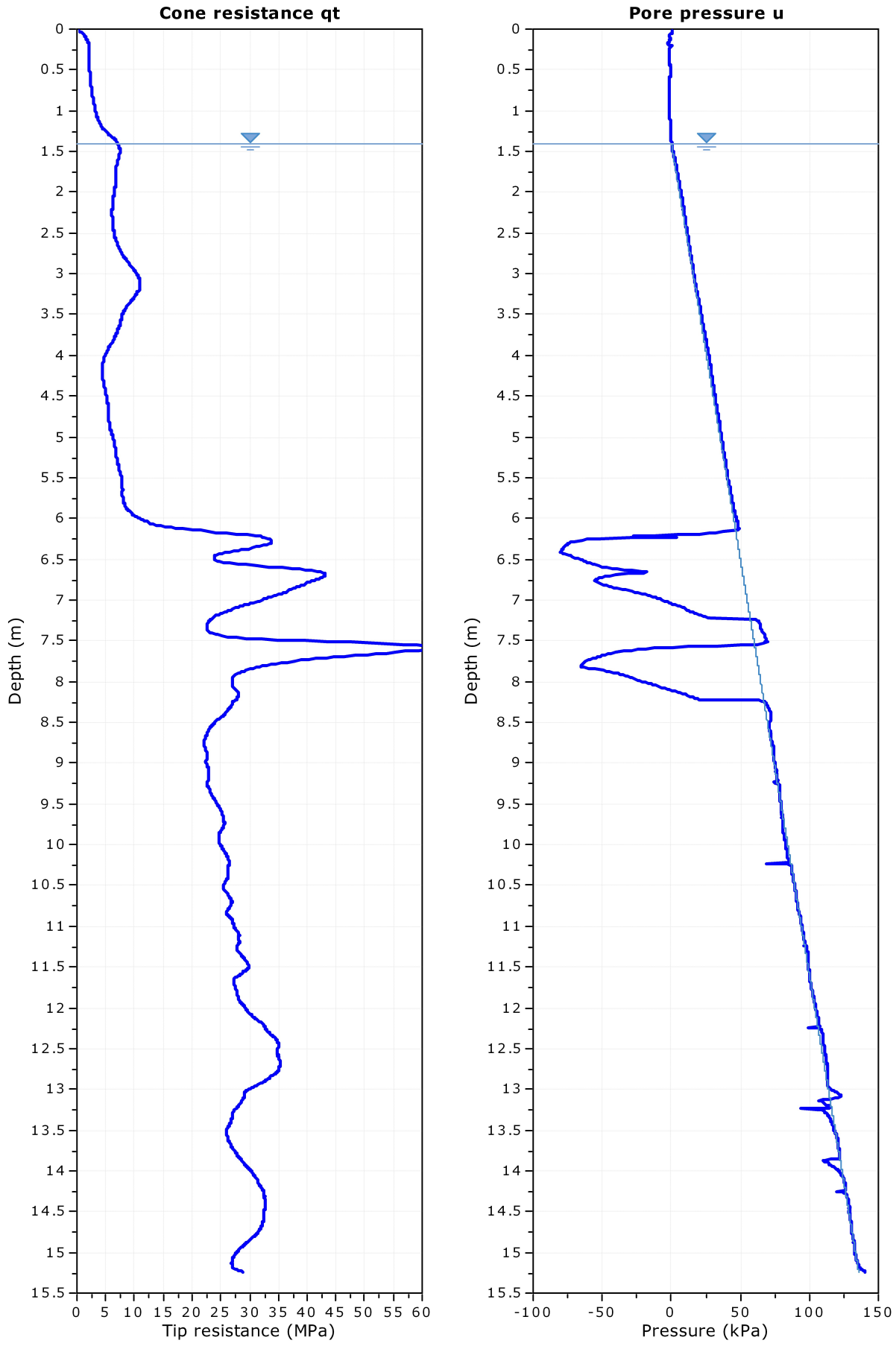
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 5
Total depth: 15.24 m, Date: 8/03/2022
Surface Elevation: 27.90 m
Coords: X:398464.41, Y:6475458.18
Cone Operator: Andrew

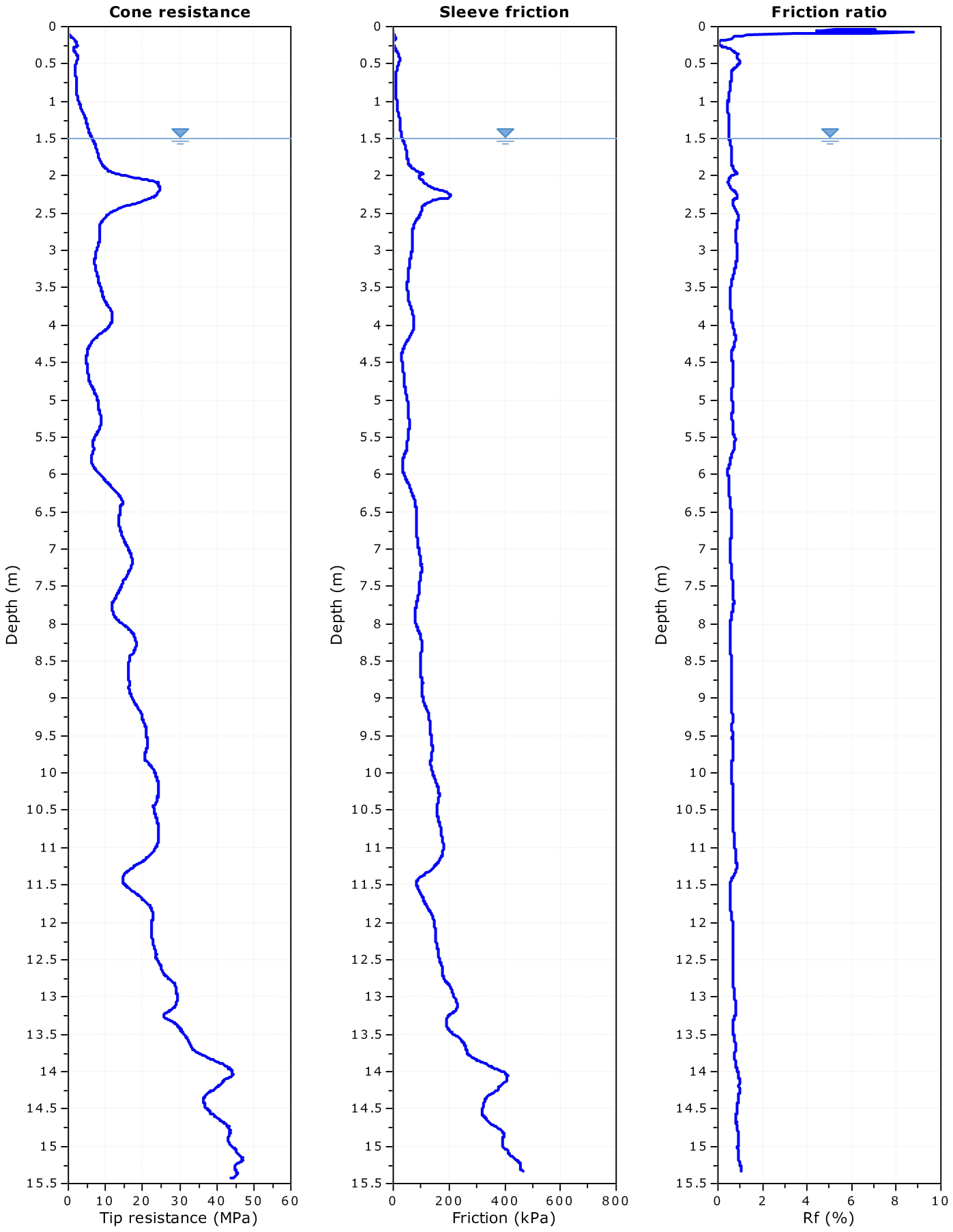
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 6
Total depth: 15.43 m, Date: 8/03/2022
Surface Elevation: 27.35 m
Coords: X:398607.91, Y:6475850.53
Cone Operator: Andrew

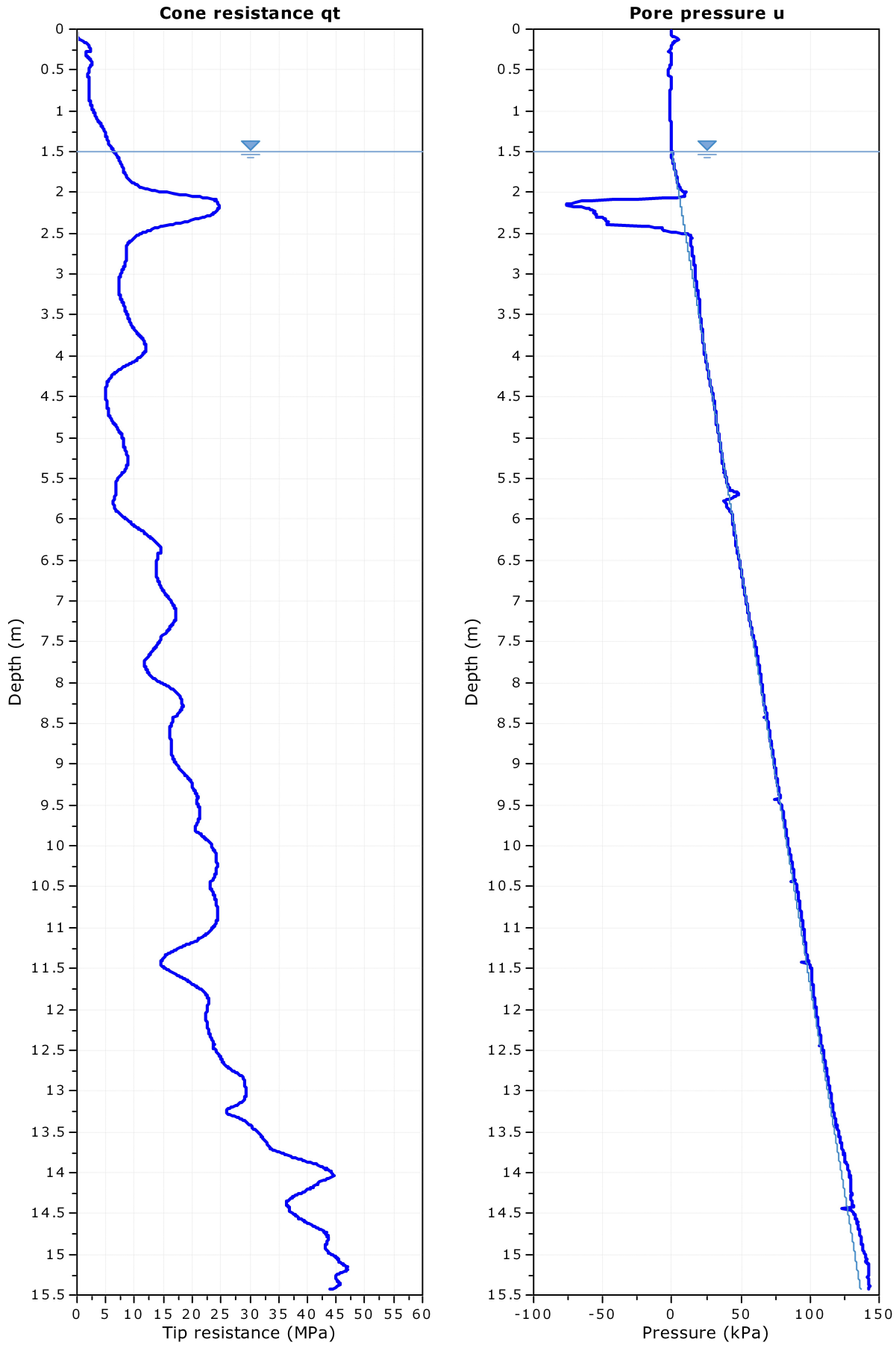
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 6
Total depth: 15.43 m, Date: 8/03/2022
Surface Elevation: 27.35 m
Coords: X:398607.91, Y:6475850.53
Cone Operator: Andrew

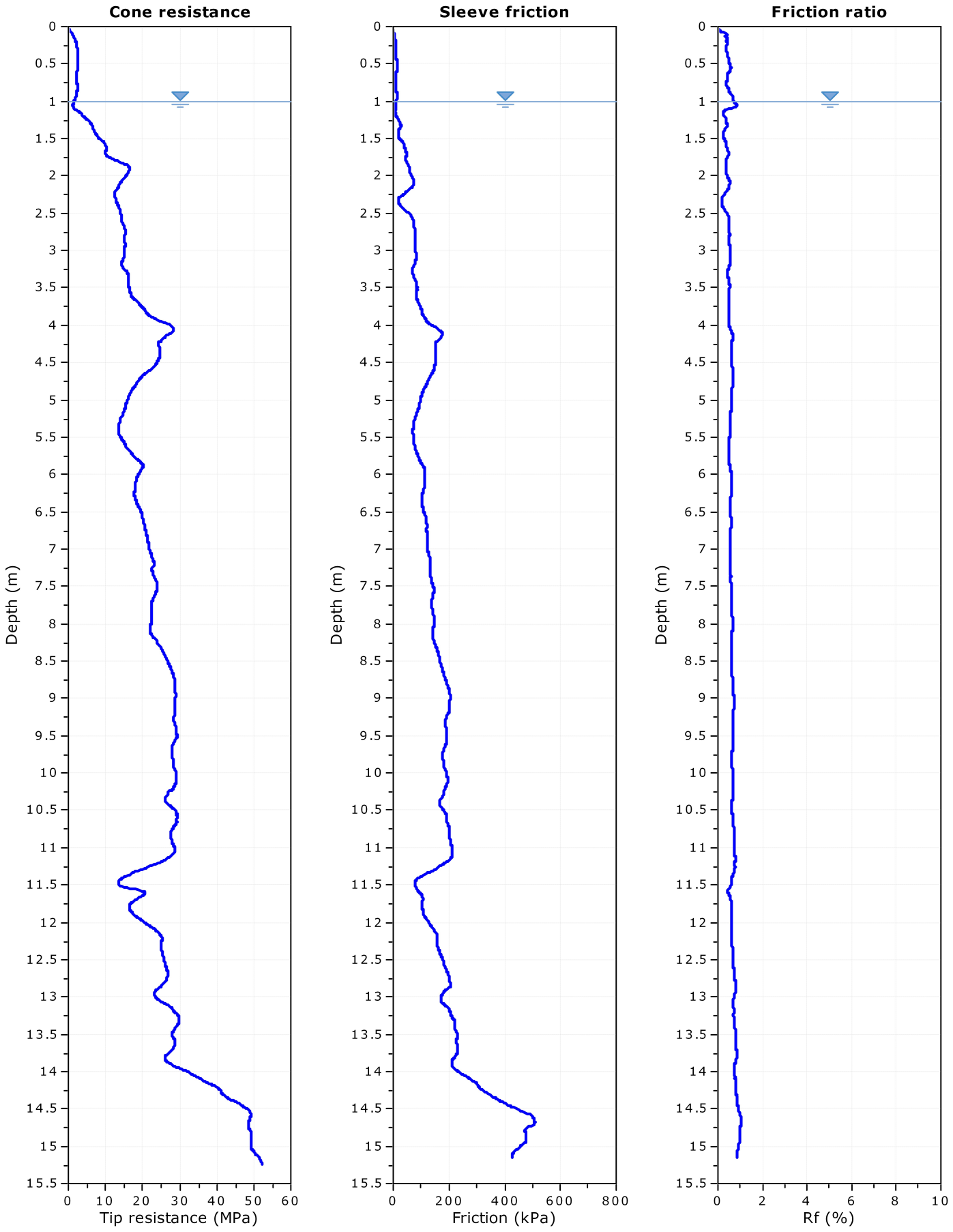
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 7
Total depth: 15.25 m, Date: 8/03/2022
Surface Elevation: 23.54 m
Coords: X:399030.40, Y:6475856.67
Cone Operator: Andrew

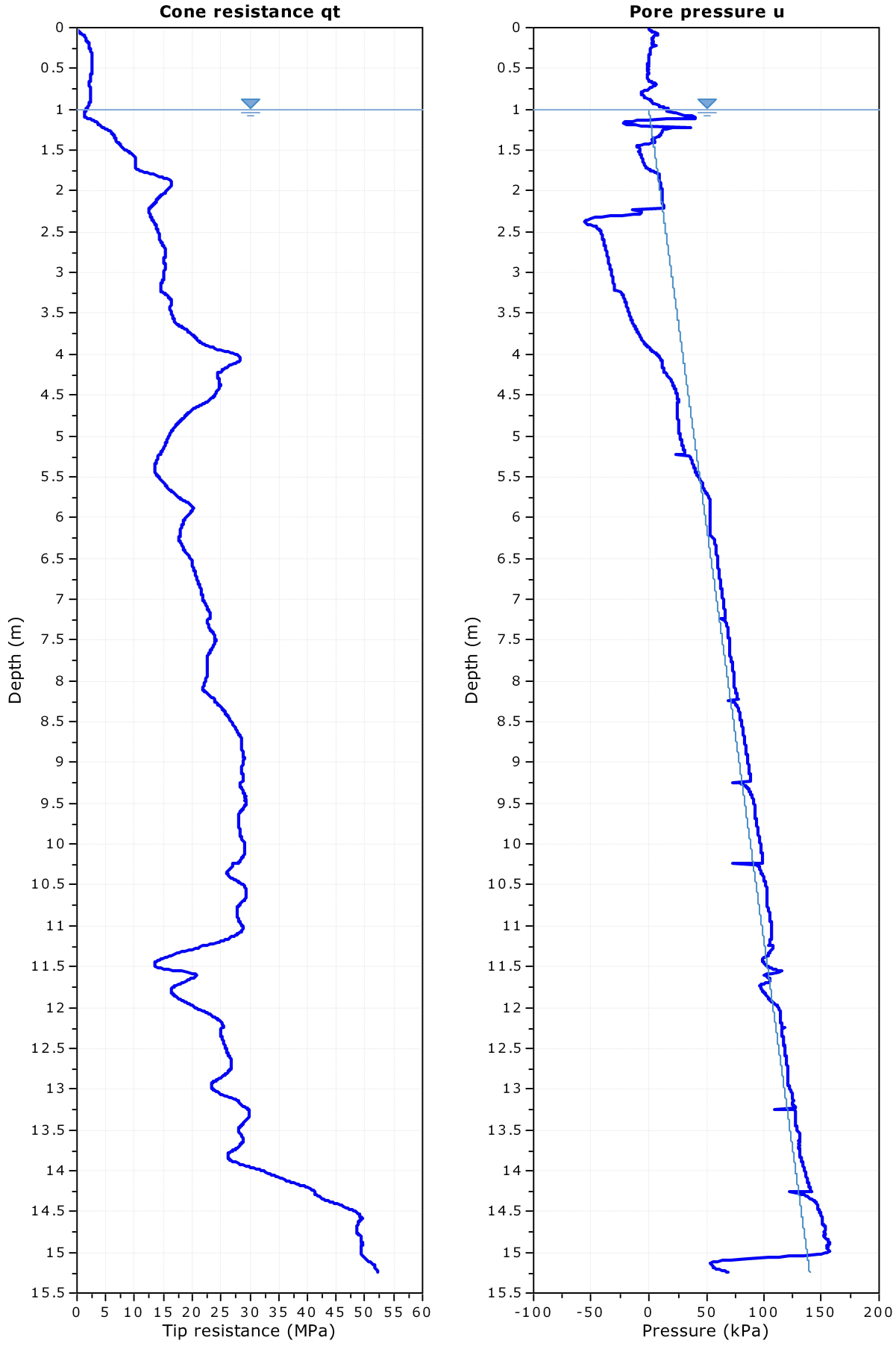
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 7
Total depth: 15.25 m, Date: 8/03/2022
Surface Elevation: 23.54 m
Coords: X:399030.40, Y:6475856.67
Cone Operator: Andrew

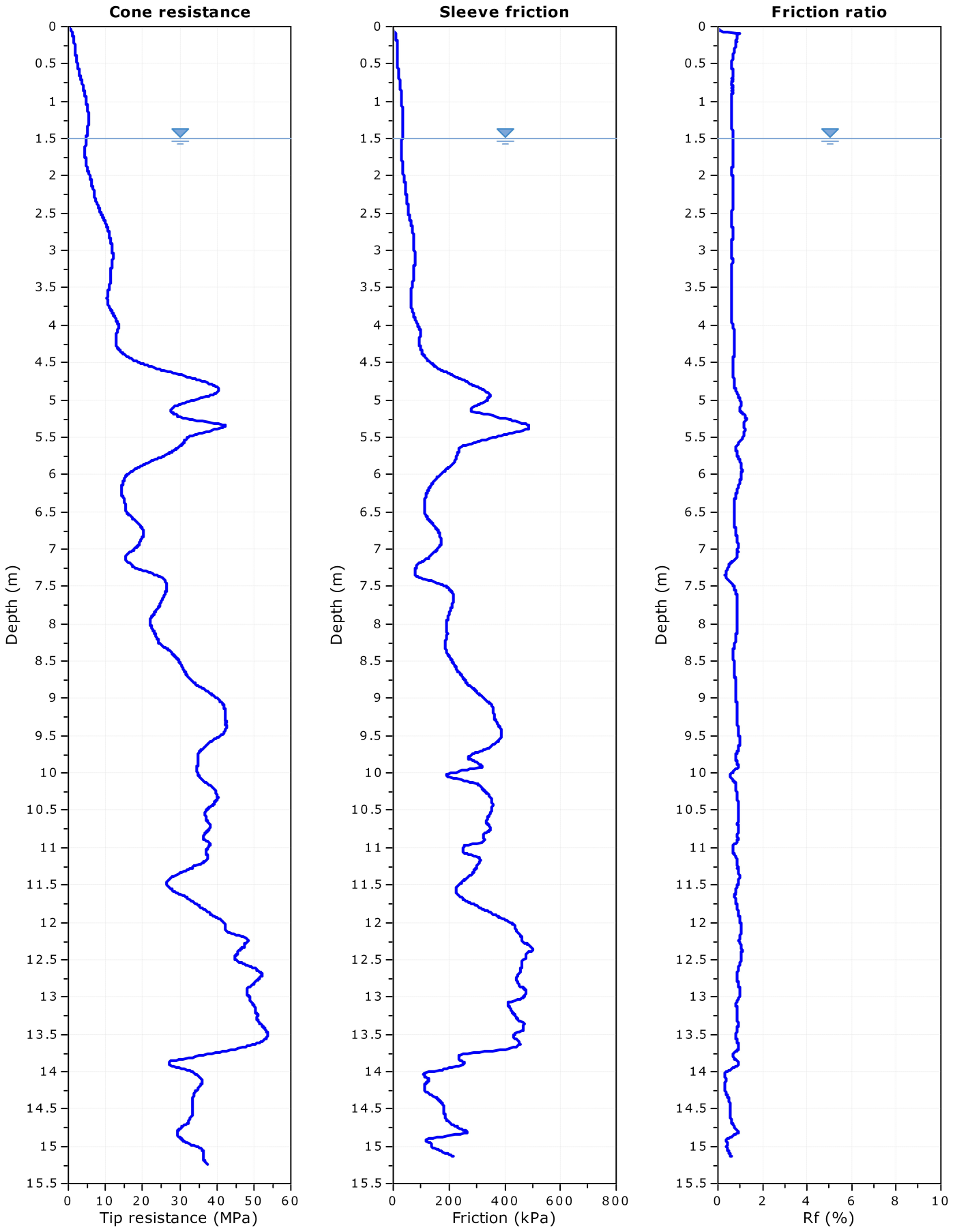
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 8
Total depth: 15.24 m, Date: 8/03/2022
Surface Elevation: 25.01 m
Coords: X:398994.83, Y:6475545.68
Cone Operator: Andrew

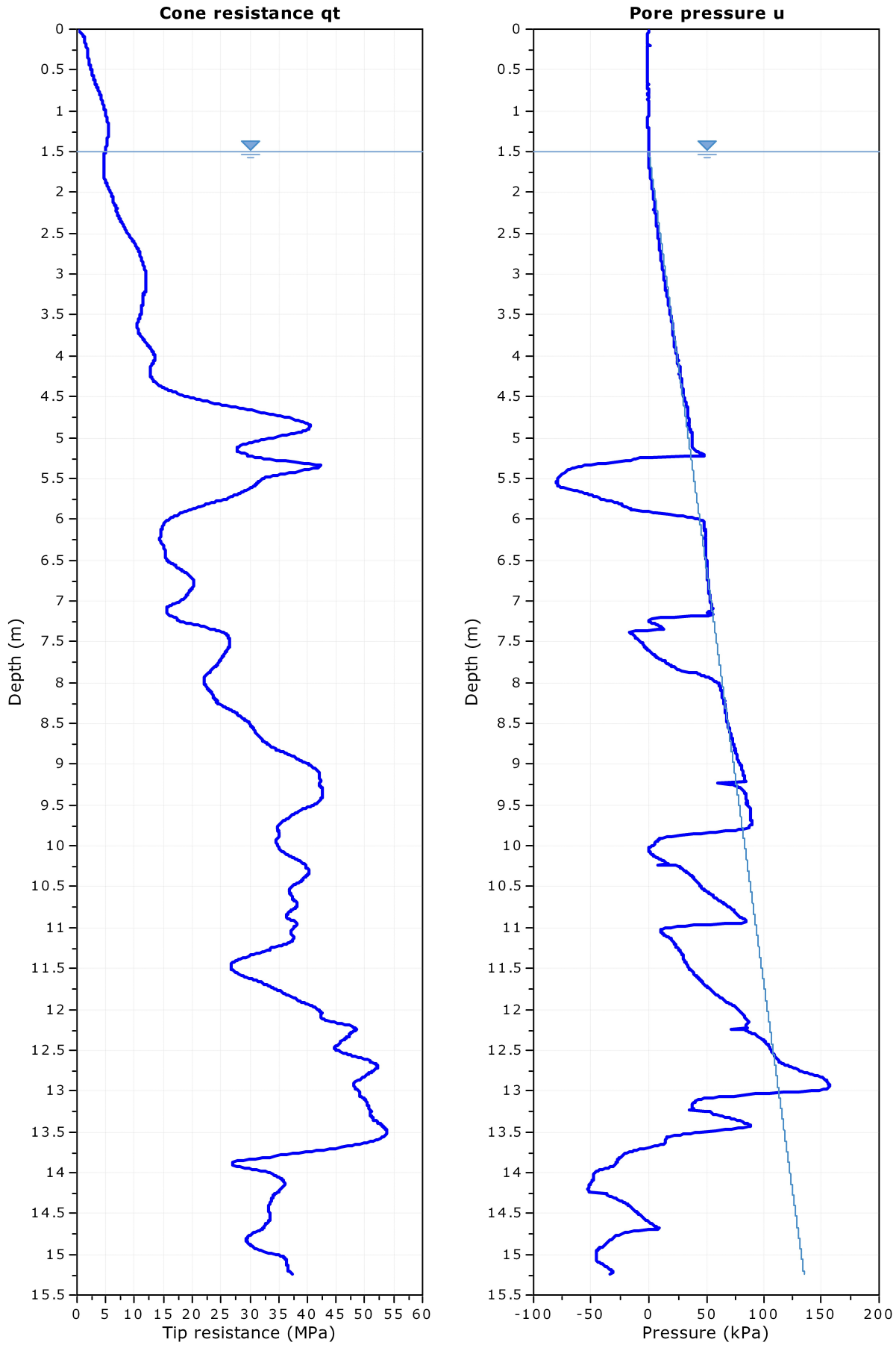
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 8
Total depth: 15.24 m, Date: 8/03/2022
Surface Elevation: 25.01 m
Coords: X:398994.83, Y:6475545.68
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



Appendix C
In-situ Permeability Test Result

CMW Geosciences	CLIENT: **Total Project Management**	DESIGNER:	DW
	PROJECT: **Home Fire Studio, Malaga** **Whiteman Park, Malaga**	CHECKED:	MO
		REVISION:	4
	TITLE: **HA01 Falling Head Permeability Test**	DATE:	9/03/2022
		PROJECT:	PER2022-0024

Specifications - Open-Ended Tube

Length L_1:	1.4	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0.18	m

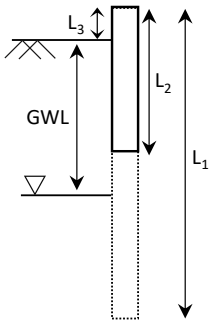
Ground Conditions

GWL: 1.2 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

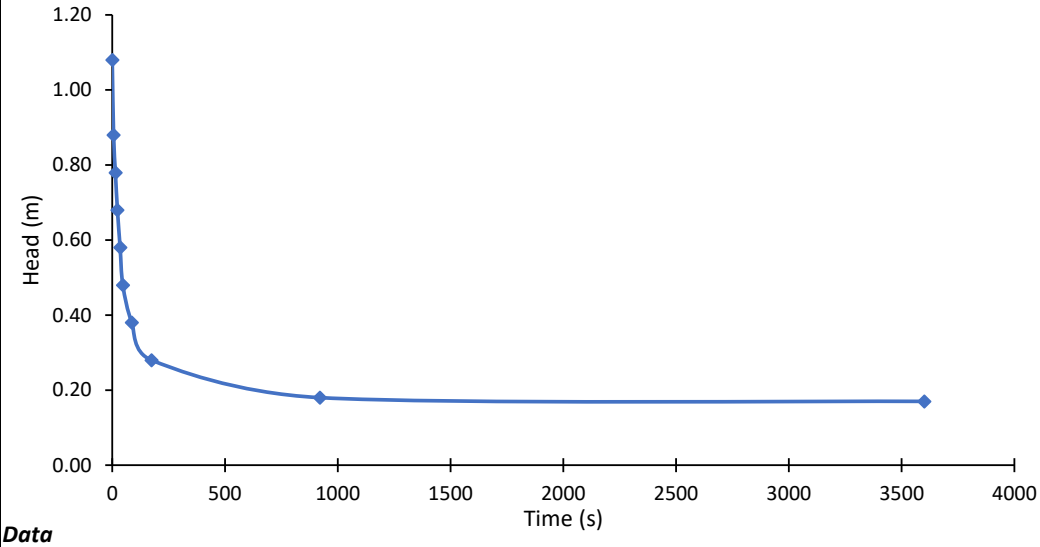
Bottom of Test Hole: 1.22 m BGL



Hydraulic Conductivity (k)

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 2.12E-04 ms^{-1} = 18.31 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.22m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.300	1.080	1.000		1.07E-04	6.42E-04
6	0.500	0.880	0.850		5.28E-05	2.80E-04
14	0.600	0.780	0.750		5.80E-05	2.81E-04
23	0.700	0.680	0.650		5.52E-05	2.43E-04
35	0.800	0.580	0.550		7.29E-05	2.86E-04
47	0.900	0.480	0.450		3.04E-05	1.04E-04
87	1.000	0.380	0.350		2.10E-05	6.11E-05
174	1.100	0.280	0.250		4.18E-06	9.91E-06
921	1.200	0.180	0.195		1.68E-07	3.32E-07
3600	1.210	0.170				

CMW Geosciences

CLIENT:	Total Project Management
PROJECT:	Home Fire Studio, Malaga Whiteman Park, Malaga
TITLE:	HA02 Falling Head Permeability Test
DESIGNER:	DW
CHECKED:	MO
REVISION:	4
DATE:	9/03/2022
PROJECT:	PER2022-0024

Specifications - Open-Ended Tube

Length L_1:	1.49	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0.13	m

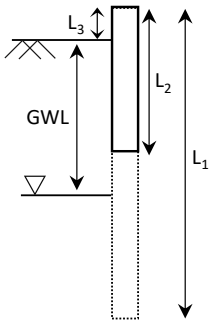
Ground Conditions

GWL: 1.8 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

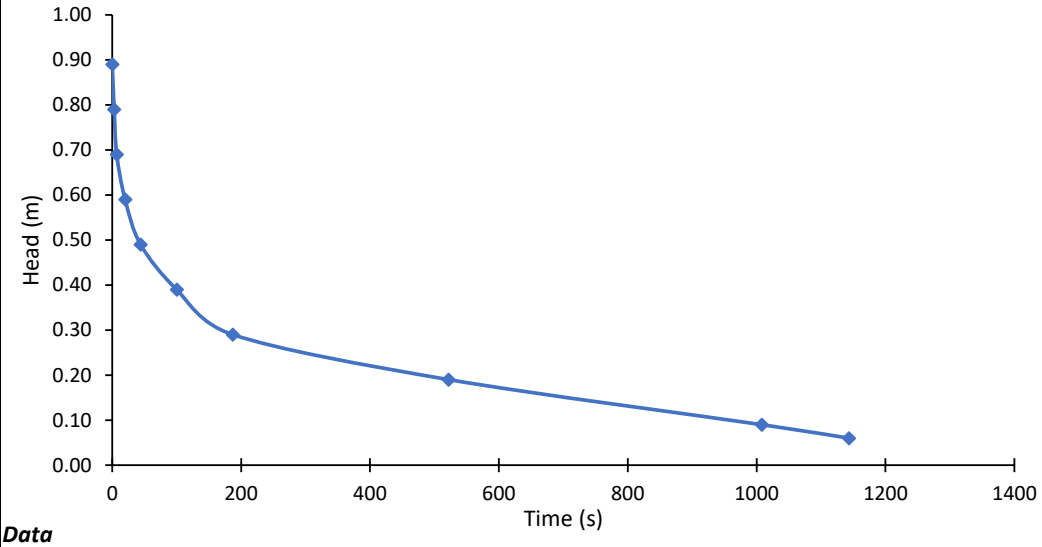
Bottom of Test Hole: 1.36 m BGL



Hydraulic Conductivity (k)

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) . \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 2.16E-04 ms^{-1} = 18.62 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.36m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.600	0.890				
3	0.700	0.790	0.840		1.40E-04	7.39E-04
7	0.800	0.690	0.740		1.30E-04	6.25E-04
20	0.900	0.590	0.640		5.07E-05	2.21E-04
44	1.000	0.490	0.540		3.62E-05	1.40E-04
100	1.100	0.390	0.440		2.15E-05	7.28E-05
187	1.200	0.290	0.340		2.07E-05	5.95E-05
522	1.300	0.190	0.240		9.09E-06	2.13E-05
1008	1.400	0.090	0.140		1.36E-05	2.41E-05
1143	1.430	0.060	0.075		3.08E-05	3.72E-05

CMW Geosciences	CLIENT: **Total Project Management**	DESIGNER:	DW
	PROJECT: **Home Fire Studio, Malaga** **Whiteman Park, Malaga**	CHECKED:	MO
		REVISION:	4
	TITLE: **HA03 Falling Head Permeability Test**	DATE:	9/03/2022
		PROJECT:	PER2022-0024

Specifications - Open-Ended Tube

Length L_1:	1.45	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0.13	m

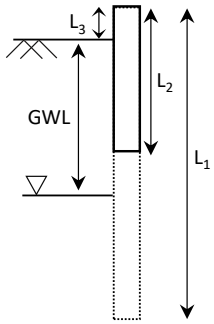
Ground Conditions

GWL: 1.4 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

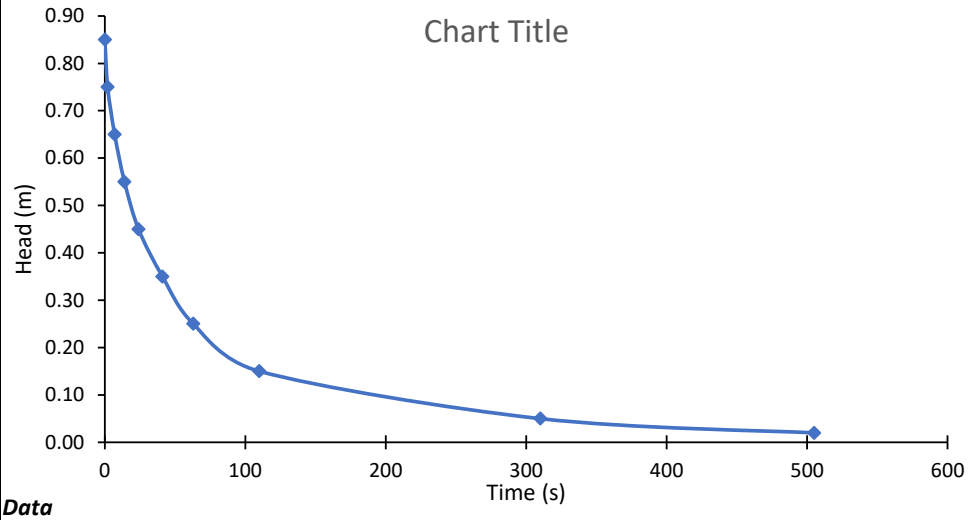
Bottom of Test Hole: 1.32 m BGL



Hydraulic Conductivity (k)

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) . \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 3.68E-04 ms^{-1} = 31.82 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.32m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.600	0.850				
2	0.700	0.750	0.800		2.28E-04	1.16E-03
7	0.800	0.650	0.700		1.14E-04	5.27E-04
14	0.900	0.550	0.600		1.05E-04	4.36E-04
24	1.000	0.450	0.500		9.82E-05	3.62E-04
41	1.100	0.350	0.400		8.22E-05	2.62E-04
63	1.200	0.250	0.300		9.90E-05	2.64E-04
110	1.300	0.150	0.200		8.47E-05	1.79E-04
310	1.400	0.050	0.100		5.33E-05	8.24E-05
505	1.430	0.020	0.035		5.16E-05	4.18E-05

CMW Geosciences	CLIENT: **Total Project Management**	DESIGNER:	DW
	PROJECT: **Home Fire Studio, Malaga** **Whiteman Park, Malaga**	CHECKED:	MO
		REVISION:	4
	TITLE: **HA04 Falling Head Permeability Test**	DATE:	9/03/2022
		PROJECT:	PER2022-0024

Specifications - Open-Ended Tube

Length L_1:	1.45	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0.38	m

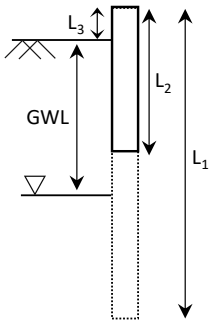
Ground Conditions

GWL: 1.3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

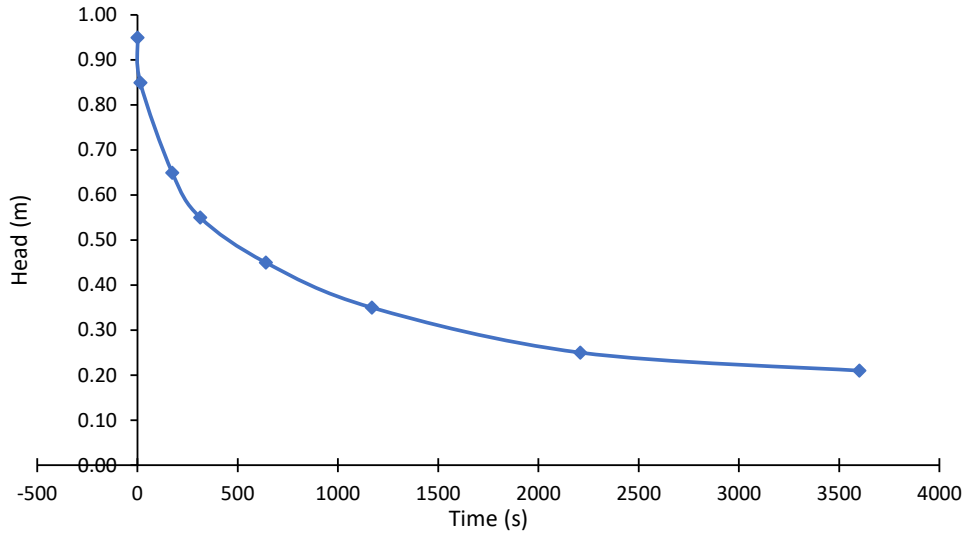
Bottom of Test Hole: 1.07 m BGL



Hydraulic Conductivity (k)

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 3.26E-05 ms^{-1} = 2.82 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.07m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.500	0.950				
14	0.600	0.850	0.900		2.68E-05	1.48E-04
173	0.800	0.650	0.750		6.42E-06	3.14E-05
313	0.900	0.550	0.600		5.23E-06	2.18E-05
640	1.000	0.450	0.500		3.00E-06	1.11E-05
1169	1.100	0.350	0.400		2.64E-06	8.42E-06
2208	1.200	0.250	0.300		2.10E-06	5.59E-06
3600	1.240	0.210	0.230		9.20E-07	2.06E-06

Appendix D
Laboratory Test Results

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

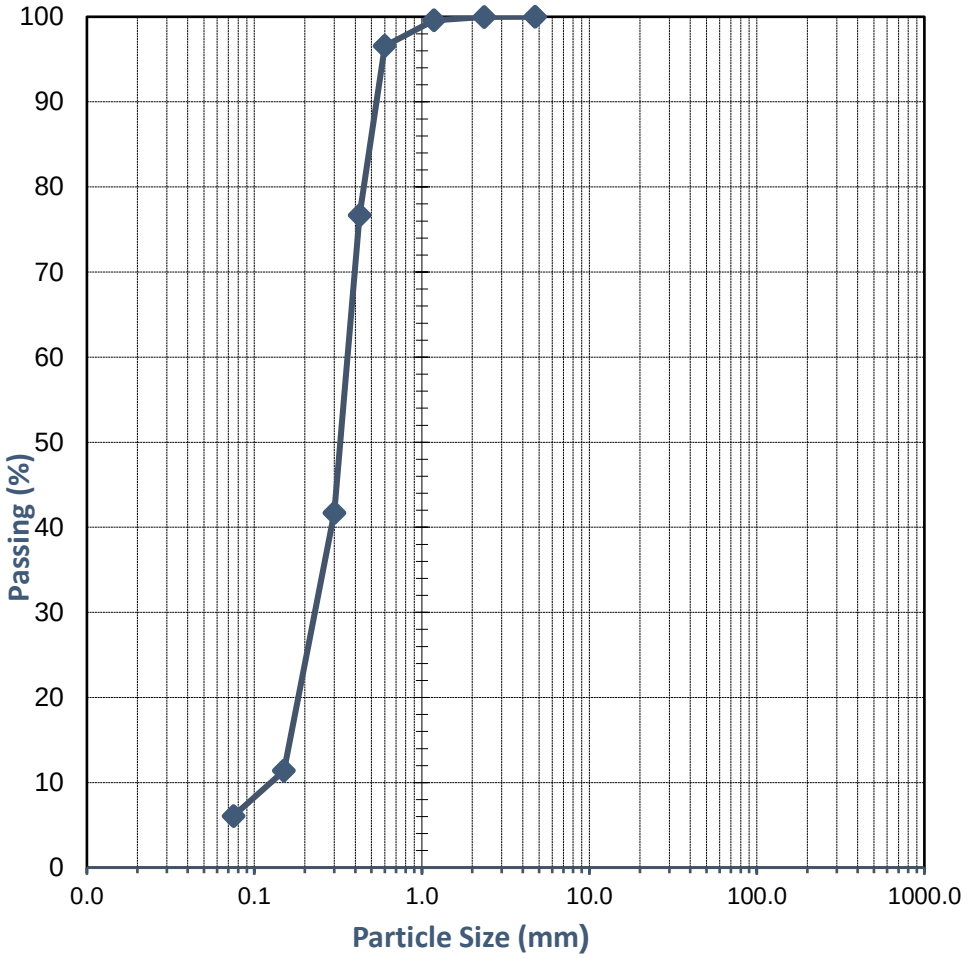
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3972_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3972
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP01 0-0.2M	*Date Tested:*	21/3-22/3/22

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	100
2.36	100
1.18	100
0.600	97
0.425	77
0.300	42
0.150	11
0.075	6



Comments:

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 22/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

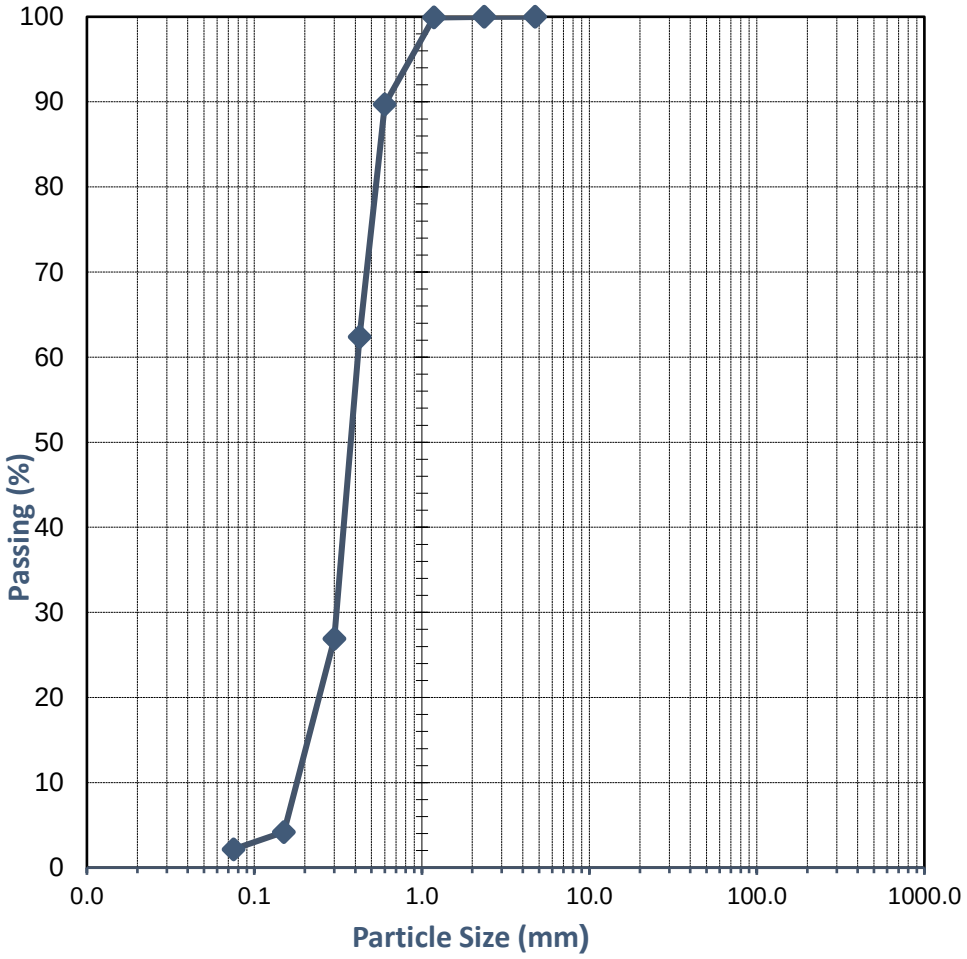
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3973_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3973
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP01 0.6-1m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	100
2.36	100
1.18	100
0.600	90
0.425	62
0.300	27
0.150	4
0.075	2



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

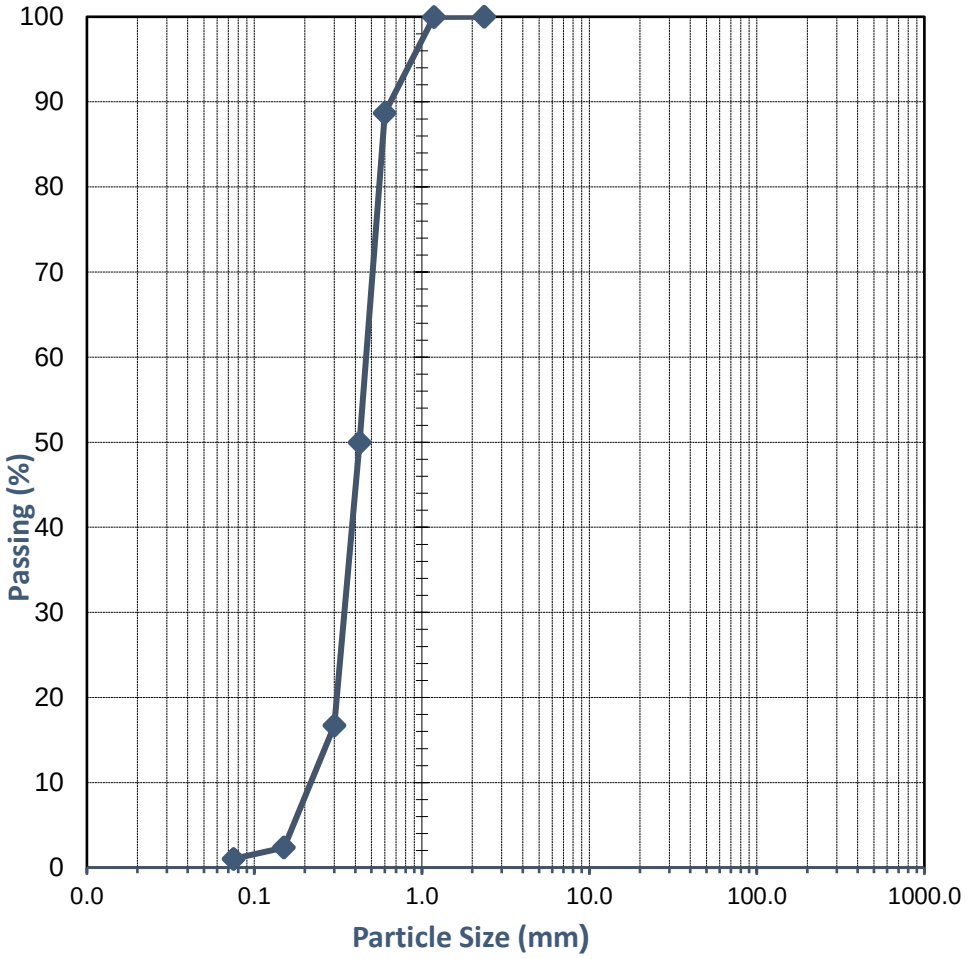
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3974_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3974
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP02 0.5-1m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	
2.36	100
1.18	100
0.600	89
0.425	50
0.300	17
0.150	2
0.075	1



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

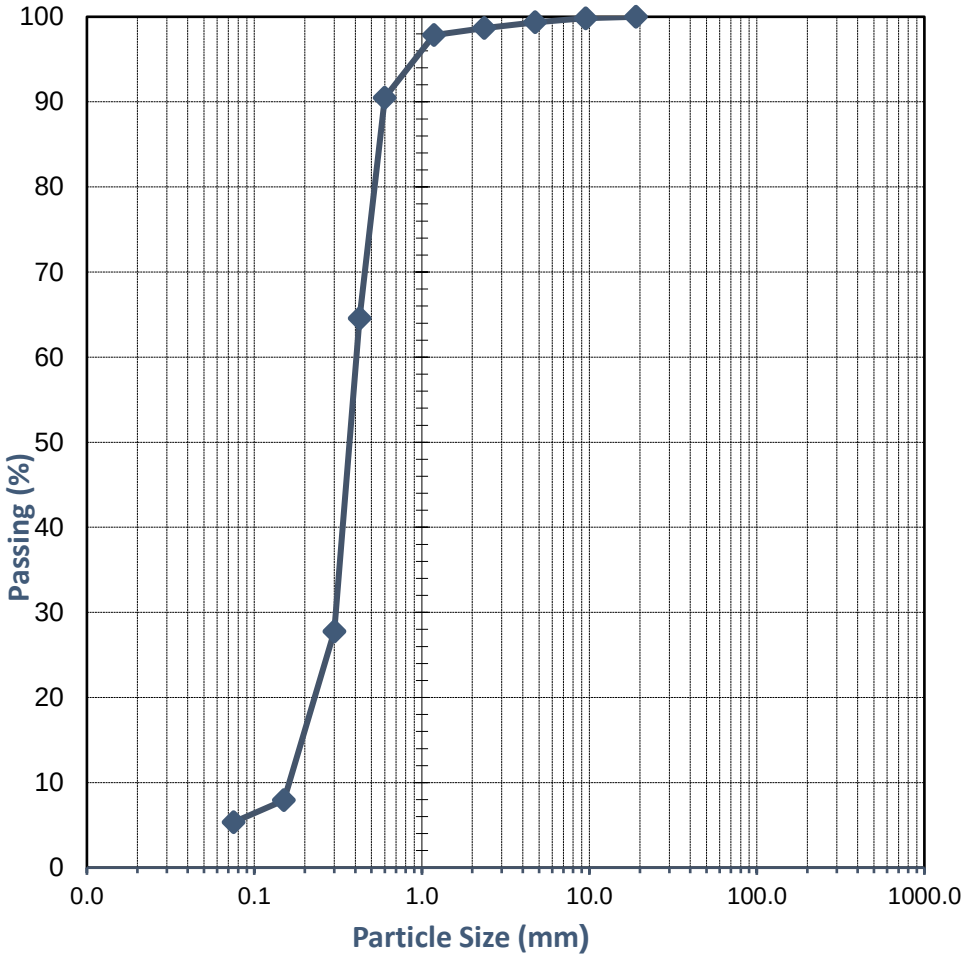
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3975_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3975
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP12 1-1.2m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	100
9.5	100
4.75	99
2.36	99
1.18	98
0.600	91
0.425	65
0.300	28
0.150	8
0.075	5



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

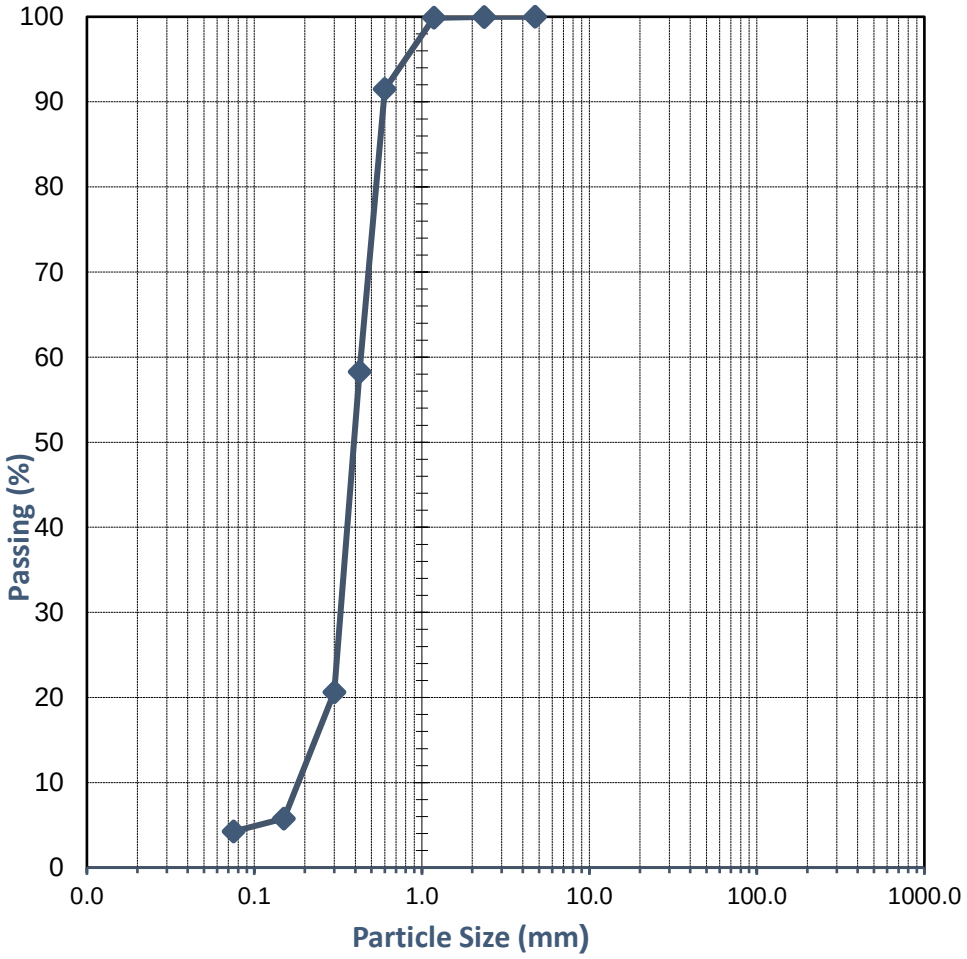
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3976_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3976
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP13 0.2-0.5m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	100
2.36	100
1.18	100
0.600	92
0.425	58
0.300	21
0.150	6
0.075	4



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

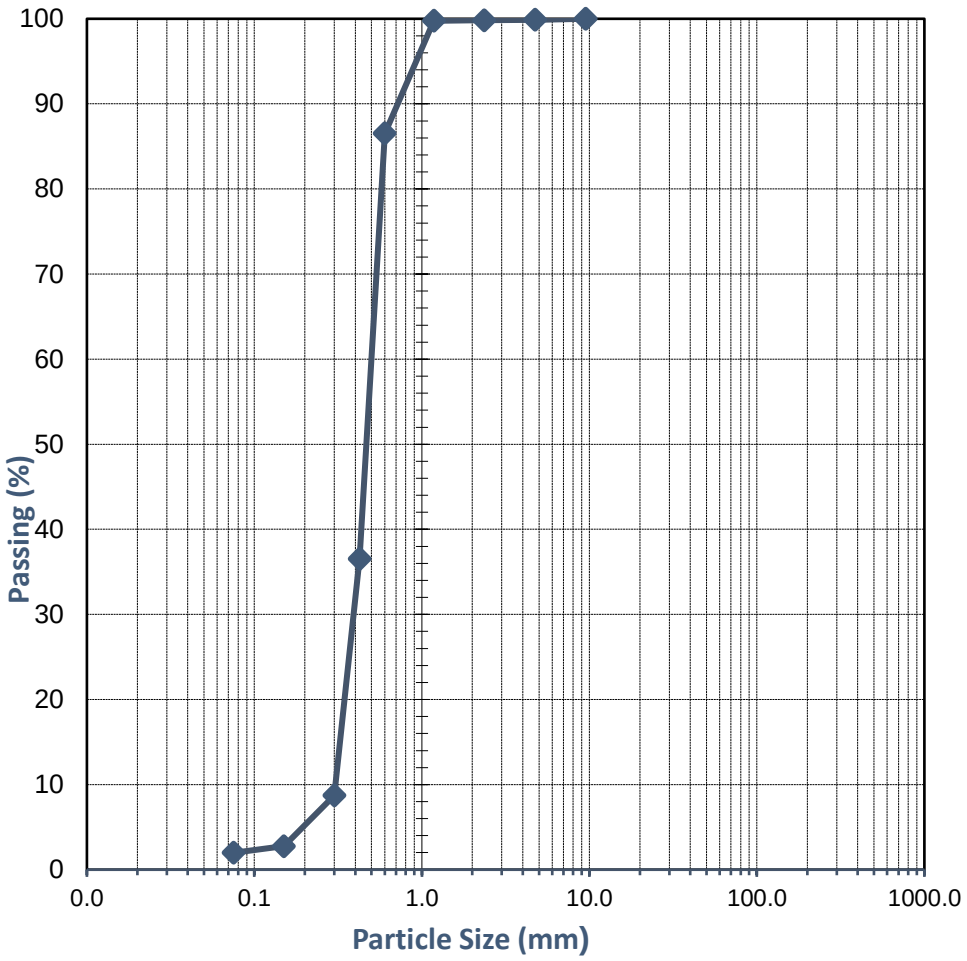
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3977_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3977
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP17 0.2-0.5m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	100
4.75	100
2.36	100
1.18	100
0.600	87
0.425	37
0.300	9
0.150	3
0.075	2



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

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SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - ASTM D2974-14 (Test Method C)

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3972_1_ORG
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3972
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	Various - See Below	*Date Tested:*	21-03-2022

TEST RESULTS - Organic Content

Sampling Method: Sampled by Client, Tested as Received

Testing Completed By: WGLS - JG

Furnace Temperature (°C): 440

Sample Number	Sample Identification	Ash Content (%)	Organic Content (%)
WG22.3972	TP01 0-0.2m	97.0	3.0
WG22.3973	TP01 0.6-1m	82.3	17.7
WG22.3974	TP02 0.5-1m	99.8	0.2
WG22.3975	TP12 1-1.2m	95.7	4.3
WG22.3976	TP13 0.2-0.5m	99.4	0.6
WG22.3977	TP17 0.2-0.5m	98.0	2.0

Comments:

Approved Signatory:

Name: Brooke Elliott

Date: 22-March-2022

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SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3972_1_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3972
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP01 0-0.2m	*Date Tested:*	21-03-2022

TEST RESULTS - Modified Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

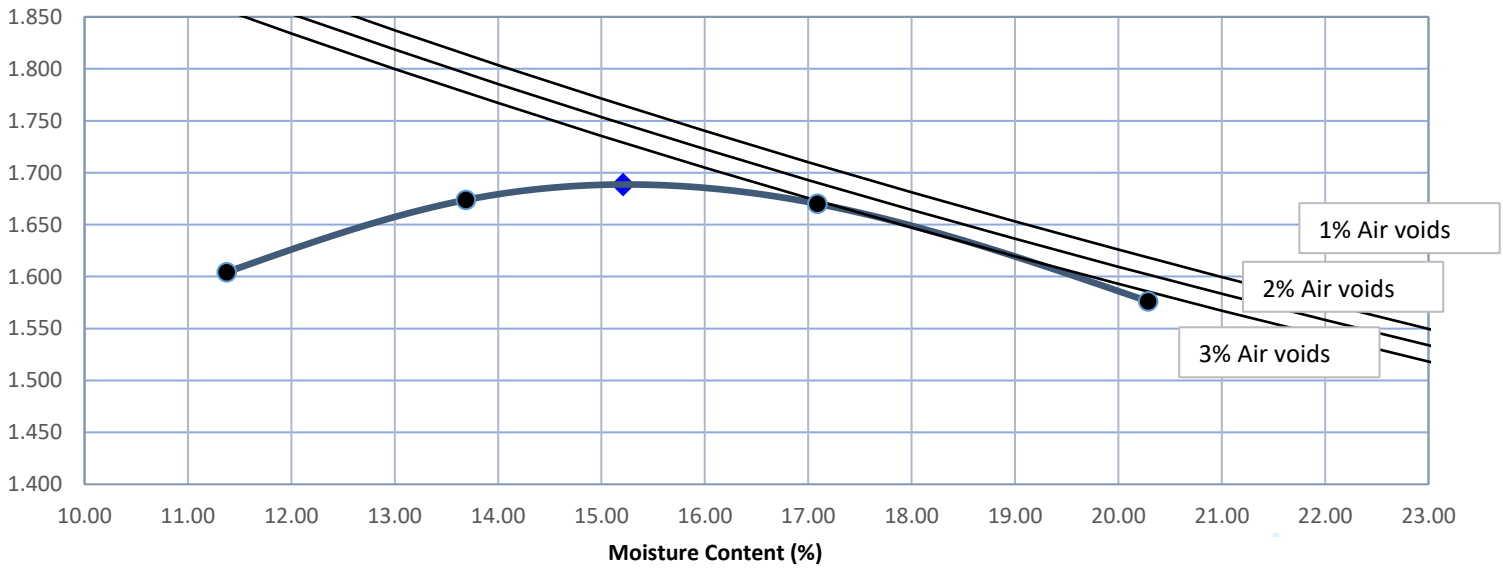
Sample Curing Time: 2 hrs

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	**11.4**	**13.7**	**17.1**	**20.3**	
Dry Density (t/m³)	**1.604**	**1.674**	**1.670**	**1.576**	

Dry Density (t/m³)



Modified Maximum Dry Density (t/m³) **1.69**

Optimum Moisture Content (%) **15.0**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.446 t/m³*

Approved Signatory:

Name: Brooke Elliott

Date: 22-March-2022

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SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3974_1_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3974
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP02 0.5-1m	*Date Tested:*	18/03/2022

TEST RESULTS - Modified Maximum Dry Density

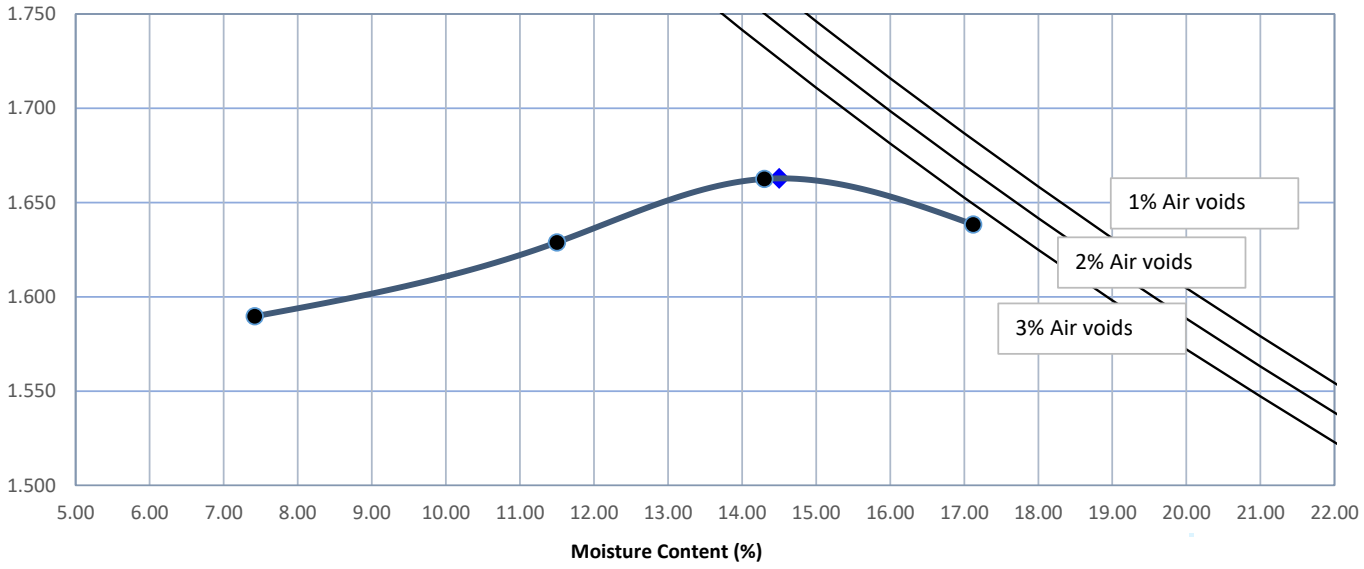
Sampling Method: Sampled by Client, Tested as Received

Sample Curing Time: 2 Hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	7.4	11.5	14.3	17.1	
Dry Density (t/m³)	1.590	1.629	1.663	1.638	



Modified Maximum Dry Density (t/m³) **1.66**

Optimum Moisture Content (%) **14.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.398 t/m³*

Approved Signatory:

Name: Cody O'Neill

Date: 21/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3975_2_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3975
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP12 1.0-1.2m	*Date Tested:*	21/03/2022

TEST RESULTS - Modified Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

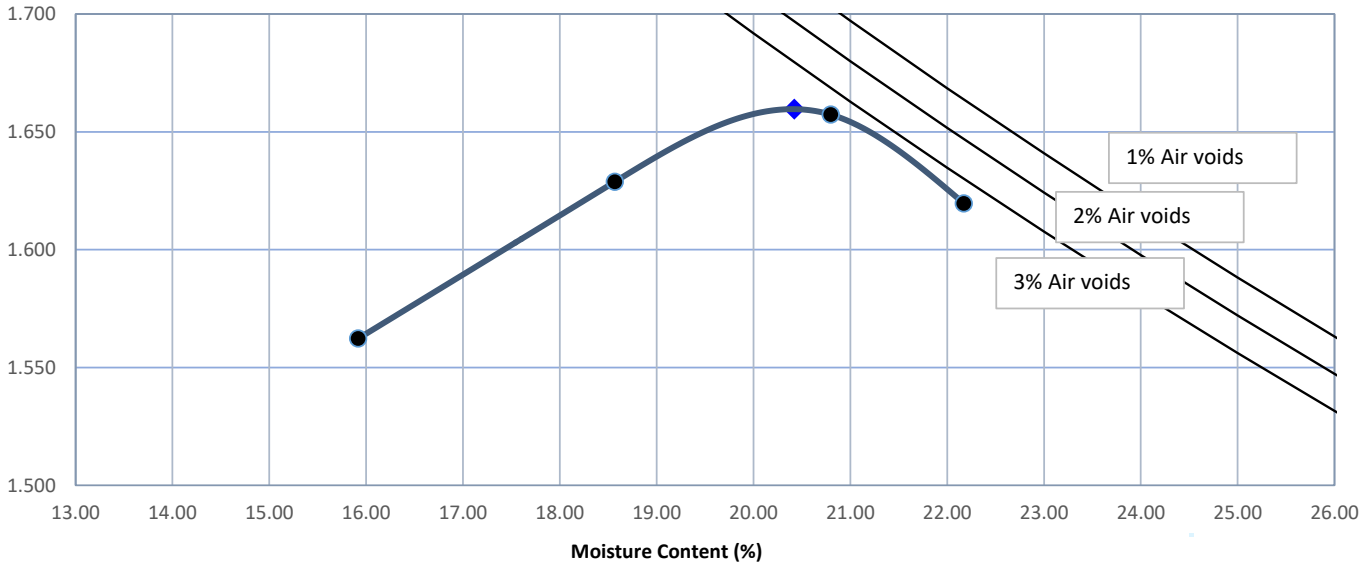
Sample Curing Time: 2 Hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	15.9	18.6	20.8	22.2	
Dry Density (t/m³)	1.562	1.629	1.657	1.620	

Dry Density (t/m³)



Modified Maximum Dry Density (t/m³) **1.66**

Optimum Moisture Content (%) **20.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.678 t/m³*

Report replaces WG22.3975_1_MMDD. Report reissued due to updated sample identification.

Approved Signatory:

Name: Cody O'Neill

Date: 23/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3976_1_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3976
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP13 0.2-0.5m	*Date Tested:*	18/03/2022

TEST RESULTS - Modified Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

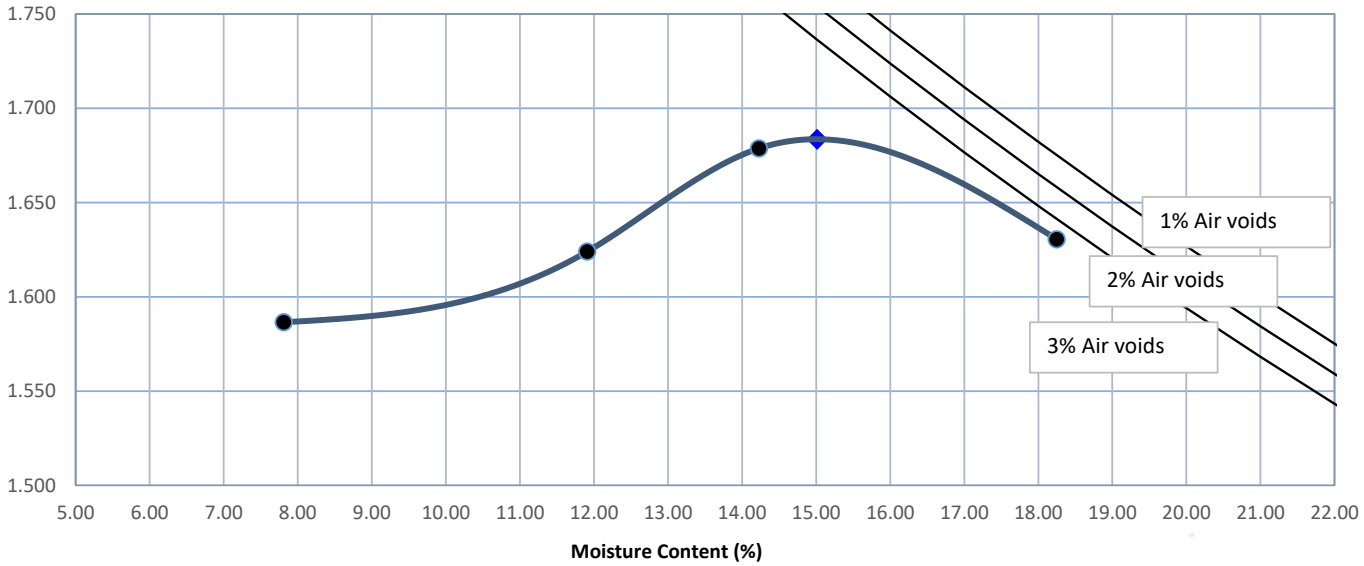
Sample Curing Time: 2 Hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	**7.8**	**11.9**	**14.2**	**18.2**	
Dry Density (t/m³)	**1.586**	**1.624**	**1.679**	**1.631**	

Dry Density (t/m³)



Modified Maximum Dry Density (t/m³) **1.68**

Optimum Moisture Content (%) **15.0**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.448 t/m³*

Approved Signatory:

Name: Cody O'Neill

Date: 21/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3977_1_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3977
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP17 0.2-0.5m	*Date Tested:*	18/03/2022

TEST RESULTS - Modified Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

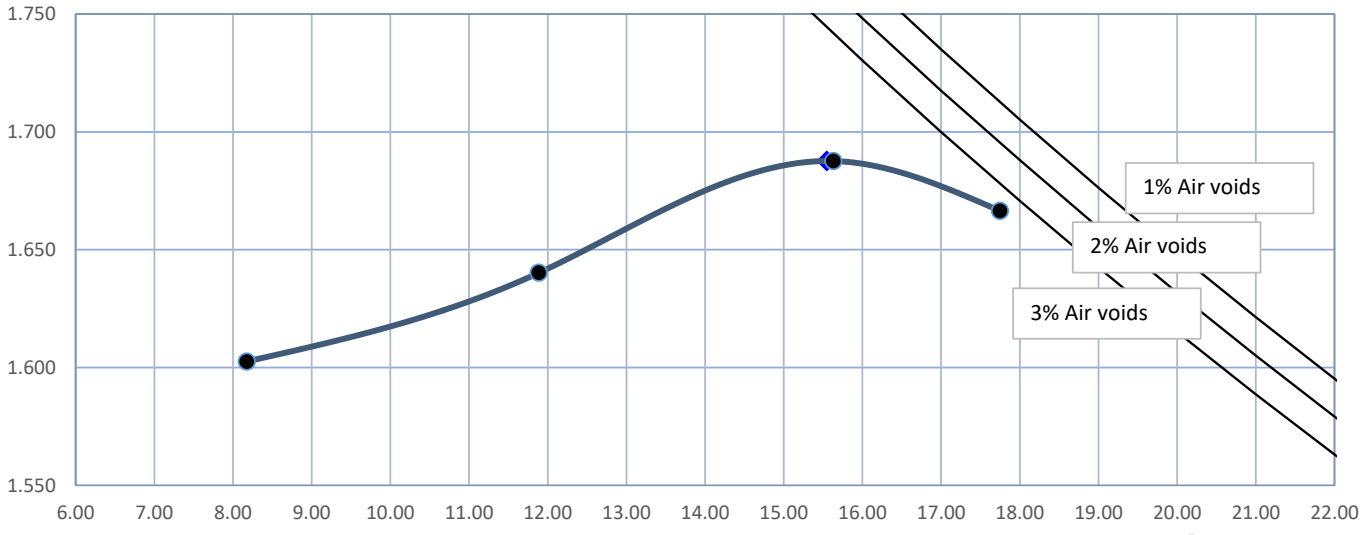
Sample Curing Time: 2 Hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	**8.2**	**11.9**	**15.6**	**17.7**	
Dry Density (t/m³)	**1.603**	**1.640**	**1.688**	**1.666**	

Dry Density (t/m³)



Modified Maximum Dry Density (t/m³) **1.69**

Optimum Moisture Content (%) **15.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.496 t/m³*

Approved Signatory:

Name: Cody O'Neill

Date: 21/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

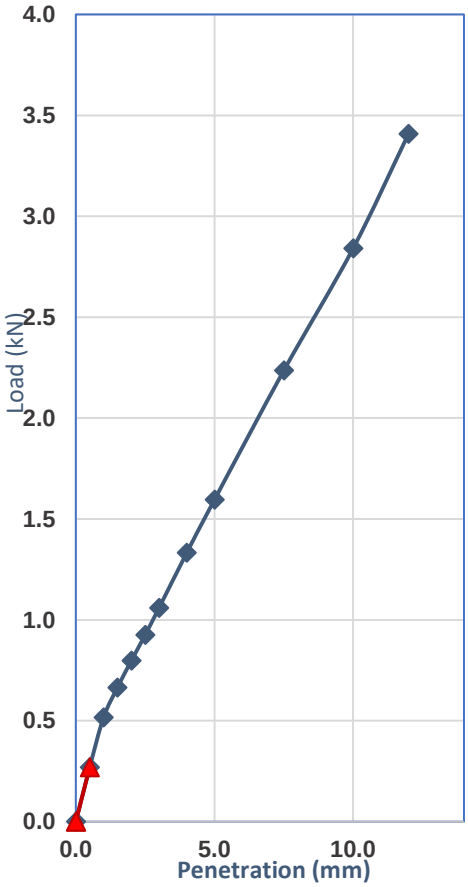
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3972_1_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3972
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP01 0-0.2m	*Date Tested:*	21/3-26/3/222

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	2.0
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.69	Optimum Moisture (%)	15.0
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.61	Moisture Content (%)	15.0
Density Ratio (%)	95.0	Moisture Ratio (%)	98.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.61	Dry Density Ratio (%)	95.0
Moisture Content (%)	19.0	Moisture Ratio (%)	125.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	16.6	Remaining Depth (%)	19.1

Correction applied to Penetration: 0mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 8%

Comments:

Approved Signatory: Coneill

Name: Cody O'Neill

Date: 28/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

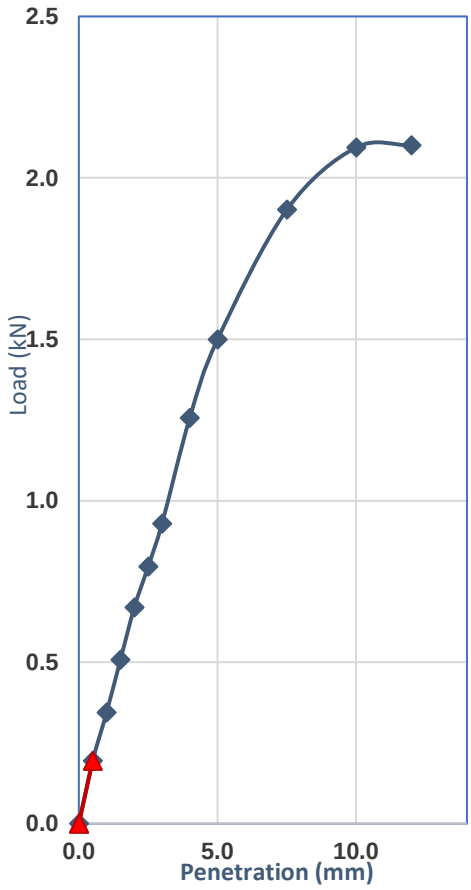
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3974_1_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3974
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP02 0.5-1m	*Date Tested:*	25/03/2022

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	3 hrs
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.66	Optimum Moisture (%)	14.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.58	Moisture Content (%)	14.9
Density Ratio (%)	95.0	Moisture Ratio (%)	102.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.58	Dry Density Ratio (%)	95.0
Moisture Content (%)	18.9	Moisture Ratio (%)	130.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	16.9	Remaining Depth (%)	17.5

Correction applied to Penetration: 0mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 8%

Comments:

Approved Signatory:

Name: Cody O'Neill

Date: 28/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

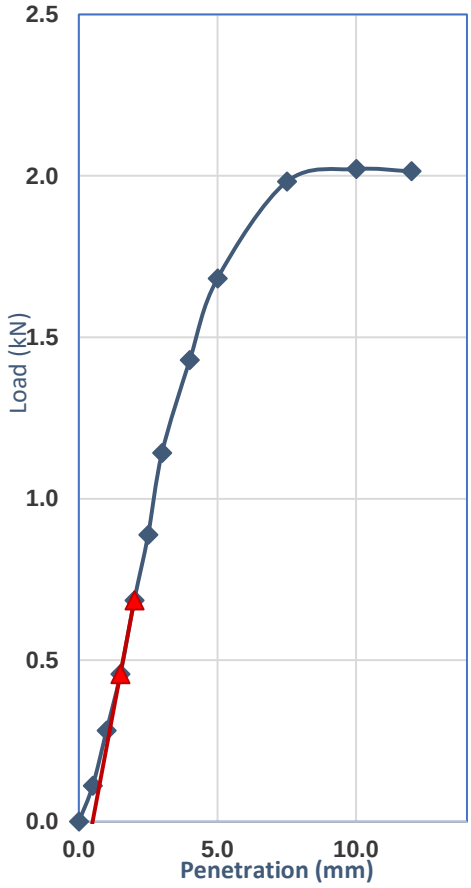
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3975_1_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3975
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP13 0.2-0.5m	*Date Tested:*	21/3-26/3/22

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	2.0
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.66	Optimum Moisture (%)	20.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.58	Moisture Content (%)	20.1
Density Ratio (%)	95.5	Moisture Ratio (%)	98.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.58	Dry Density Ratio (%)	95.5
Moisture Content (%)	23.9	Moisture Ratio (%)	117.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	22.4	Remaining Depth (%)	23.3

Correction applied to Penetration: 0.5mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 9%

Comments:

Approved Signatory:

Name: Cody O'Neill

Date: 28/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

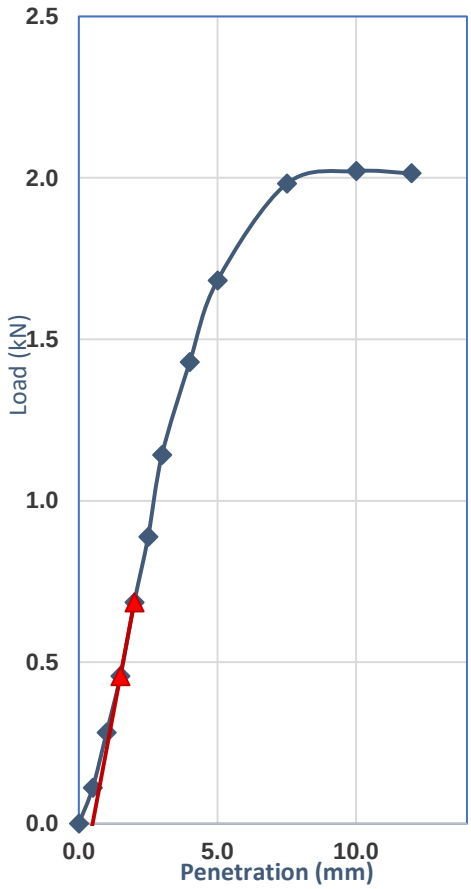
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3975_2_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3975
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP12 1.0-1.2m	*Date Tested:*	21/3-26/3/22

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	2.0
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.66	Optimum Moisture (%)	20.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.58	Moisture Content (%)	20.1
Density Ratio (%)	95.5	Moisture Ratio (%)	98.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.58	Dry Density Ratio (%)	95.5
Moisture Content (%)	23.9	Moisture Ratio (%)	117.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	22.4	Remaining Depth (%)	23.3

Correction applied to Penetration: 0.5mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 9%

Comments: Report replaces WG22.3975_1_SCBR. Report reissued due to updated sample identification.

Approved Signatory:

Name: Cody O'Neill

Date: 28/March/2022

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Accreditation No. 20599

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

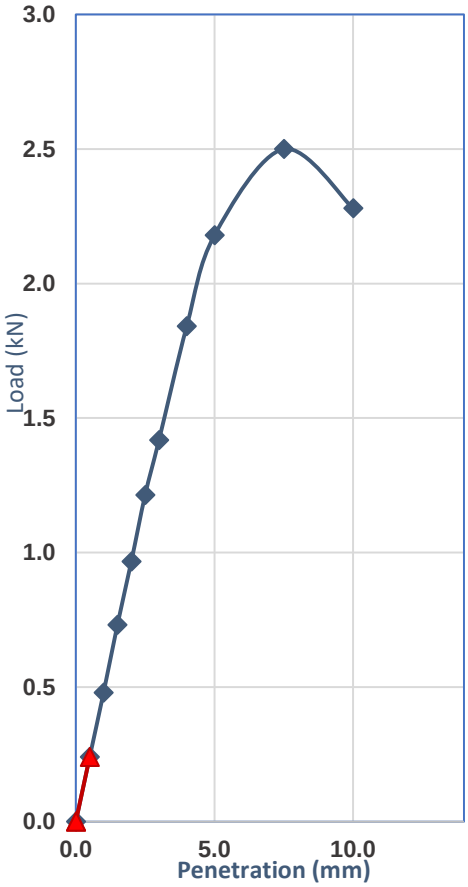
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3977_1_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3977
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP17 0.2-0.5m	*Date Tested:*	18/3-25/3/22

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	3.5 hrs
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.69	Optimum Moisture (%)	15.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.60	Moisture Content (%)	15.8
Density Ratio (%)	95.0	Moisture Ratio (%)	102.0

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.60	Dry Density Ratio (%)	95.0
Moisture Content (%)	18.3	Moisture Ratio (%)	118.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	16.4	Remaining Depth (%)	17.9

Correction applied to Penetration: 0mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 11%

Comments:

Approved Signatory:

Name: Cody O'Neill

Date: 28/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

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Appendix C – Geotechnical Report – CMW June 2022

13 April 2022

PROPOSED BUILDING DEVELOPMENT
HOME FIRE STUDIO, MALAGA.

GEOTECHNICAL INVESTIGATION REPORT

Home Fire Creative Industries Pty Ltd c/- Hesperia

PER2022-0024AC Rev 1

PER2022-0024AC		
Date	Revision	Comments
31 March 2022	0	Geotechnical Investigation Report
13 April 2022	1	Revised based on Hydrologist's comments

Table of Contents

Figure

Appendices

1 INTRODUCTION

CMW Geosciences Pty Ltd (CMW) was authorised by Edward Neville of Total Project Management c/- Home Fire Creative Industries Pty Ltd by way of a Letter of Engagement dated 02 March 2022 to undertake a geotechnical desktop study and subsequent field investigation for a proposed Home Fire Film Studio - Stage 3AA located at Malaga, WA.

The scope of work is outlined in our Cost Time and Resource Schedule (CTR), referenced *PER2022-0024AA Rev 1.*

The purpose of this report is to describe the investigation completed, the ground conditions encountered and to provide recommendations with respect to geotechnical aspects of the proposed Home Fire Studio development including potential geotechnical risks, site preparation, excavatability, foundation design parameters, site classification and permeability characteristics, as detailed in our proposal letter.

2 DESKTOP STUDY

2.1 Site Description, Topography & History

From the plans provided, we understand the site is situated at the southern boundary of Whiteman Park, north of Marshall Road and east of Beechboro Road North at the intersection of Tonkin Highway and Reid Highway. The expansion of the Morley to Ellenbrook rail network will run to the north of the site and the new Malaga Station being built adjacent to the home fire site.

The 61 ha proposed site is gently sloping towards the south from approximately RL 23m AHD along the eastern boundary to approximately RL 29m AHD along the western boundary. The topography is undulating in areas with some lower-lying flood plains characteristic of paleochannels within the area where surface levels decrease.

Historical aerial photographs of the area indicate the site has been used for agricultural purposes with the first development occurring prior to 1965 comprising the construction of a shed with a second development occurring prior to 1970. Sometime between 1995 and 2000 the second development was demolished with the first being removed sometime after January 2022.

2.2 Proposed Development

The 61 ha site proposed for the Home Fire Studio development consists of two Phases: Phase 1, a 19 ha area which will comprise 4 x 1,850m^2 sound stages, a 3,500m^2 workshop, 500 car bays, 20,000 m^2 backlot and 2,750m^2 of offices.

Phase 2 is 42 ha and will be a future expansion site of the original film studio (Phase 1). We have not been provided with plans for this phase of the development.

2.3 Geology

The published geology map – Perth, 1:50,000 Scale, Environmental Geology Series, Western Australian Geological Survey, sheet 2034 II and part of 2034 III and 2134 III – shows the site to be underlain by:

(S_8) Bassendean Sand described as very light grey at surface, yellow at depth, fine to medium grained, subrounded quartz, moderately well sorted of aeolian origin; and,

(Mgs_1) Pebbly silt of the Guildford formation described as strong brown silt with common, fine to occasionally coarse grained, subrounded laterite quartz, heavily weathered granite pebble, some fine to medium grained quartz sand, of alluvial origin.

Based on the known history of the site and surrounding land levels, some superficial depths of fill could be anticipated as a result of previous developments on the site.

2.4 Hydrogeology and Hydrology

The Department of Environment's Perth Groundwater Atlas, Second Edition, indicates that historical minimum and maximum recorded groundwater levels beneath the site to be between approximately RL 23m AHD and RL 30m AHD, which equates to an approximate depth of between <1m and 2m below existing ground levels.

Expressions of groundwater were observed on site as small ponds across the site, indicating the close proximity of the water to the existing surface. Bennet Brook is also present to the east of the site running in a north south direction.

Recent ground monitoring report (Home Fire Studio Precinct Malaga Hydrological Due Diligence, Document No. H22002Av1, dated 25 March 2022) also shows the ground water levels range from between from 27.5 m AHD in the west of the site to 23.5 m AHD along its eastern boundary (see Appendix E).

2.5 Acid Sulphate Soils

Based on the published acid sulphate soils map from the Australian Government National Map part of the site closest to the boundary of the proposed site has a low to moderate risk of ASS occurring within 3m of natural soil surface (or deeper) occurring on site. For the central portion of the site there is no known risk.

3 EXISTING GEOTECHNICAL DATA

A series of hand auger boreholes were drilled along the Morley to Ellenbrook rail alignment along the northern boundary of the Phase 2 area. A total of 3 investigation locations denoted P3-HA32, P3-HA33 and P3-HA34 spaced relatively equidistant along the rail alignment were completed as part of a previous investigation.

The investigation locations are shown in Table 1 below together with a summary of the encountered ground conditions and the depth to groundwater recorded in the relevant hand auger borehole.

Table 1: Summary of Previous Investigation Locations

Location ID	Refusal depth (mbgl)	Ground Conditions Encountered in the Borehole at Surface	Depth to Groundwater Encountered in the Borehole (mbgl)
P3-HA32	1.8	**Bassendean Sand:** described as SAND (SP): loose, fine to medium grained, rounded to sub-rounded, quartz, grey speckled black, trace/with organic silt (aeolian).	0.9
P3-HA33	1.7		0.9
P3-HA34	1.7		1.05

4 CURRENT FIELD INVESTIGATION

Following a dial before you dig search, and onsite service location, the field investigation was carried out between 8th and 9th March 2022. All fieldwork was carried out under the direction of CMW Geosciences Pty Ltd in general accordance with AS1726 (2017), Geotechnical Site Investigations. The scope of fieldwork completed was as follows:

- A walkover survey of the site to assess the general landform and site conditions and adjacent structures;
- 20 test pits, denoted TP01 to TP20, were excavated using a JCB 8.5 tonne backhoe fitted with a 300mm wide toothed bucket to a target depth of up to 3m, or prior refusal, below existing ground levels to investigate the underlying ground conditions, excavatability and the possible presence of uncontrolled fill. Representative bulk samples were collected for subsequent laboratory testing. Engineering logs of the test pits and associated photographs are presented in Appendix A;
- Perth Sand Penetrometer (PSP) tests were carried out adjacent to each test pit location in general accordance with AS1289. 6.3.3, to depths of up to 2.1m, or prior refusal, to provide soil density/consistency of the subsurface conditions within the zone of influence of shallow foundations. Graphical results of the PSP plots are presented on the test pit logs in Appendix A;
- 8 Electric Friction Cone Penetrometer Tests (CPTu's), denoted CPT01 to CPT08, were advanced to a maximum investigation depth of 15m, using CPT equipment fitted to a 22-tonne Mercedes trucked rig to assess the deeper soil profile beneath the site. CPTu's were split evenly to target both Phase 1 and Phase 2 areas of the development. CPT plots prepared by the subcontractor (CPTWest) are presented in Appendix B;
- Four hand auger boreholes, denoted HA01 to HA04, were drilled to a depth of 1.5m below existing ground levels to facilitate in-situ permeability testing. Results of the permeability test are presented in Appendix C.

The approximate locations of the respective investigation sites referred to above are shown on the attached Site Investigation Plan (Figure No. 1). Where possible, surface elevations were taken from a feature survey plan conducted by MNG Locate 16 March 2022. Test locations were chosen by CMW to provide adequate coverage of the site and to ensure representative soil samples could be taken for laboratory testing. Test locations were measured using a hand-held GPS to an accuracy of ±5m.

5 LABORATORY TESTING

Laboratory testing was carried out generally in accordance with the requirements of the current edition of AS1289 (where applicable). Where a test was not covered by an Australian standard, a local or international standard was adopted and noted on the laboratory test certificate.

All testing was scheduled by CMW and carried out by Western Geotechnical and Laboratory Services, a NATA registered Testing Authority.

A summary of the number and type of laboratory tests conducted, and the test method followed is presented in Table 2 below.

Table 2: Laboratory Test Schedule Summary

Type of Test	Test Method	Quantity
Particle Size Distribution	AS1289.3.6.1	6
Organic Content	ASTM D 2974-14	6
Modified Compaction	AS1289.5.2.1	5
California Bearing Ratio (soaked)	AS 1289.6.1.1	5

6 GROUND MODEL

6.1 Subsurface Conditions

The ground conditions encountered and inferred from the test pit and CPT investigation were considered to be generally consistent with the published geology for the area and can be generalised according to the following subsurface sequence:

TOPSOIL: SILTY SAND	loose to medium dense, fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics., overlying;
SAND (SP)	loose to very dense, fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).

The distribution of these units is summarised in Table 3.

Table 3: Summary of Encountered Soil Stratigraphy

Description	Depth to base of layer (m BGL)			Depth to base of layer (m AHD) *	
	Minimum	Maximum	Average	Minimum	Maximum
FILL: SILTY SAND	0.15	0.15	0.15	28.5	24.25
SAND (SP)	>15.0**			>8.5	

Note:

* m AHD based on average surface elevation across the site from the feature survey plan.

** Base of SAND not encountered during the investigation.

Note: Uncontrolled fill was not encountered within any of the test pit locations however it may still be present in the locations where the previous agricultural developments have been cleared. We have not been provided with any engineering completion reports that deems the material in these areas to be engineered fill.

6.2 Groundwater

A review of the Perth Groundwater Atlas suggests that maximum historical ground water levels range from between 23.5 and 30m AHD a cross the site. Based on the current Hydro Monitoring and Assessment Report (Home Fire Studio Precinct Malaga Hydrological Due Diligence, Document No. H22002Av1, dated 25 March 2022), the refined ground water levels range from between from 27.5 m AHD in the west of the site to 23.5 m AHD along its eastern boundary. This equates to between 0.5 and 1.5m BGL.

During the investigation, which was completed in early autumn conditions (March 2022), groundwater was encountered within 14 of the test pits and all CPTu locations. A summary of the encountered groundwater levels is presented in Table 4 below.

Table 4: Summary of Encountered Groundwater Levels					
Location ID	**Easting**	**Northing**	**Surface Elevation (m AHD)**	**Groundwater (mbgl)**	**Groundwater Elevation (m AHD)**
CPTu 1	398741.06	6475185.78	26.57	1.0	25.57
CPTu 2	399072.34	6475158.45	24.34	1.21	23.13
CPTu 3	399083.51	6475356.71	23.89	0.89	23.0
CPTu 4	398744.39	6475350.84	27.11	1.29	25.82
CPTu 5	398464.41	6475458.18	27.90	1.4	26.0
CPTu 6	398607.91	6475850.53	27.35	1.5	25.85
CPTu 7	399030.4	6475856.67	23.54	1.0	22.54
CPTu 8	398994.83	6475545.68	25.01	1.5	23.51
TP01	398927	6475096	25.00	1.4	23.6
TP03	398669	6475305	27.00	2.0	25.0
TP04	398873	6475256	26.00	0.8	25.2
TP06	398893	6475403	25.20	1.5	23.7
TP07	399115	6475486	24.40	1.8	22.6
TP09	398925	6475690	-	1.3	-
TP10	398799	6475878	-	1.4	--
TP11	398760	6475785	-	1.3	
TP12	398600	6475734	-	0.8	-
TP14	398408	6475676	-	1.6	-
TP16	398570	6475577	-	1.3	-
TP17	398728	6475473	27.00	1.7	25.3
TP18	398790	6475603	-	1.6	-
TP20	399106	6475827	-	1.0	-
Note: mbgl = meters below ground level.					

6.3 Permeability

The results of the in-situ falling head infiltration tests carried out were used to estimate the soil coefficient of permeability in accordance with the methods described in CIRIA Report No. 113 (falling head test).

Table 5 summarises the results obtained. The test certificate is attached in Appendix C.

Table 5: Summary of Infiltration Tests

Standpipe ID	Screen Depth (m bgl)	Screened Formation	Test Method	Approximate Infiltration Rate	
				(m/sec)	(m/day)
HA01	0 to 1.5	Slotted	Falling Head	2.12*10-04	18 to 19
HA02	0 to 1.5	Slotted	Falling Head	2.16*10-04	18 to 19
HA03	0 to 1.5	Slotted	Falling Head	3.68*10-04	31 to 32
HA04	0 to 1.5	Slotted	Falling Head	3.26*10-05	2 to 3

Note: The infiltration rate of HA04 was much lower than the other three permeability tests likely due to the high groundwater table at this location (1.3 mbgl).

7 LABORATORY TEST RESULTS

A summary of the geotechnical laboratory test results undertaken by CMW are presented in Table 6 below.

Table 6: Summary of Laboratory Tests Results

Location ID	TP01 0.0 – 0.2m	TP01 0.6 – 1.0m	TP02 0.5 – 1.0m	TP12 1.0 – 1.2m	TP13 0.2 – 0.5m	TP17 0.2 – 0.5m
Gravel, %	0	0	0	0	0	0
Sand, %	96	98	99	95	96	98
Fines, %	4	2	1	5	4	2
OC, %	3	17.7	0.2	4.3	0.6	2.0
MMDD, t/m^3	1.69	-	1.66	1.66	1.68	1.69
OMC, %	15	-	14.5	20.5	15.0	15.0
CBR, %	8	-	8	9	10	11

Note: Gravel, Sand and Fines percentages are by weight, OC = Organic Content, OMC = Optimum Moisture Content, MMDD = Modified Maximum Dry Density, CBR = California Bearing Ratio.

A copy of the laboratory test certificates is provided in Appendix D.

8 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

8.1 Groundwater

Shallow groundwater is present across the entirety of the proposed development site. This will present a risk to both permanent and temporary works including excavation, bearing capacity of footings and construction/excavation issues with the potential need for dewatering.

For the purposes of preliminary design in this report, a design groundwater level of between 0.5 m and 1.5m below ground level in line with the refined groundwater level (by hyd_20, 2022) should be adopted as shown in Figure 2.

A further hydrogeological assessment may be required if the groundwater levels become critical to the design.

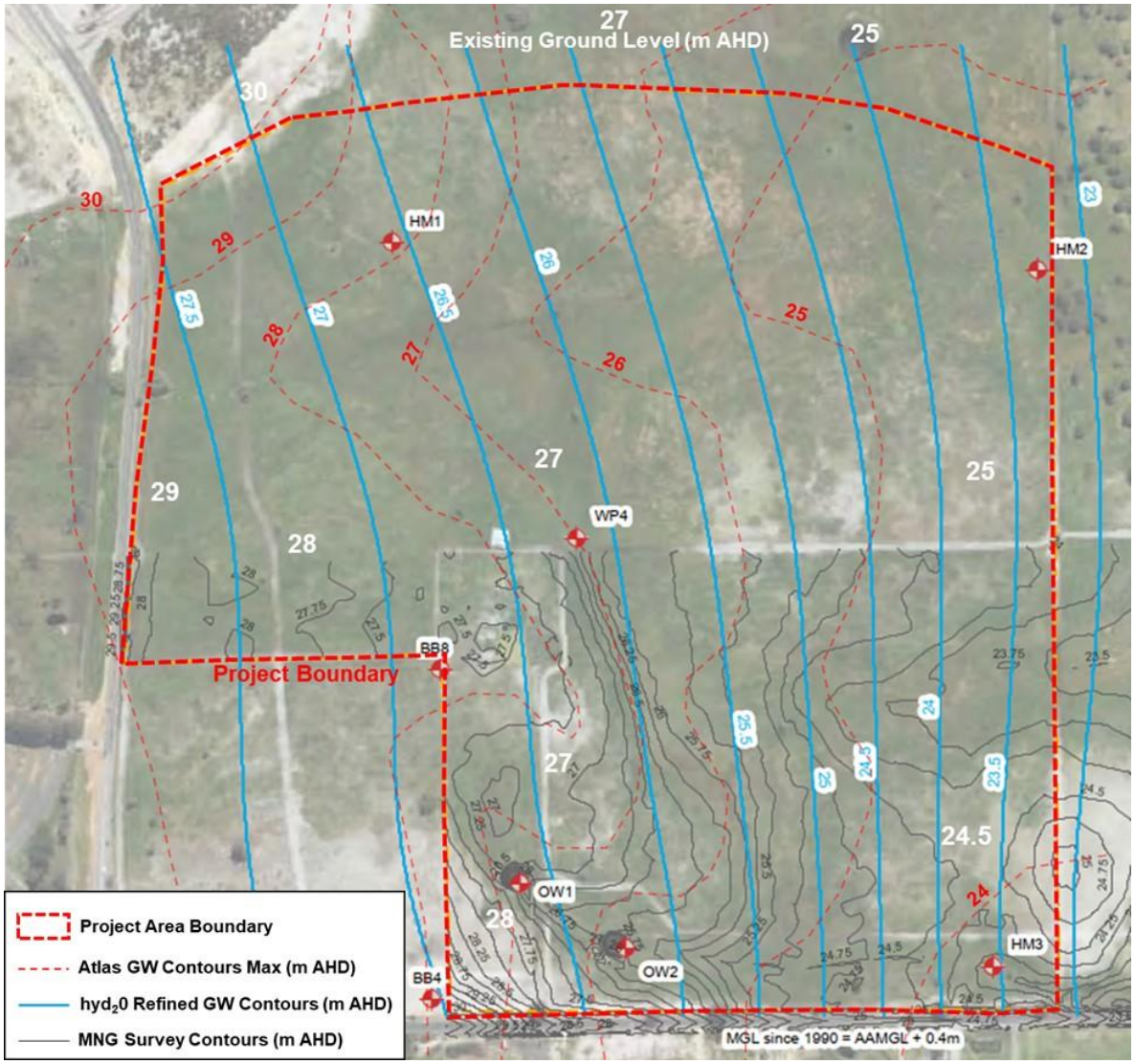


Figure 2: Groundwater contours compared with surface elevation

Figure 2 illustrates the maximum ground water contours indicated in red taken from the Perth Ground water atlas. The measurements are in elevation m AHD. Ground level elevations are indicated by the white numbers. Figure 2 shows that maximum groundwater levels are within 1m of ground level in across the site and reach ground level in places.

The civil design will need to take into account the close proximity of the groundwater and the potential difficulties infiltrating groundwater and impact of the civil design on the groundwater regime.

8.2 Retention Systems

We understand that retaining walls may be required as part of the development.

Design parameters for permanent and temporary retaining walls are summarised in Table 7.

Table 7: Retaining Wall Design Parameters

Soil Unit	Ɣ (kN/m^3)	Ø' (deg)	K_0	E' (MPa)	No wall friction		Wall friction = 2/3Ø	
					K_a	K_p	K_a	K_p
ENGINEERED FILL	18	34	0.441	40	0.283	3.537	0.254	8.952
SAND (loose to medium dense)	18	32	0.470	30	0.310	3.250	0. 310	3.320
SAND (medium dense to dense)	18	34	0.441	40	0.283	3.537	0.254	8.952

Notes:
1. Refer to Table 3 for definition of soil unit levels.
2. Ɣ – soil unit weight; Ø' - angle of internal soil friction; K_0 - coefficient of earth pressure at rest, K_a - coefficient of active earth pressure, K_p - coefficient of passive earth pressure; E' – long term Young's modulus.
3. Values of K_0 are based on initial conditions following construction of the walls.
4. The retaining wall designer must adopt the above set of K_a and K_p parameters relevant to the actual construction method adopted.
5. The above parameters are based on the condition of a horizontal ground surface behind the retaining structure. Applicable surcharge loads behind the wall must also be considered in the design.

Retaining structures should be designed in accordance with AS 4678-2002 "*Earth Retaining Structures*" or an alternate approved factor of safety approach. Should any fill be placed against the permanent basement retaining wall after construction, it is expected that the compaction induced pressures will be much greater than the above active earth pressures. The compaction equipment used to compact backfill behind the wall must be carefully selected and preferably light-weight compaction equipment should be used. The load on the retaining wall due to compaction equipment may be estimated from Figure J5 in AS4678-2002 *"Earth Retaining Structures"*.

It is noted that some ground movement will occur behind temporary or permanent retaining walls. By definition, movement of the wall must occur to fully mobilise the active and passive earth pressure coefficients provided in Table 7 above. The extent of this movement is dependent on the height of retaining wall, type of wall selected and construction methodology. This must be considered during the design and construction of the retaining walls to ensure adjacent facilities are not adversely affected.

Any ground anchors associated with retaining wall construction should be designed based on the above effective stress soil parameters and using appropriate design standards such as BS8081.

8.3 Earthworks

Recommendations associated with this work are summarised as follows:

- Where present below design subgrade levels, any topsoil or otherwise unsuitable material must be removed and cut to waste. This material will need to be removed or remediated (i.e. proof compacted) prior to construction as per the following recommendations;
- Excavations to design subgrade levels are expected to encounter predominantly loose to medium dense Bassendean Sand that should be readily excavated using conventional earthmoving plant and that most of the material excavated will be disposed of off-site or, alternatively, be available for re-use on site as engineered fill;
- Any uncontrolled fill material remaining beneath floor slabs or footings shall be excavated, screened to remove oversize (>100mm) and recompacted to achieve at least 7 blows per 300mm penetration with a PSP excluding the top 150mm, which is generally equivalent to a dry density ratio of at least 95% based on Modified Compaction (AS1289 5.2.1). Any loose, weak, cohesive or organic materials observed during this proof roll shall be removed and replaced with compacted clean fill.
- At the completion of any excavation to design levels, including foundation excavations, the upper 300mm of the exposed subgrade must be moisture conditioned and compacted to achieve at least 7 blows per 300mm penetration with a PSP excluding the top 150mm, which is equivalent to a dry density ratio of at least 95% based on Modified Compaction (AS1289 5.2.1). Any loose, weak, cohesive or organic materials observed during this proof roll shall be removed and replaced with compacted clean fill;
- Any fill material should comprise clean granular material with <10% fines content and maximum particle size of 100mm. It must be moisture conditioned with a water cart and compacted in layers not exceeding 300mm to achieve at least 7 blows per 300mm penetration with a PSP. The onsite sand material meets this requirement, subject to screening for oversize;
- Any temporary cut batters in natural sand may be excavated to a gradient of up to 1V:1.5H (approximately 34 degrees);
- The sandy nature of the site soils means that they will dry quickly where exposed which will lead to significant rutting under construction vehicle loads. Therefore, across the building platform, consideration to the placement of a 150 mm thick blinding layer of crushed limestone gravel or similar should be made following sand subgrade compaction.
- Excavations may require local dewatering to lower groundwater and to achieve compaction levels identified above.

The technical and control requirements for Engineered Fill, including site observation and compaction testing, are outlined in AS3798. We recommend that this work is completed under the direction and control of a suitably experienced Geotechnical Engineer familiar with the contents of this report. CMW would be pleased to perform this function if required.

8.4 Strip Foundations

The design of available foundation bearing pressures for isolated strip footings at this site has been carried out using the Terzaghi bearing capacity equation. Subject to completing the earthworks and foundation preparation recommendations provided herein, shallow strip or pad footings founded within medium dense sand may be designed on the basis of the maximum allowable bearing pressures provided in Table 8. Given the shallow depth of groundwater across the site, we

recommend that footings should be designed to a formation level of at least 500mm above the groundwater to negate the requirement for construction dewatering.

Table 8: Summary of Shallow Footing Design Bearing Pressure			
Embedment Depth (m)	**Footing Width (m)**	**Footing Length (m)**	**Allowable Bearing Pressure (kPa)**
0.3	0.5 Strip		95
	1 Strip		140
	1	1	120
	2	2	190
0.5	0.5 Strip		130
	1 Strip		170
	1	1	150
	2	2	220
1	0.5 Strip		210
	1 Strip		250
	1	1	240
	2	2	250

These values are based on a geotechnical strength reduction factor of 0.5 and an average load factor of 1.5 (Factor of Safety = 3.0). It should be noted that these bearing pressures assume isolated vertical, non-eccentric loads.

Subject to the earthworks and foundation preparation works being undertaken as described herein, it has been calculated that the total elastic settlement of the footing configurations and design pressures outlined in Table 8 above is unlikely to exceed approximately 20 to 25mm. Differential settlements are unlikely to exceed approximately one half of these values.

8.5 Site Classification

Although not directly relevant to the Home Fire Studio development proposed for this site, a site classification of Class A is recommended subject to the foundation preparation recommendations provided in Section 8.3 above.

8.6 Soak wells

On-site soak wells may be designed on the basis of a soil coefficient of permeability of 10 m/day subject to being located a distance of at least 3m away from any building foundations. This does not allow for any clogging, silting or other design aspects of the soak wells.

Due to the shallow nature of groundwater across the site soak wells may not be viable. Shallow groundwater and the potential for mounding around soak wells must be considered in design.

8.7 Floor Slabs

On the basis that appropriate levels of compaction are maintained during site preparation, as described in Section 8.3 above, an average long-term Young's Modulus value of 30MPa is considered appropriate for the soils below at grade floor slabs with respect to the design of a proposed slab-on-ground.

8.8 Pavement CBR

Based on the laboratory test results, it is recommended that pavements be designed on the basis of a subgrade CBR value of 9%.

This design CBR value is subject to the exposed subgrade being moisture conditioned and compacted in accordance with the recommendations provided in Section 8.3 above. It is recommended that QA / QC testing be undertaken on subgrade materials during construction.

8.8 Earthquake

Based on our understanding of the general geology beneath the site, the results of our investigation and the recommendations provided in AS1170.4-2007, a site subsoil class of C_e to Section 4.2 of AS1170.4 is recommended for seismic design purposes. The hazard factor (Z) for the site is shown on Figure 3.2(D) of AS1170.4 as 0.09.

9 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use by Home Fire Creative Industries Pty Ltd c/- Hesperia in relation to the Home Fire Studio, Malaga project in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than Home Fire Creative Industries Pty Ltd c/- Hesperia and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

For and on behalf of
CMW Geosciences Pty Ltd

Prepared by

Youngho Kim

Senior Geotechnical Engineer

Reviewed and authorised by

Jonathan Liang

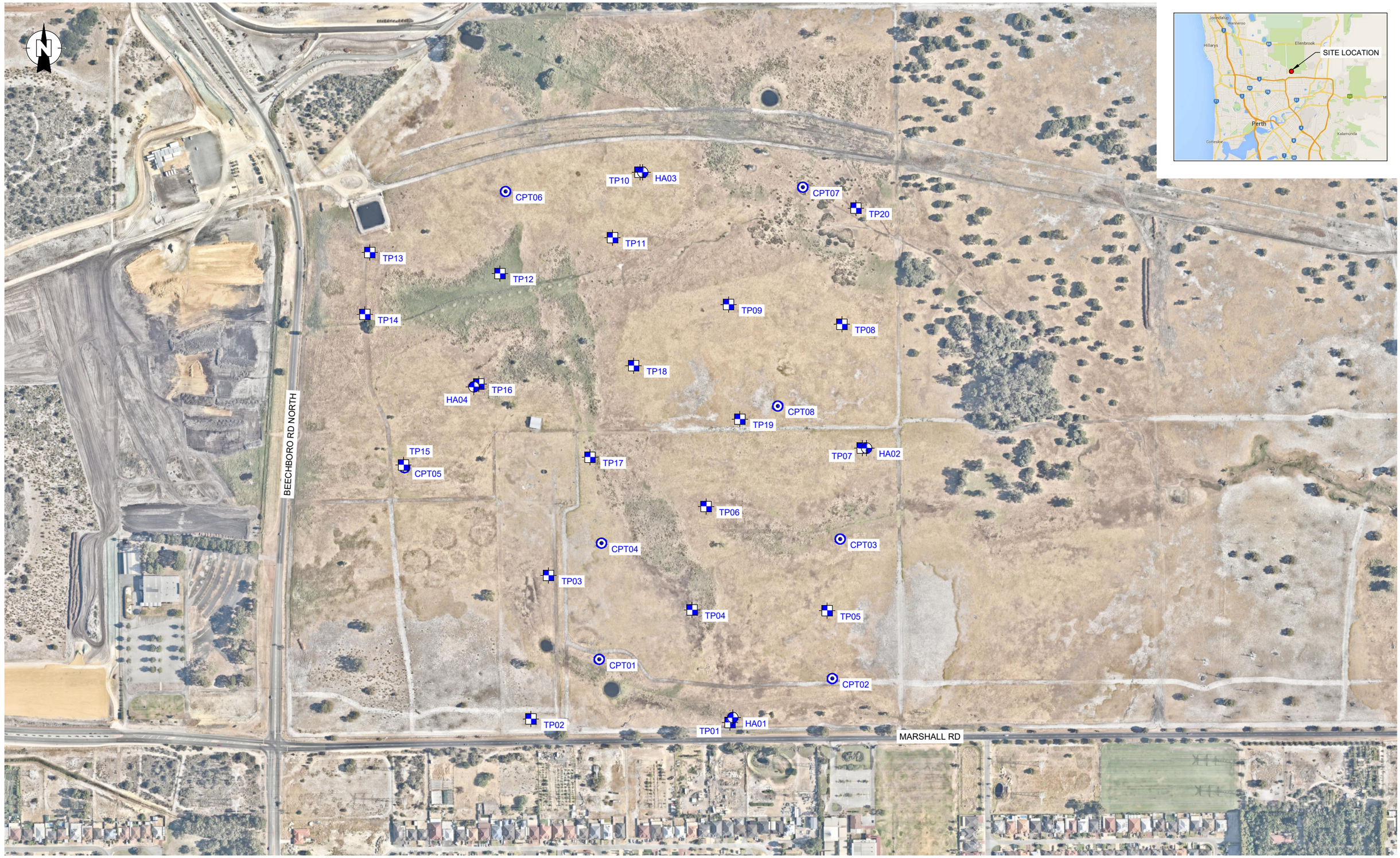
Principal Geotechnical Engineer

Distribution: 1 copy to Home Fire Creative Industries Pty Ltd c/- Hesperia (electronic)
Original held by CMW Geosciences Pty Ltd

10 REFERENCES

- Appendix 4, Control of Groundwater for Temporary Works (CIRIA Report No. 113)
- Home Fire Studio Precinct Malaga Hydrological Due Diligence Report, Hyd$_2$o, Document No. H22002Av1, dated 25 March 2022
- AS 1289, *Methods of testing soils for engineering purposes,* Standards Australia, Sydney
- AS 1726, *Geotechnical Site Investigations,* Standards Australia, Sydney, 2017
- AS 2870, *Residential slabs and footings,* Standards Australia, Sydney, 2011
- AS 3798 (inc. amendment 1), *Guidelines on earthworks for commercial and residential developments,* Standards Australia, Sydney, 2007
- AS 4678 (inc amendments 1 & 2), *Earth retaining structures,* Standards Australia, Sydney, 2002
- BS 1377-9:1990 Methods for test for soils for civil engineering purposes. In-situ tests.
- U.S. Corps of Eng., Waterways Exp. Sta., Vicksburg, Miss., 1951
- *Perth Groundwater Atlas,* Second Edition, Perth: Department of Environment, 2004
- *Perth, Sheet 2034 II and part of 2034 III and 2134 III ,* Perth Metropolitan Region Environmental Geology Series, Geological Survey of Western Australia, 1986
- Terzaghi, K. (1943). Theoretical soil mechanics. 1st ed. New York: J. Wiley and Sons, Inc.
- WA Online Atlas, Shared Land Information Platform – ASS Risk Map, https://www2.landgate.wa.gov.au/bmvf/app/waatlas/.

Figure 1
Site Investigation Plan



LEGEND:

- HA01 HAND AUGER (HA) LOCATION
- CPT01 CONE PENETROMETER TEST (CPT) LOCATION
- TP01 TEST PIT (TP) LOCATION

NOTES:

1. AERIAL FROM NEARMAP 30.01.22

1:5000 0 50 100 150 200 250 m

CMW Geosciences

CLIENT: HOME FIRE CREATIVE INDUSTRIES PTY LTD		DRAWN: DE	PROJECT: PER2022-0024
PROJECT: HOME FIRE STUDIO MALAGA, WA		CHECKED: MO	DRAWING: 01
		REVISION: A	SCALE: 1:5000
TITLE: SITE INVESTIGATION PLAN		DATE: 14.03.22	SHEET: A3 L

Appendix A
Test Pit Logs, Photographs and PSP Plots

TEST PIT LOG - TP01

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398927m N.6475096m
Elevation: 25 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.0 - 0.5	1	24.8	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD to D	4, 4, 3	
	0.6 - 1.0	2				SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			4, 3, 3	
				1		*... at 1.00m, becoming brown*	M to W		2, 2	
▼			23.5			Test pit terminated at 1.50 m	W	L to MD	4, 4, 5, 6, 6	
				2						
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.4 m BGL.

TEST PIT LOG - TP02

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398644m N.6475101m
Elevation: 28.65 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.5 - 1.0	1	28.5	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	4, 2, 3, 2, 3, 3	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		2, 2, 3, 4, 5	
			26.8	2		Test pit terminated at 1.90 m			4, 5	
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP03

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

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Logged by: DW | Position: E.398669m N.6475305m | Plant: JCB 8.5t backhoe
Checked by:MO | Elevation: 27 m | Contractor: ANH Contracting | Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			26.8	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3, 2, 2, 2, 2, 2	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).				
						... at 0.85m, becoming dark brown; with fines; trace rootlets				
				1					7	
							M to W	MD to D	15	
									18	
▼				2			W			
			24.8			Test pit terminated at 2.20 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 2.0 m BGL.

TEST PIT LOG - TP04

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398873m N.6475256m
Elevation: 26 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼			25.8	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		2	
				1			W		3	
									2	
									2	
			24.5			Test pit terminated at 1.50 m			3	
				2						
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 0.8 m BGL.

TEST PIT LOG - TP05

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.399065m N.6475255m
Elevation: 24.5 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			24.4	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3, 3, 3, 2, 2, 3	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		2, 1, 2, 2, 3, 5	
						... at 1.90m, becoming dark brown, coffee rock, highly cemented				
			22.5	2		Test pit terminated at 2.00 m			9	
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP06

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398893m N.6475403m
Elevation: 25.2 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			25.0	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	4, 2, 3, 2, 3, 4	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		3, 2, 2	
▼			23.6				W		4, 9, 9, 9	
				2		Test pit terminated at 1.60 m				
				3						
				4						

Perth Sand Penetrometer (Blows/150mm) scale: 5, 10, 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.5 m BGL.

TEST PIT LOG - TP07

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.399115m N.6475486m
Elevation: 24.4 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
			24.2	0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3, 4, 4, 3, 4, 4	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		2, 2, 2, 2, 4	
▼							W		6	
			22.4	2		Test pit terminated at 2.00 m			11	
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.8 m BGL.

TEST PIT LOG - TP08

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

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1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.399086m N.6475662m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	2	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			3	
									2	
									3	
				1					3	
									3	
						... at 1.50m, becoming grey mottled black			2	
									2	
									2	
						... at 1.70m, becoming brownish grey	M to W		3	
									6	
				2		Test pit terminated at 2.00 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP09

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

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1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398925m N.6475690m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	3, 3, 2, 3, 2, 2	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).				
						... at 1.00m, becoming pale brown to black	M to W	VL	1, 1, 1	
							W	MD	3, 6, 6, 7	
						Test pit terminated at 1.80 m				
				2						
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.3 m BGL.

TEST PIT LOG - TP10

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

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Logged by: DW
Checked by:MO

Position: E.398799m N.6475878m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	D	4	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			4	
									4	
							M to W		4	
				1					4	
									4	
								L to MD	2	
									2	
									2	
							W		4	
									5	
									6	
				2		Test pit terminated at 2.00 m			9	
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.4 m BGL.

TEST PIT LOG - TP11

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

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Logged by: DW | Position: E.398760m N.6475785m | Plant: JCB 8.5t backhoe
Checked by:MO | Elevation: | Contractor: ANH Contracting | Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	4	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			3	
							M to W		2	
				1					2	
▼									2	
									2	
								VL	1	
									1	
						... at 1.50m, becoming dark brown, coffee rock, highly cemented	W	MD to D	10	
									4	
				2					5	
									10	
						Test pit terminated at 2.50 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.3 m BGL.

TEST PIT LOG - TP12

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398600m N.6475734m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼	1.0 - 1.2	1		1		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD to D	3	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			3	
									2	
							M to W		8	
									10	
									10	
							W		9	
									9	
									9	
									10	
									10	
									5	
				2					10	
						Test pit terminated at 2.20 m				
				3						
				4						

Perth Sand Penetrometer (Blows/150mm) scale: 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 0.8 m BGL.

TEST PIT LOG - TP13

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

CMW Geosciences

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Logged by: DW
Checked by:MO

Position: E.398415m N.6475764m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.2 - 0.5	1		1		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics. SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	D to M	MD to D	5, 4, 4, 4, 4, 5	
				2			M to W		5, 5, 6, 7, 9, 13	
						Test pit terminated at 2.10 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP14

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

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Logged by: DW | Position: E.398408m N.6475676m | Plant: JCB 8.5t backhoe
Checked by:MO | Elevation: | Contractor: ANH Contracting | Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M		7	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			6	
									5	
									6	
									8	
				1			M to W	MD to D	10	
									8	
									3	
									7	
									8	
							W		6	
									7	
				2		Test pit terminated at 2.00 m			7	
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.6 m BGL.

TEST PIT LOG - TP15

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

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Logged by: DW
Checked by:MO

Position: E.398463m N.6475462m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M		3, 4, 3, 3, 3, 3	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).		MD	3	
						... at 1.00m, becoming brownish grey to dark grey	M to W		2, 3, 6, 7, 10, 8	
				2		Test pit terminated at 2.50 m				
				3						
				4						

Perth Sand Penetrometer (Blows/150mm) scale: 5, 10, 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP16

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DW
Checked by:MO

Position: E.398570m N.6475577m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				1		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD	2	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			2	
						... at 0.50m, becoming dark grey to black, with fines			2	
							M to W		2	
						... at 1.00m, becoming pale brown to brown, organic smells			3	
				2					4	
									4	
							W		8	
						Test pit terminated at 2.50 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.3 m BGL.

TEST PIT LOG - TP17

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

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Logged by: DW
Checked by:MO

Position: E.398728m N.6475473m
Elevation: 27 m

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
	0.2 - 0.5	1	26.8	0		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD to D	5, 4, 3, 3, 3, 3	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).				
						... at 1.00m, becoming dark grey to dark brown	M to W		3, 3, 6, 8, 9, 9	
				2			W		10	
			24.5			Test pit terminated at 2.50 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.7 m BGL.

TEST PIT LOG - TP18

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 08/03/2022

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Logged by: DW
Checked by:MO

Position: E.398790m N.6475603m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				0		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	L to MD	4	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			3	
									3	
									4	
									3	
				1			M to W		2	
									3	
									2	
									3	
									6	
									8	
							W		9	
				2		... at 1.90m, becoming dark brown to black			10	
						Test pit terminated at 2.20 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater encountered at 1.6 m BGL.

TEST PIT LOG - TP19

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

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Logged by: DW
Checked by:MO

Position: E.398941m N.6475527m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
				0		TOPSOIL: SILTY SAND : fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	MD	4, 3, 3, 5, 5, 4	
				1		SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).	M to W		3, 3, 4, 5, 5, 4, 4	
				2		Test pit terminated at 2.30 m				
				3						
				4						

Perth Sand Penetrometer (Blows/150mm): 5 10 15

Termination Reason: Refusal: Pit Wall Collapse

Remarks: Backfilled. Groundwater not encountered.

TEST PIT LOG - TP20

Client: Total Project Management
Project: Home Fire Studio - Malaga
Location: Whiteman Park, Malaga
Project: PER2022-0024
Date: 09/03/2022

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Logged by: DW
Checked by:MO

Position: E.399106m N.6475827m
Elevation:

Plant: JCB 8.5t backhoe
Contractor: ANH Contracting

Dimensions : 0.50m x 2.00m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description: Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Perth Sand Penetrometer (Blows/150mm)	Structure & other observations
▼				0		TOPSOIL: SILTY SAND: fine to coarse grained, subangular to subrounded; dark brown mottled grey; silt, low to medium plasticity; trace rootlets; trace organics.	D to M	D	5	
						SP: SAND: fine to coarse grained, subangular to subrounded; grey to pale brown; trace fines. (Bassendean Sand).			4	
									3	
									3	
						... at 0.80m, becoming brown	M to W		2	
				1					2	
								L to MD	2	
									2	
									3	
							W		6	
									10	
								D	12	
				2						
						Test pit terminated at 2.30 m				
				3						
				4						

Termination Reason: Refusal: Pit Wall Collapse

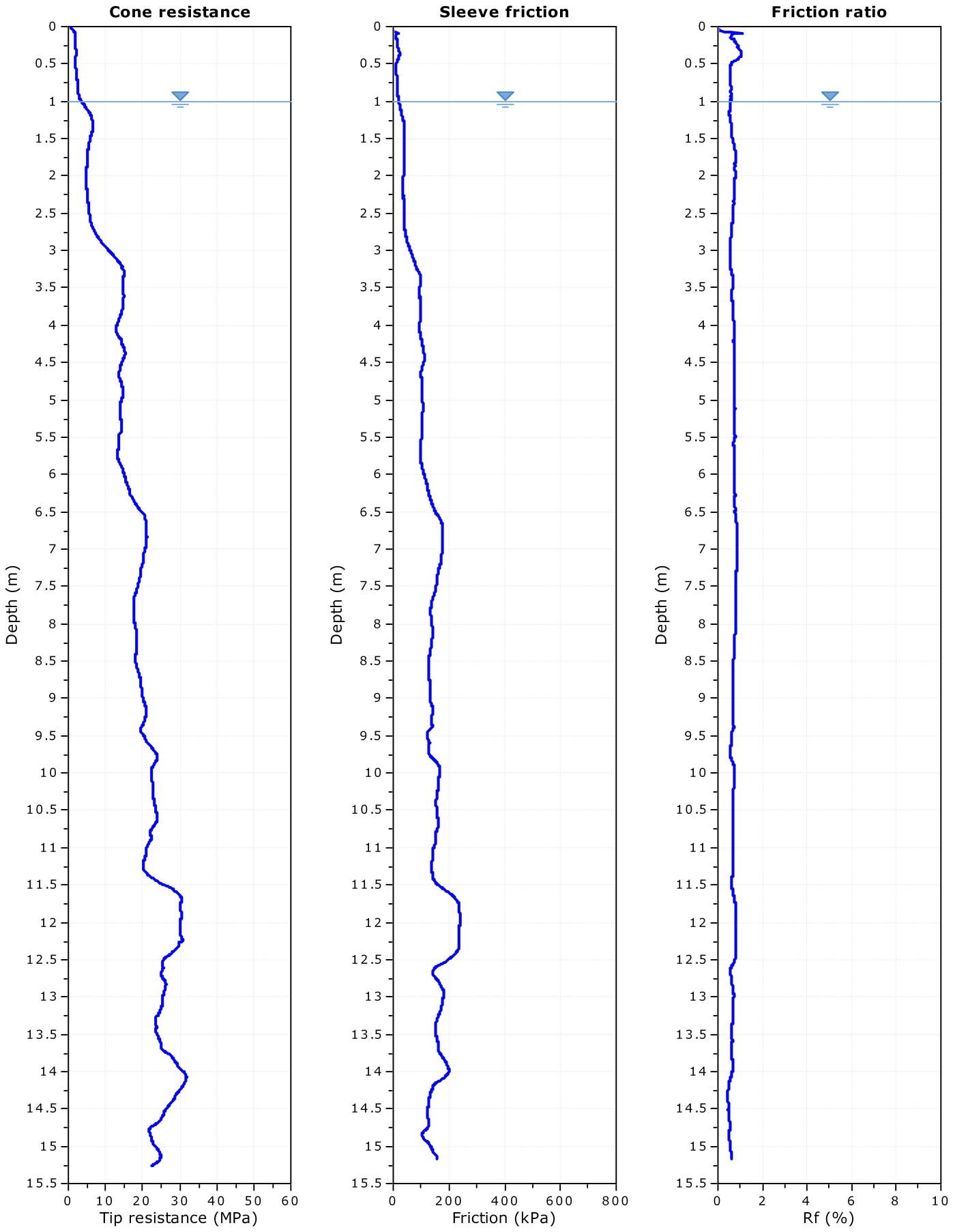
Remarks: Backfilled. Groundwater encountered at 1.0 m BGL.

Appendix B
CPTu Plots

info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 1
Total depth: 15.27 m, Date: 8/03/2022
Surface Elevation: 26.57 m
Coords: X:398741.06, Y:6475185.78
Cone Operator: Andrew

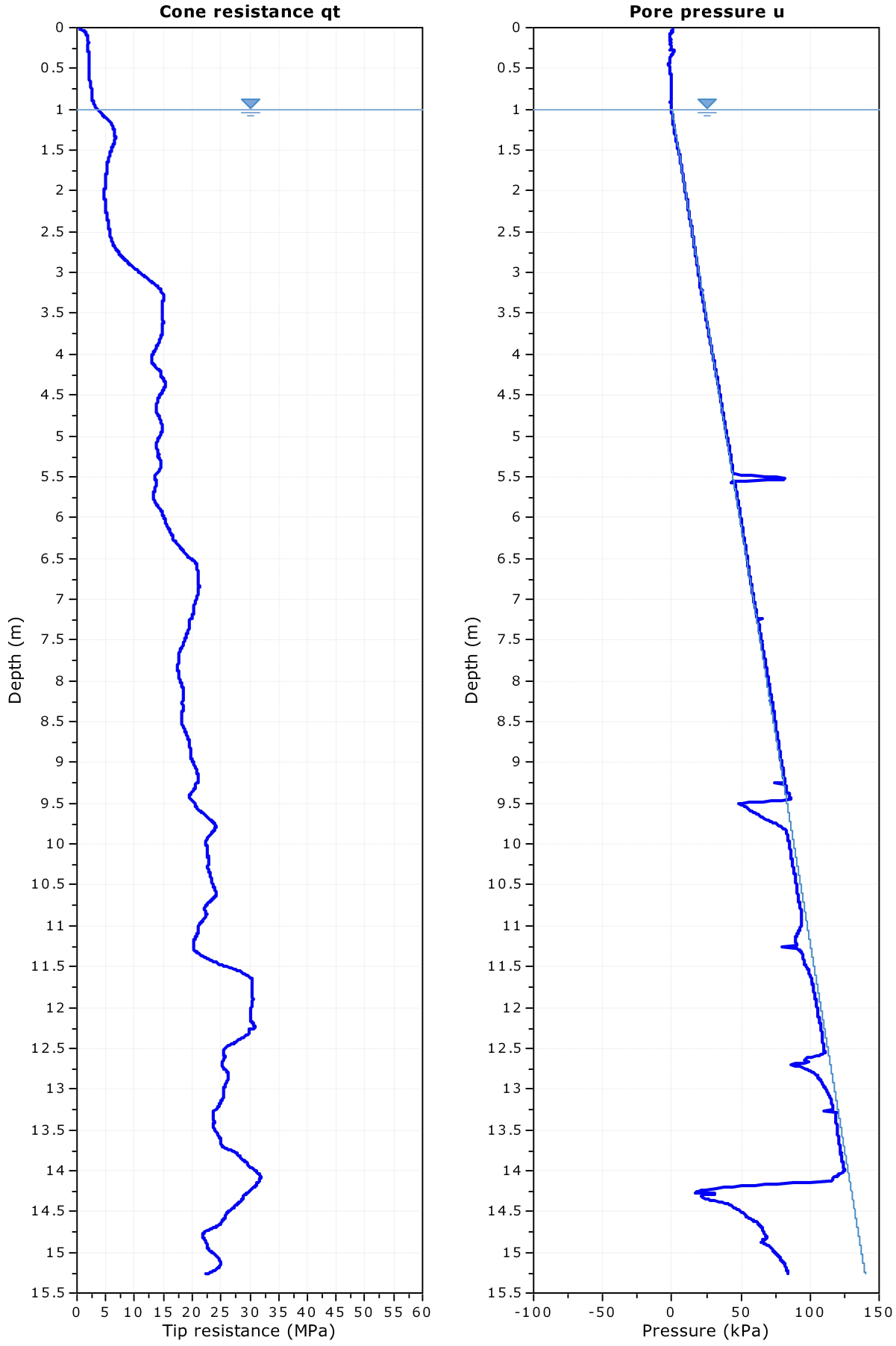
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 1
Total depth: 15.27 m, Date: 8/03/2022
Surface Elevation: 26.57 m
Coords: X:398741.06, Y:6475185.78
Cone Operator: Andrew

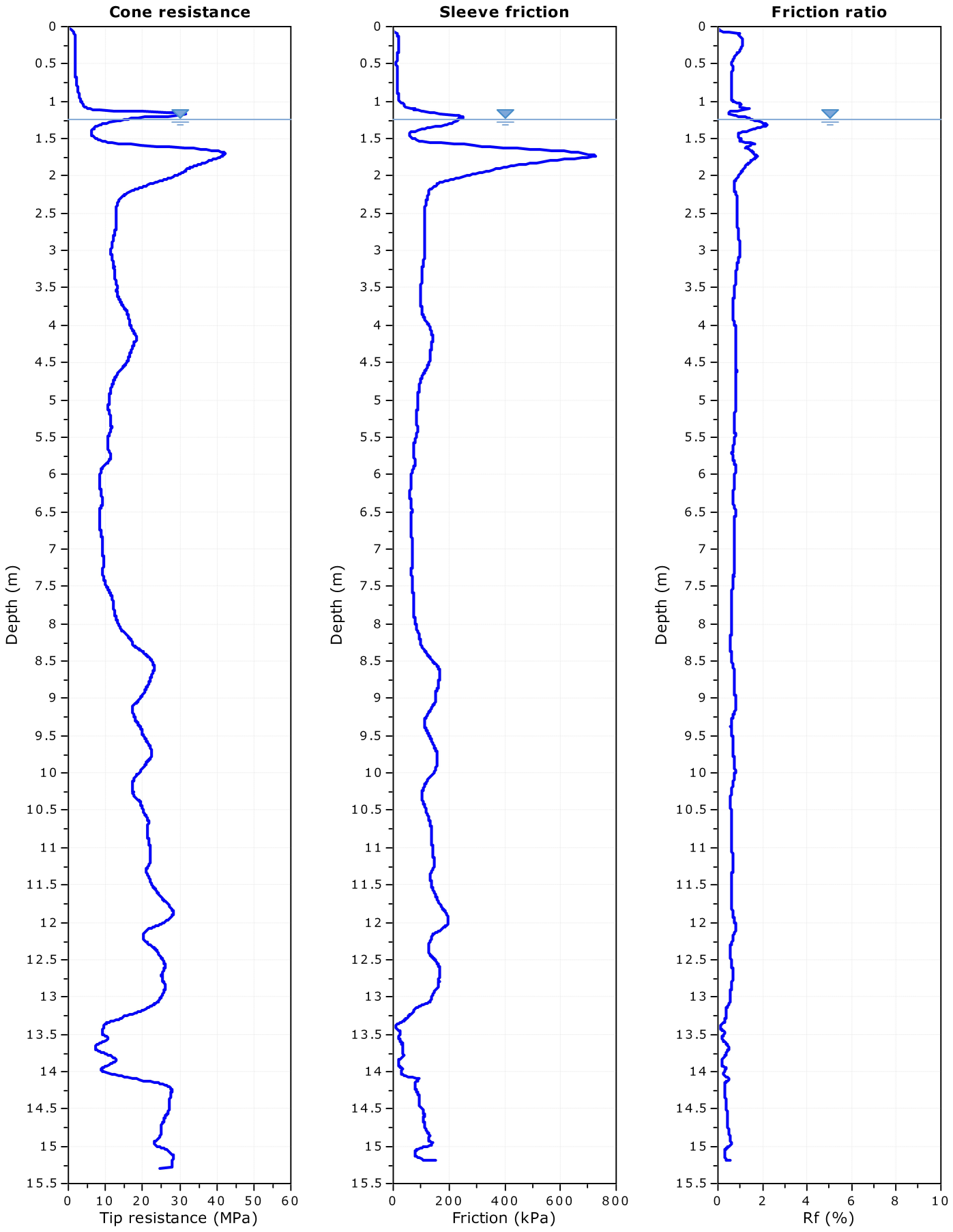
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 2
Total depth: 15.29 m, Date: 8/03/2022
Surface Elevation: 24.34 m
Coords: X:399072.34, Y:6475158.45
Cone Operator: Andrew

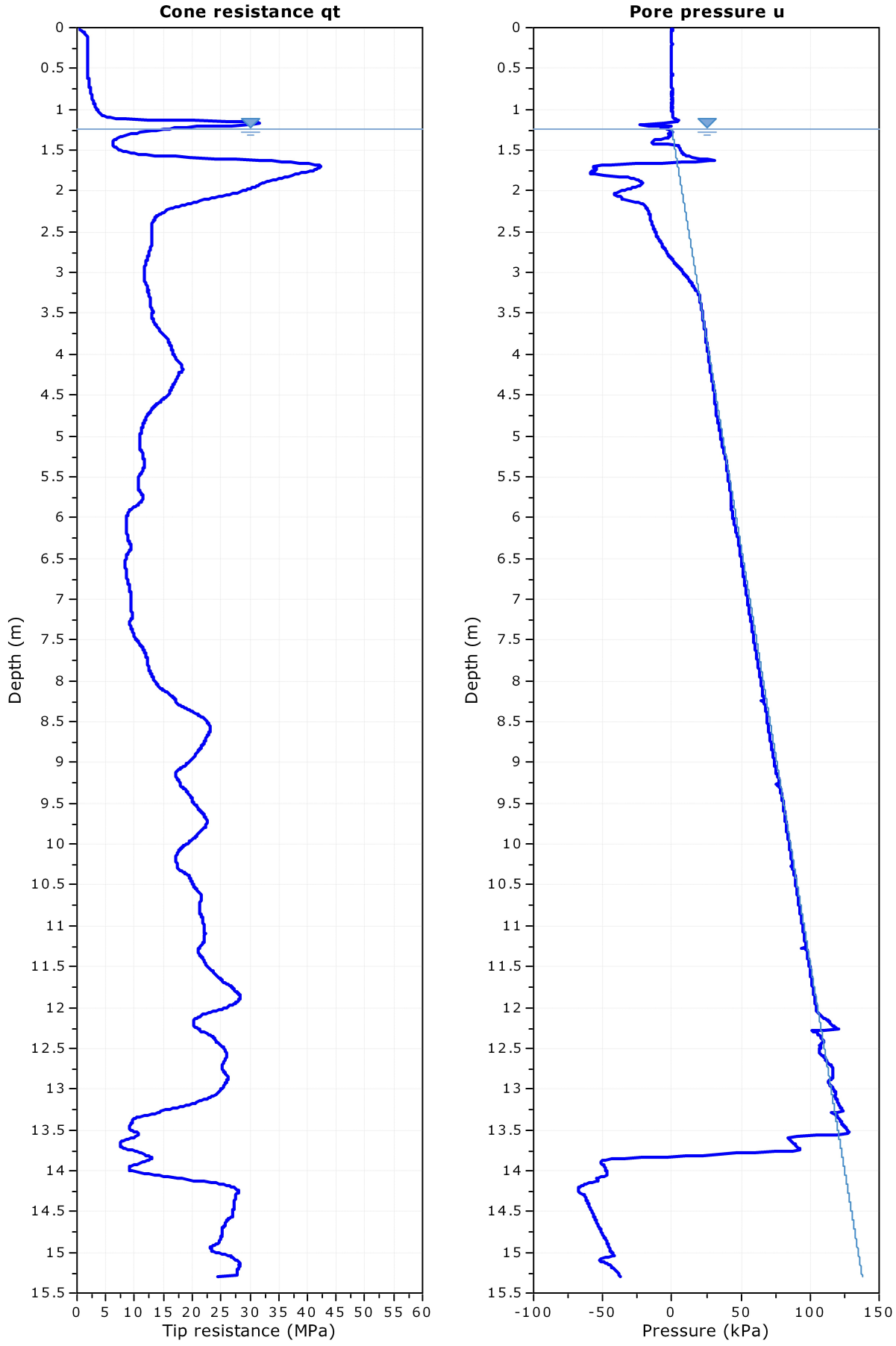
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 2
Total depth: 15.29 m, Date: 8/03/2022
Surface Elevation: 24.34 m
Coords: X:399072.34, Y:6475158.45
Cone Operator: Andrew

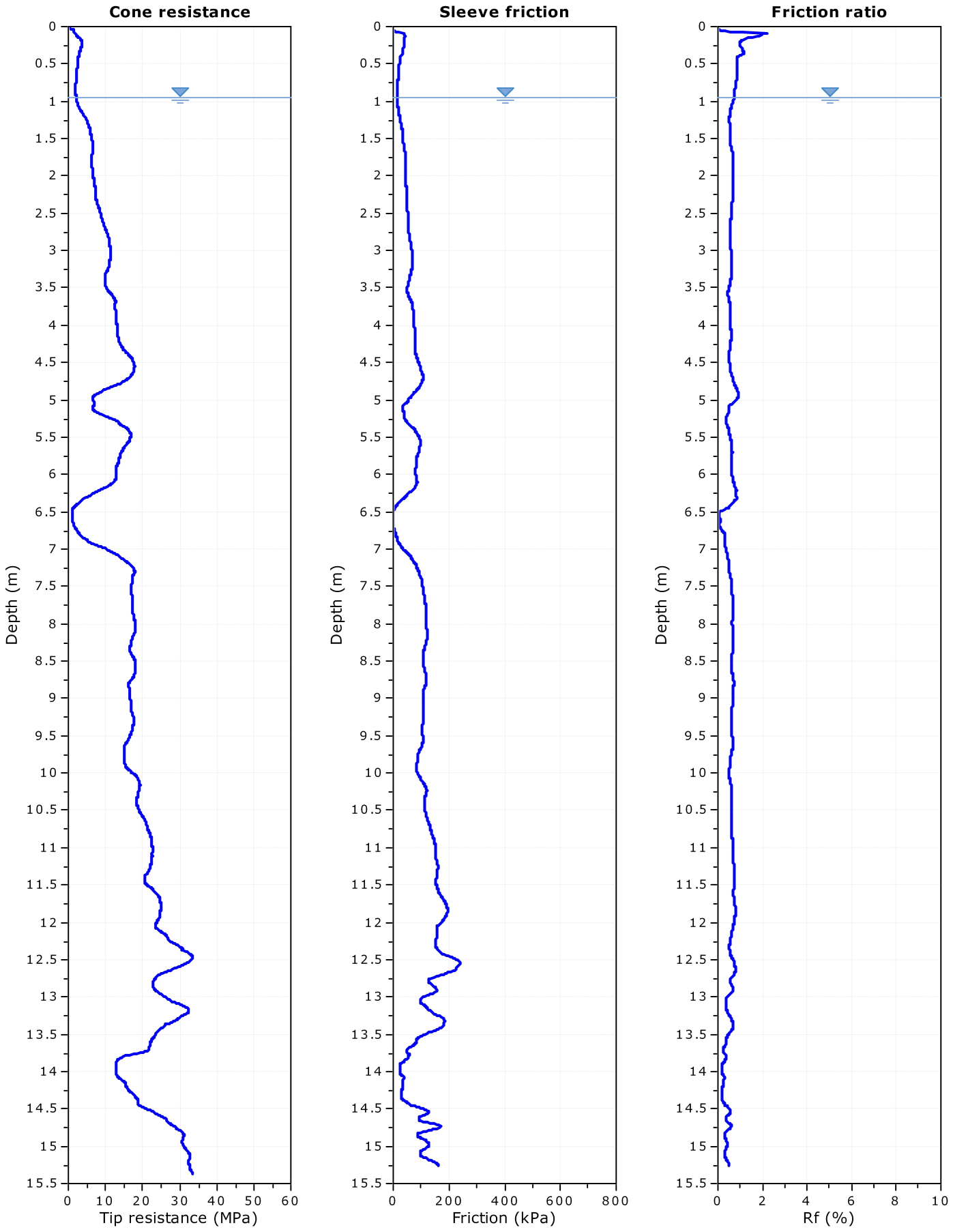
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 3
Total depth: 15.37 m, Date: 8/03/2022
Surface Elevation: 23.89 m
Coords: X:399083.51, Y:6475356.71
Cone Operator: Andrew

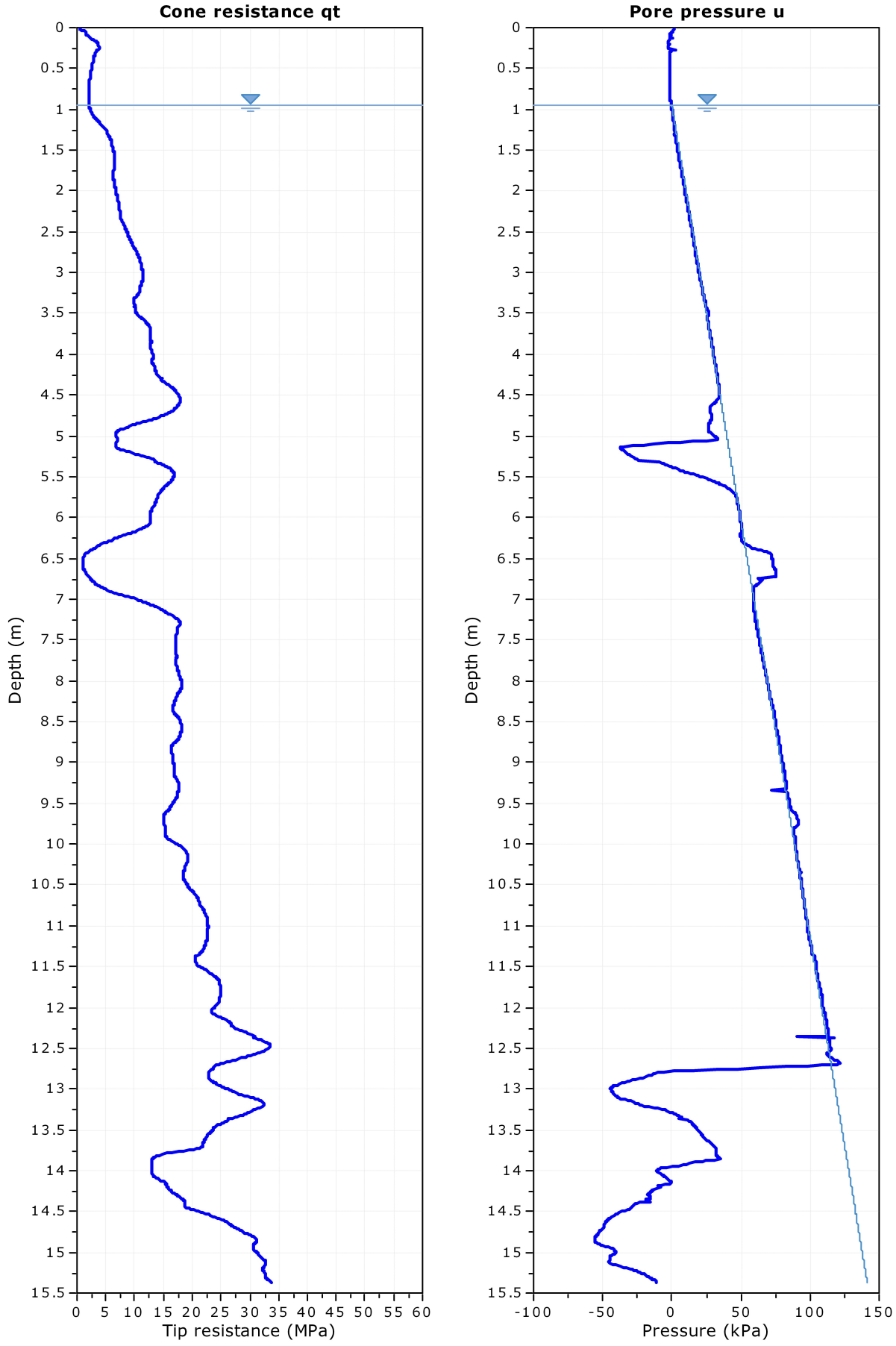
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 3
Total depth: 15.37 m, Date: 8/03/2022
Surface Elevation: 23.89 m
Coords: X:399083.51, Y:6475356.71
Cone Operator: Andrew

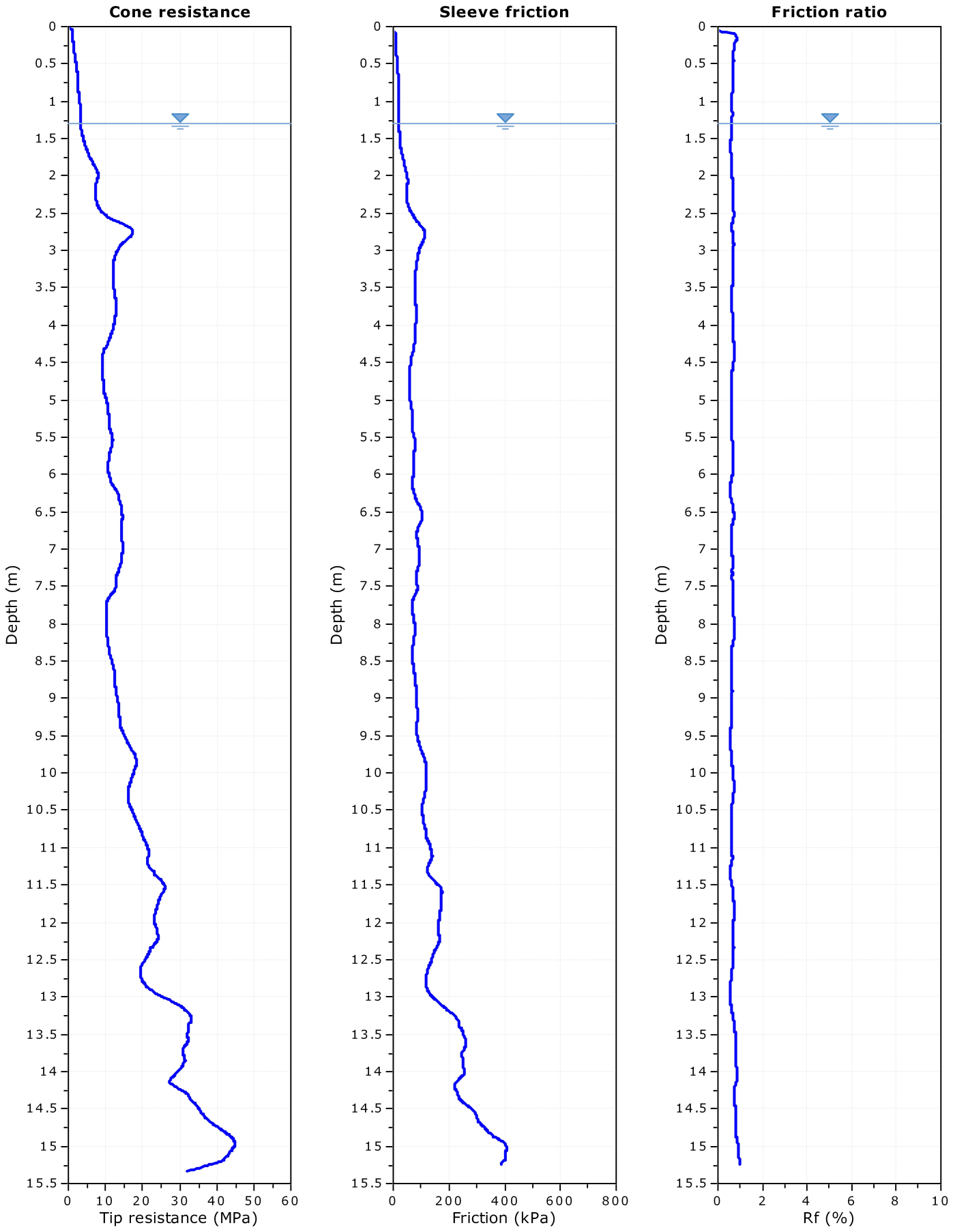
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 4
Total depth: 15.34 m, Date: 8/03/2022
Surface Elevation: 27.11 m
Coords: X:398744.39, Y:6475350.84
Cone Operator: Andrew

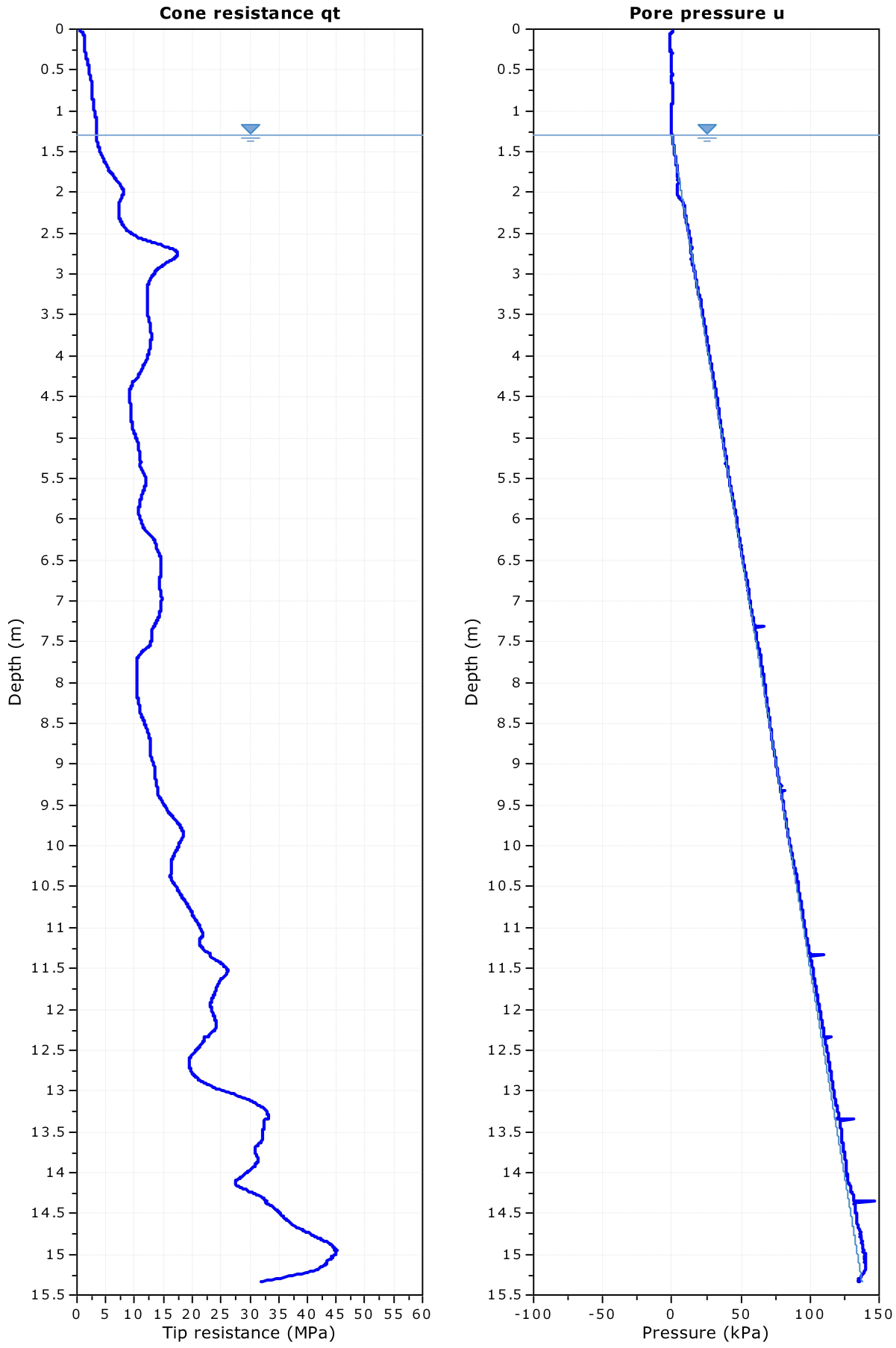
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 4
Total depth: 15.34 m, Date: 8/03/2022
Surface Elevation: 27.11 m
Coords: X:398744.39, Y:6475350.84
Cone Operator: Andrew

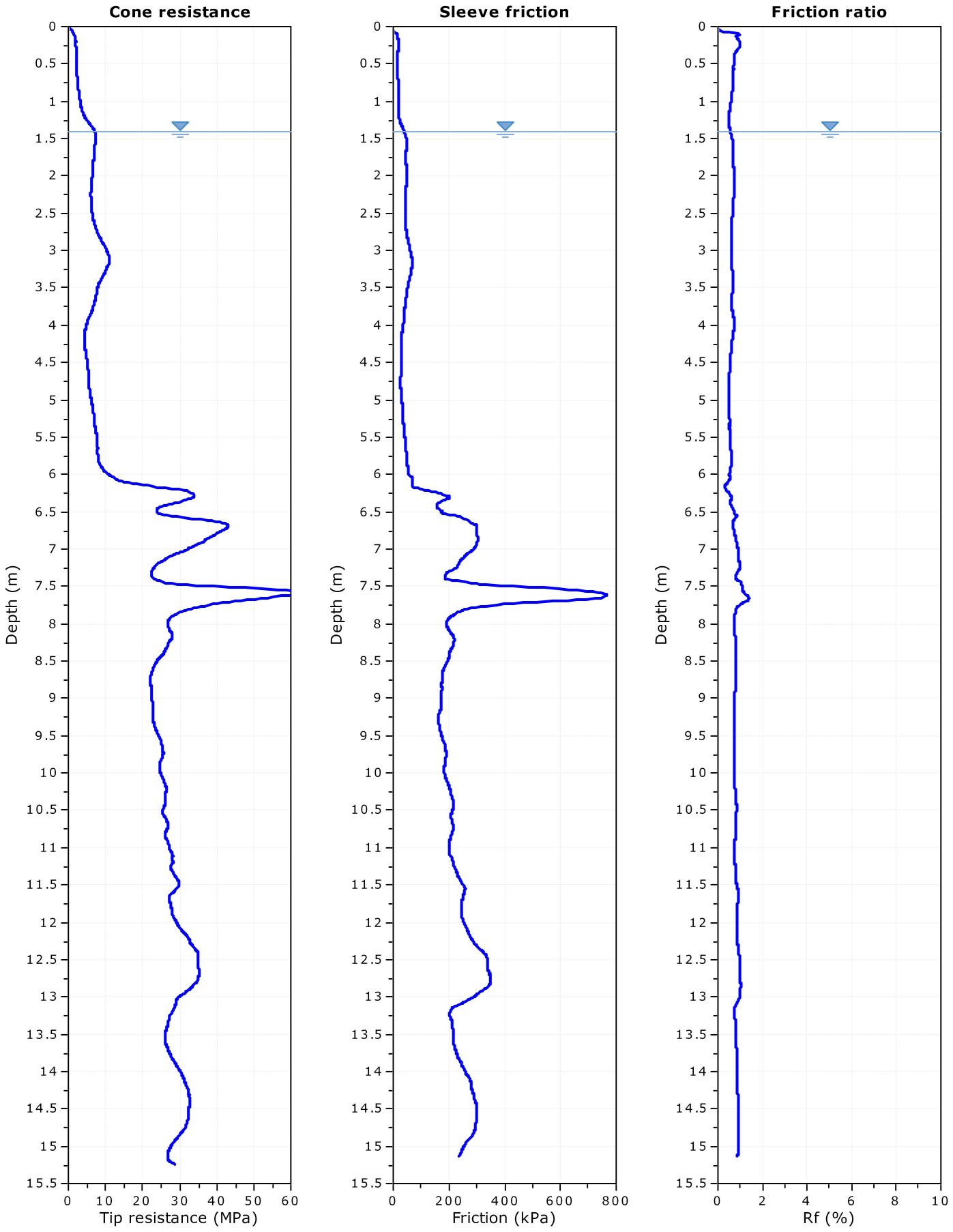
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 5
Total depth: 15.24 m, Date: 8/03/2022
Surface Elevation: 27.90 m
Coords: X:398464.41, Y:6475458.18
Cone Operator: Andrew

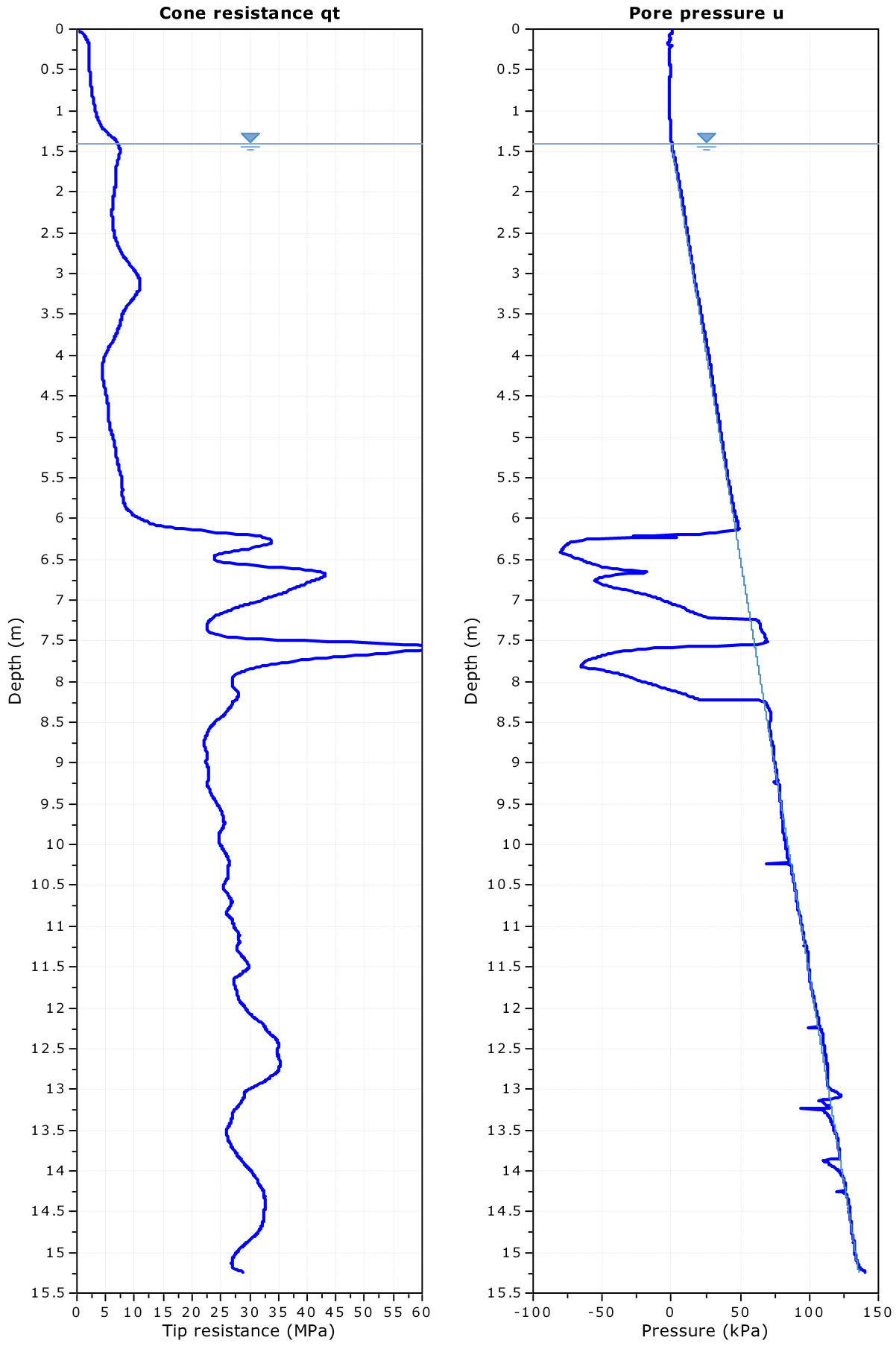
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 5
Total depth: 15.24 m, Date: 8/03/2022
Surface Elevation: 27.90 m
Coords: X:398464.41, Y:6475458.18
Cone Operator: Andrew

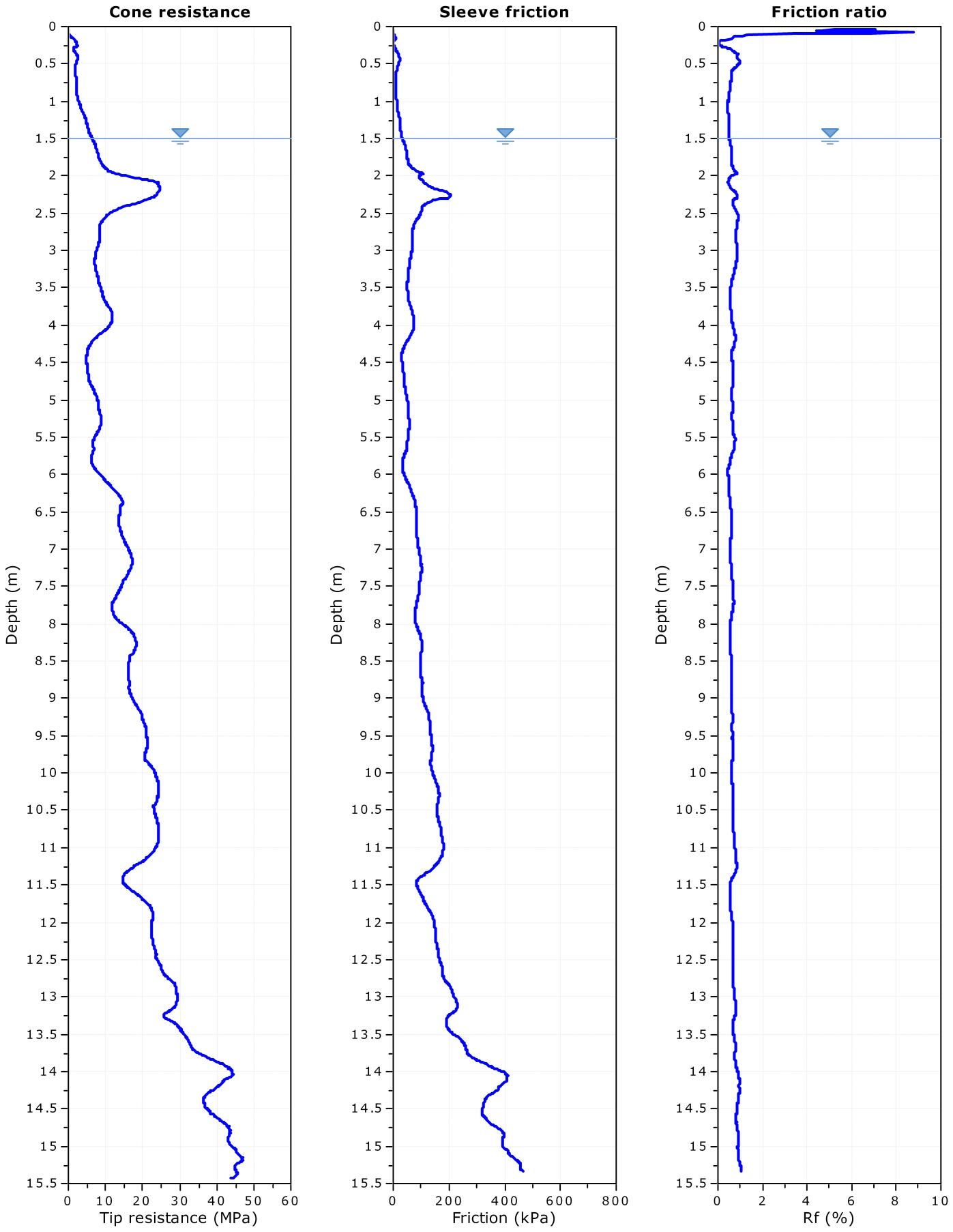
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 6
Total depth: 15.43 m, Date: 8/03/2022
Surface Elevation: 27.35 m
Coords: X:398607.91, Y:6475850.53
Cone Operator: Andrew

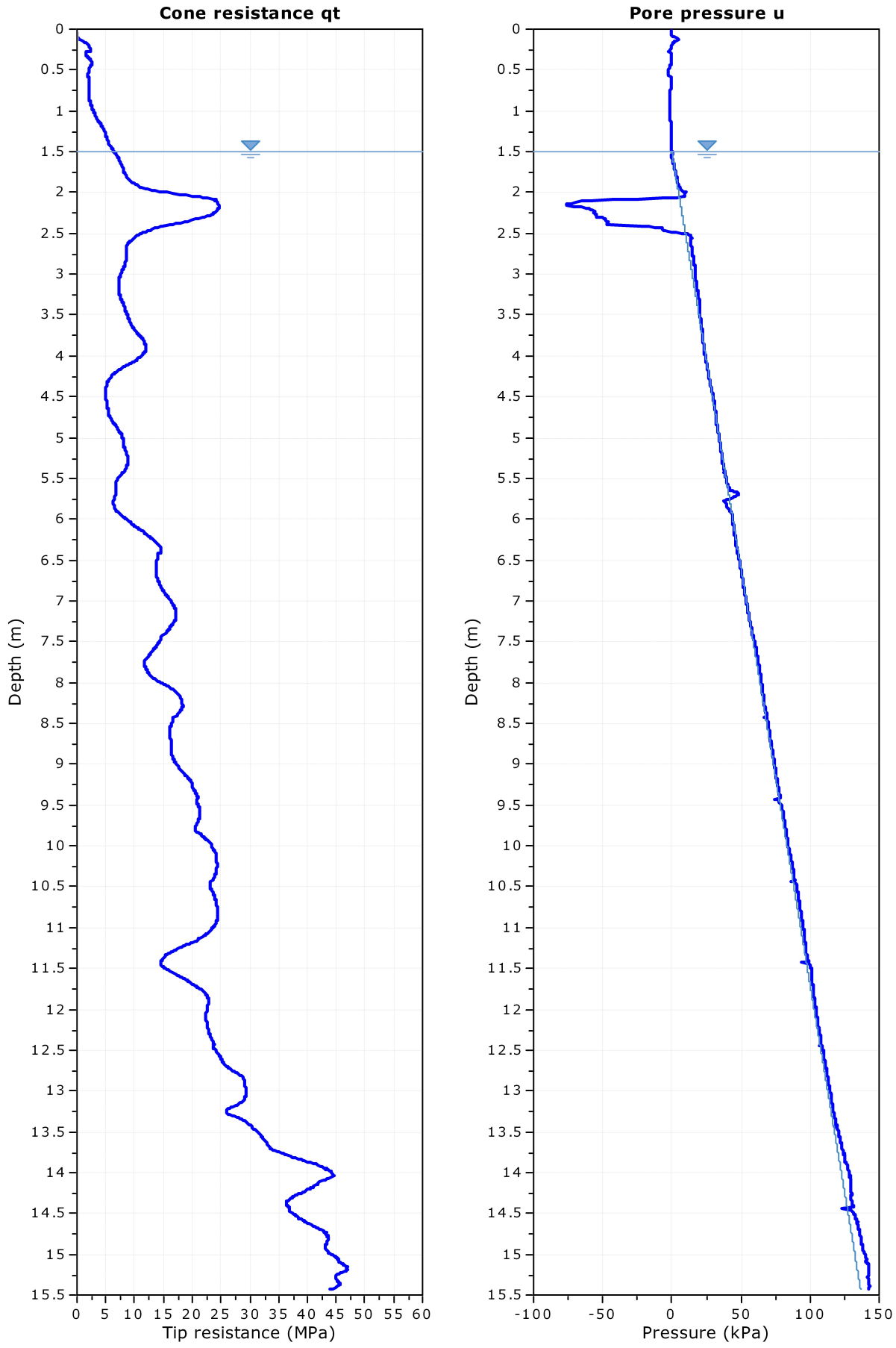
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 6
Total depth: 15.43 m, Date: 8/03/2022
Surface Elevation: 27.35 m
Coords: X:398607.91, Y:6475850.53
Cone Operator: Andrew

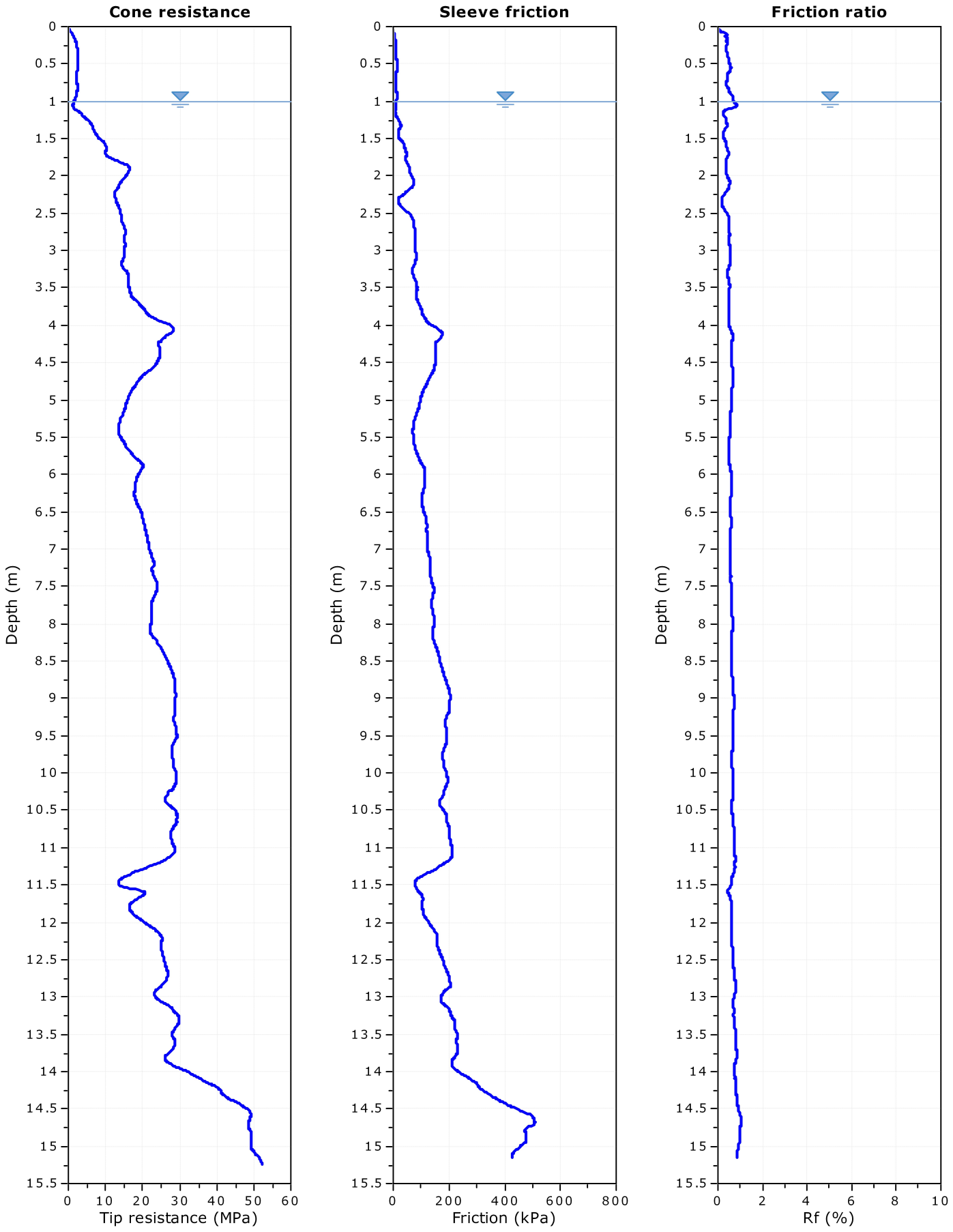
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 7
Total depth: 15.25 m, Date: 8/03/2022
Surface Elevation: 23.54 m
Coords: X:399030.40, Y:6475856.67
Cone Operator: Andrew

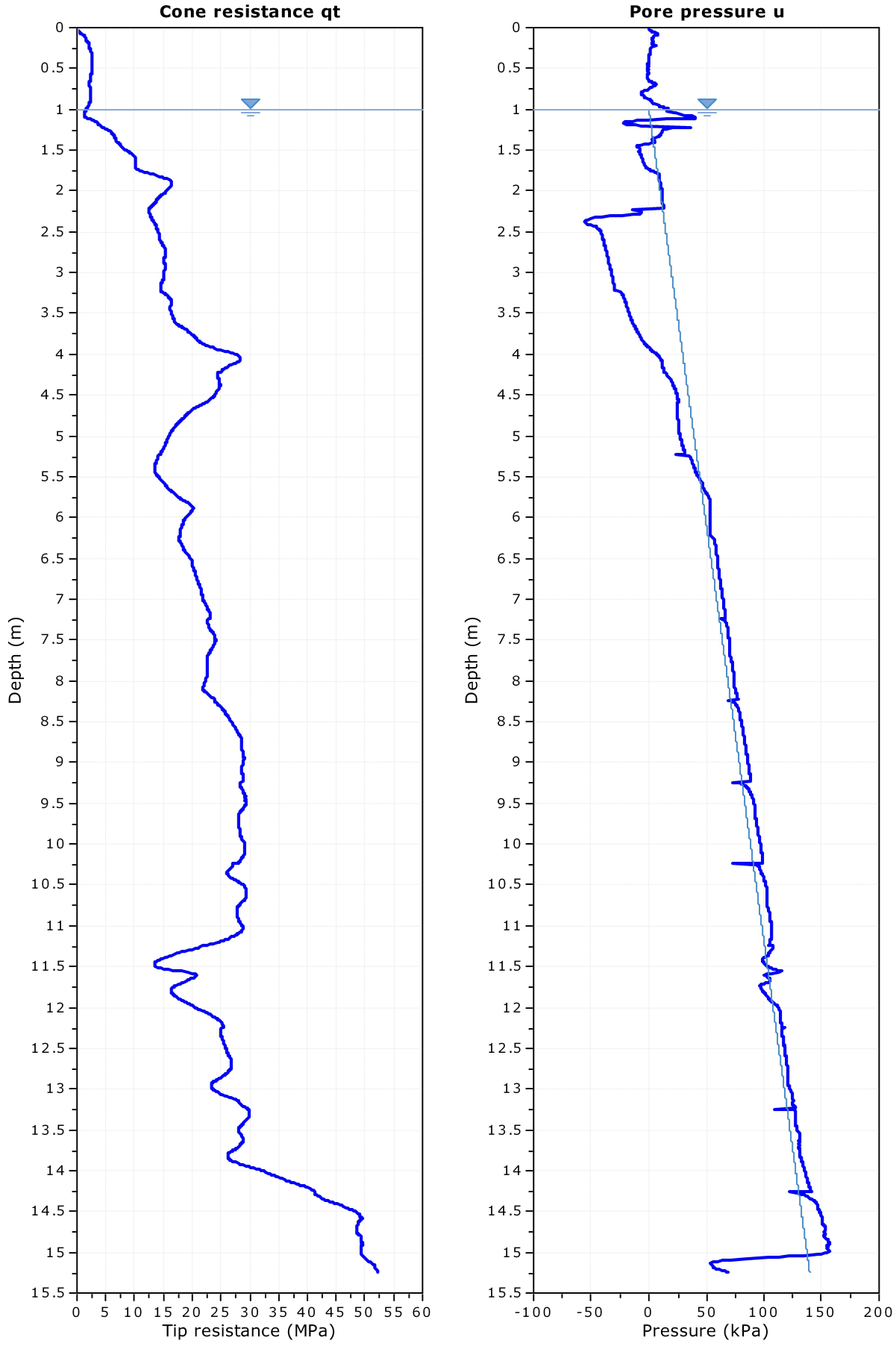
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 7
Total depth: 15.25 m, Date: 8/03/2022
Surface Elevation: 23.54 m
Coords: X:399030.40, Y:6475856.67
Cone Operator: Andrew

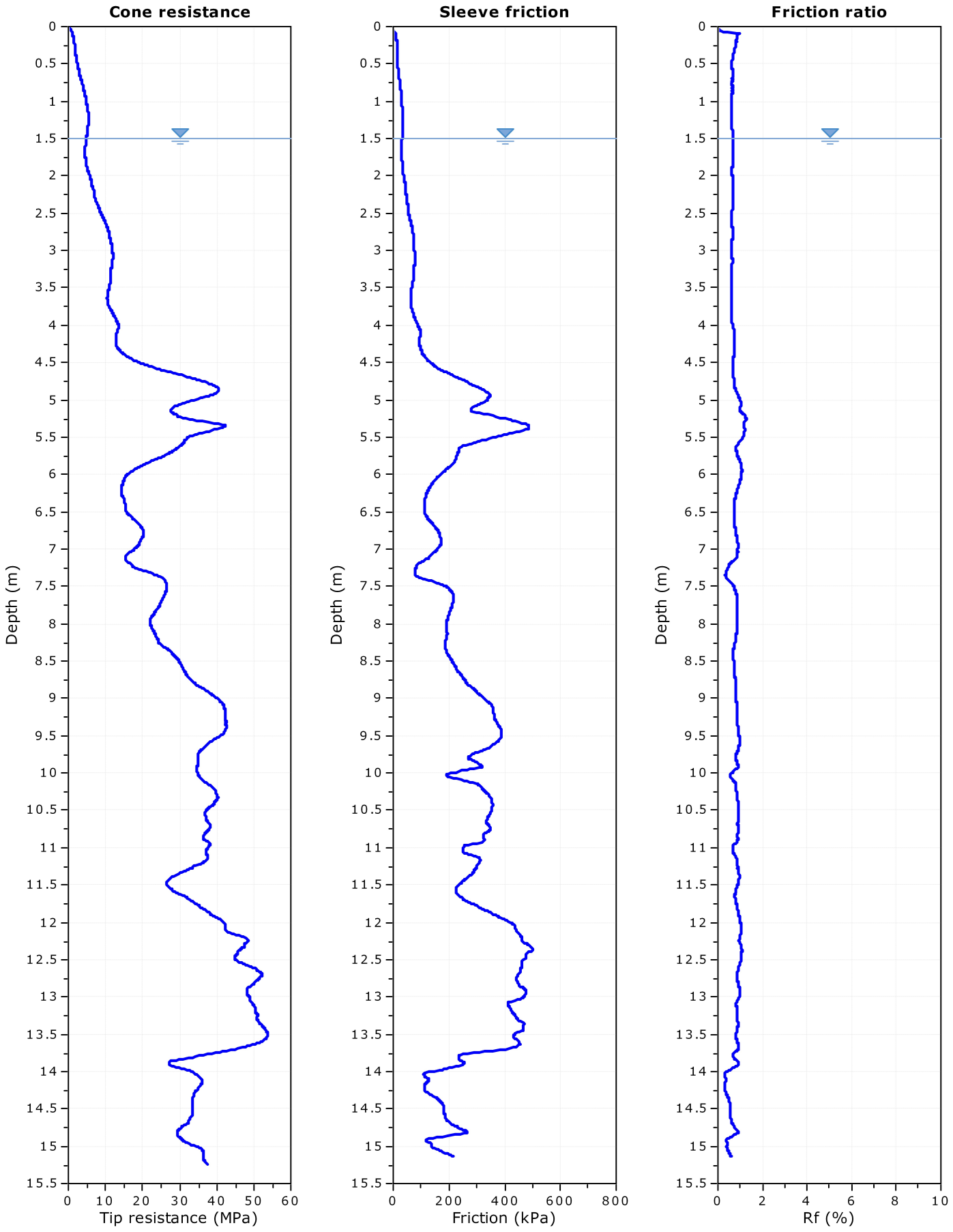
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 8
Total depth: 15.24 m, Date: 8/03/2022
Surface Elevation: 25.01 m
Coords: X:398994.83, Y:6475545.68
Cone Operator: Andrew

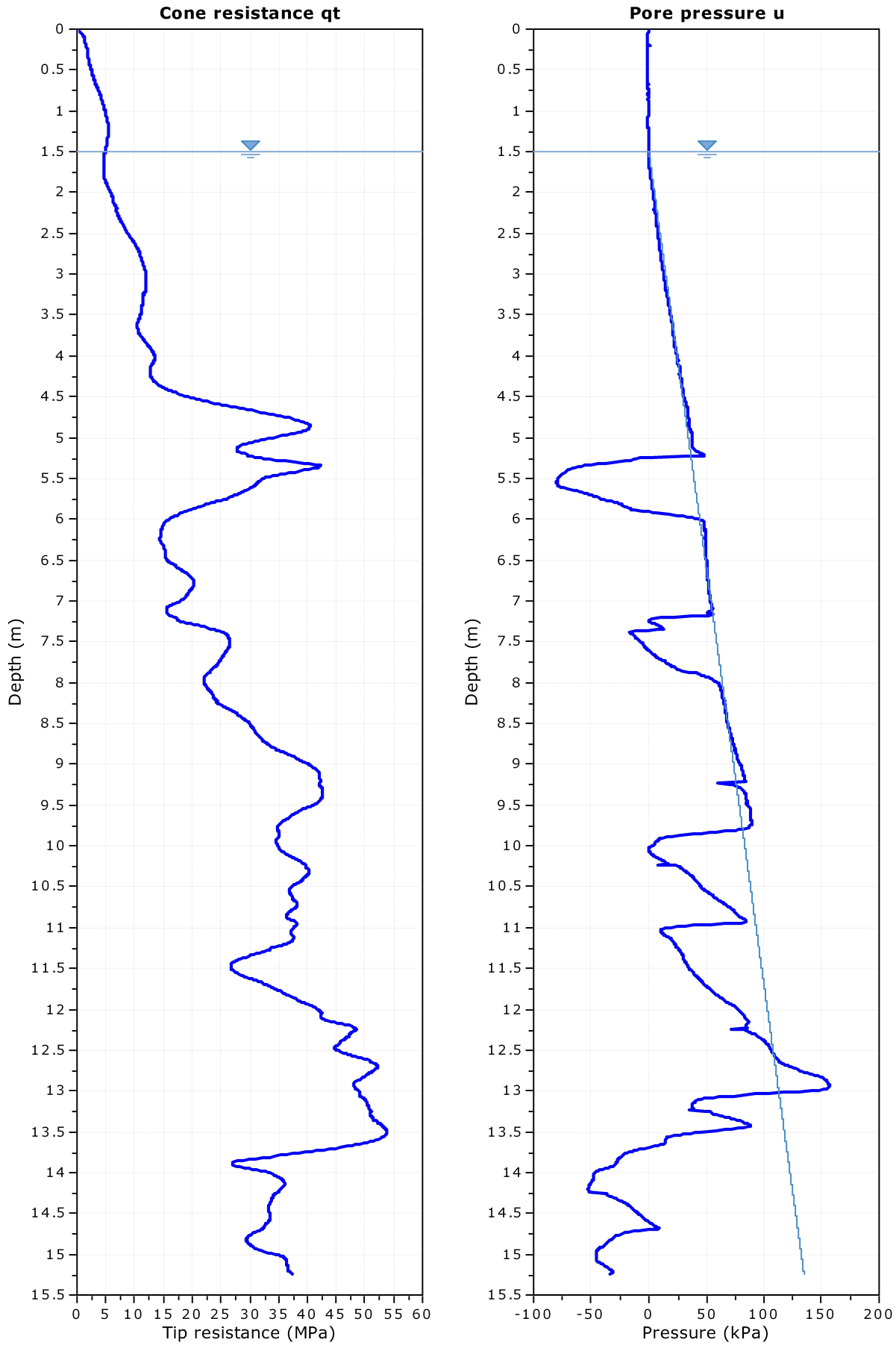
Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



info@cptwest.com.au
www.cptwest.com.au
T: 0403 370 045

CPTu 8
Total depth: 15.24 m, Date: 8/03/2022
Surface Elevation: 25.01 m
Coords: X:398994.83, Y:6475545.68
Cone Operator: Andrew

Project: Home Fire Studio (Project No.: PER2022-0024)
Location: Malaga (Client: Home Fire Creative Industries Pty Ltd)



Appendix C
In-situ Permeability Test Result

CMW Geosciences	CLIENT: **Total Project Management**	DESIGNER:	DW
	PROJECT: **Home Fire Studio, Malaga** **Whiteman Park, Malaga**	CHECKED:	MO
		REVISION:	4
	TITLE: **HA01 Falling Head Permeability Test**	DATE:	9/03/2022
		PROJECT:	PER2022-0024

Specifications - Open-Ended Tube

Length L_1:	1.4	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0.18	m

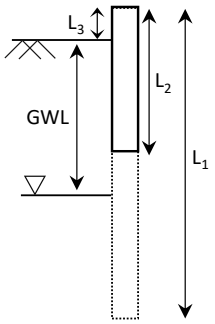
Ground Conditions

GWL: 1.2 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

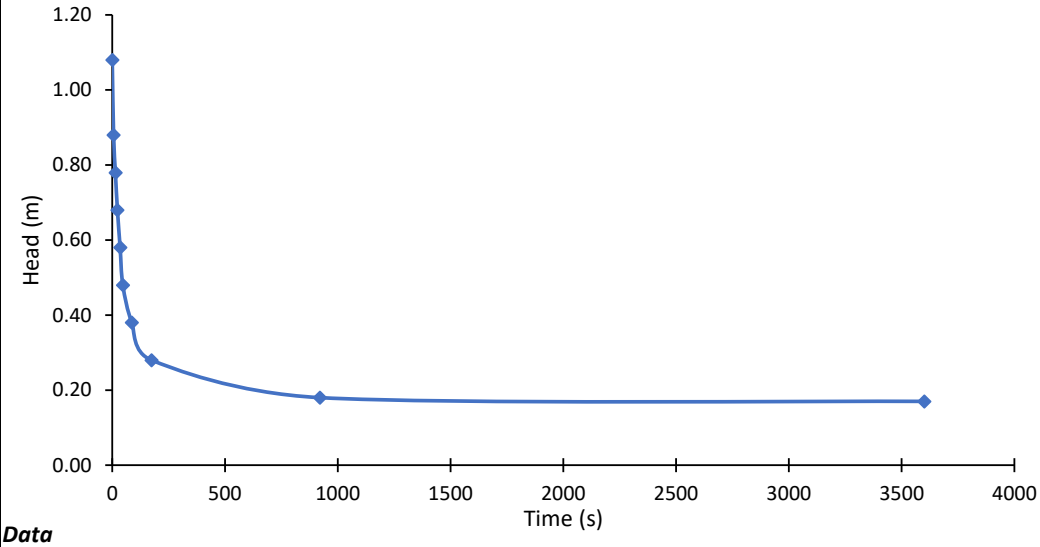
Bottom of Test Hole: 1.22 m BGL



Hydraulic Conductivity (k)

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 2.12E-04 ms^{-1} = 18.31 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.22m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.300	1.080	1.000		1.07E-04	6.42E-04
6	0.500	0.880	0.850		5.28E-05	2.80E-04
14	0.600	0.780	0.750		5.80E-05	2.81E-04
23	0.700	0.680	0.650		5.52E-05	2.43E-04
35	0.800	0.580	0.550		7.29E-05	2.86E-04
47	0.900	0.480	0.450		3.04E-05	1.04E-04
87	1.000	0.380	0.350		2.10E-05	6.11E-05
174	1.100	0.280	0.250		4.18E-06	9.91E-06
921	1.200	0.180	0.195		1.68E-07	3.32E-07
3600	1.210	0.170				

CMW Geosciences

CLIENT:	Total Project Management
PROJECT:	Home Fire Studio, Malaga Whiteman Park, Malaga
TITLE:	HA02 Falling Head Permeability Test
DESIGNER:	DW
CHECKED:	MO
REVISION:	4
DATE:	9/03/2022
PROJECT:	PER2022-0024

Specifications - Open-Ended Tube

Length L_1:	1.49	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0.13	m

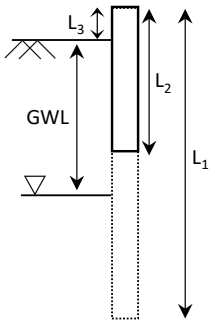
Ground Conditions

GWL: 1.8 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

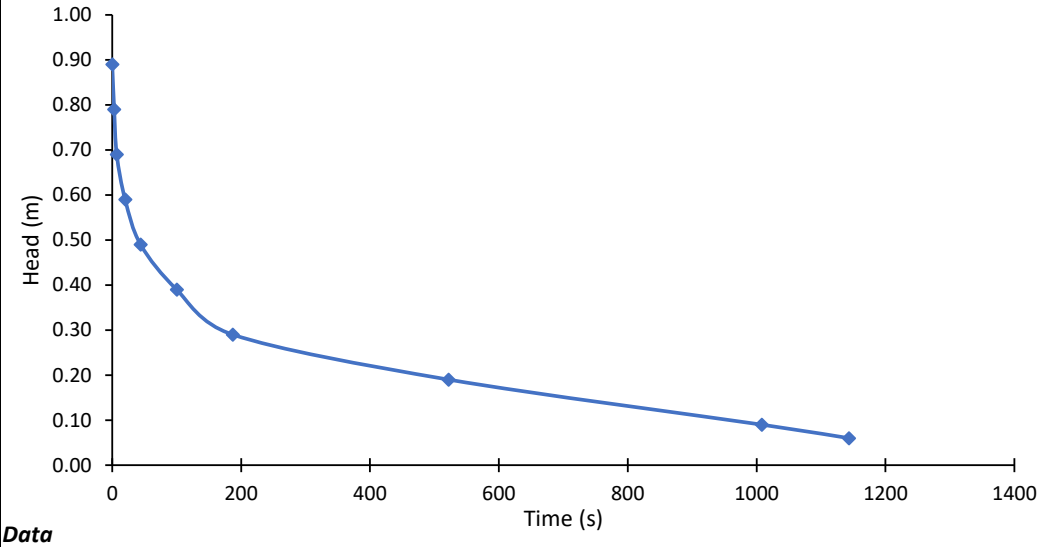
Bottom of Test Hole: 1.36 m BGL



Hydraulic Conductivity (k)

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) . \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 2.16E-04 ms^{-1} = 18.62 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.36m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.600	0.890				
3	0.700	0.790	0.840		1.40E-04	7.39E-04
7	0.800	0.690	0.740		1.30E-04	6.25E-04
20	0.900	0.590	0.640		5.07E-05	2.21E-04
44	1.000	0.490	0.540		3.62E-05	1.40E-04
100	1.100	0.390	0.440		2.15E-05	7.28E-05
187	1.200	0.290	0.340		2.07E-05	5.95E-05
522	1.300	0.190	0.240		9.09E-06	2.13E-05
1008	1.400	0.090	0.140		1.36E-05	2.41E-05
1143	1.430	0.060	0.075		3.08E-05	3.72E-05

CMW Geosciences	CLIENT: **Total Project Management**	DESIGNER:	DW
	PROJECT: **Home Fire Studio, Malaga** **Whiteman Park, Malaga**	CHECKED:	MO
		REVISION:	4
	TITLE: **HA03 Falling Head Permeability Test**	DATE:	9/03/2022
		PROJECT:	PER2022-0024

Specifications - Open-Ended Tube

Length L_1:	1.45	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0.13	m

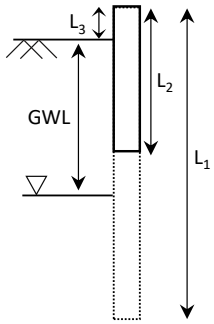
Ground Conditions

GWL: 1.4 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

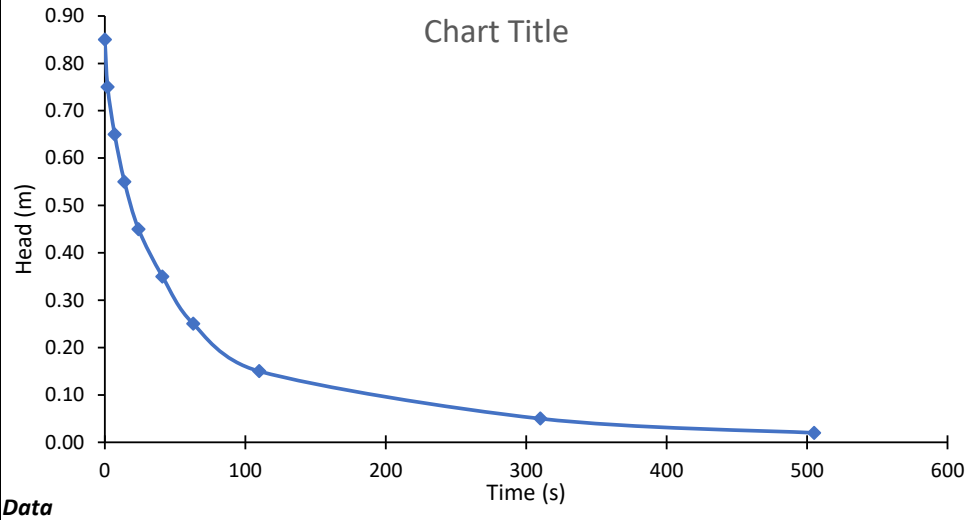
Bottom of Test Hole: 1.32 m BGL



Hydraulic Conductivity (k)

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) . \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 3.68E-04 ms^{-1} = 31.82 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.32m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.600	0.850				
2	0.700	0.750	0.800		2.28E-04	1.16E-03
7	0.800	0.650	0.700		1.14E-04	5.27E-04
14	0.900	0.550	0.600		1.05E-04	4.36E-04
24	1.000	0.450	0.500		9.82E-05	3.62E-04
41	1.100	0.350	0.400		8.22E-05	2.62E-04
63	1.200	0.250	0.300		9.90E-05	2.64E-04
110	1.300	0.150	0.200		8.47E-05	1.79E-04
310	1.400	0.050	0.100		5.33E-05	8.24E-05
505	1.430	0.020	0.035		5.16E-05	4.18E-05

CMW Geosciences	CLIENT: **Total Project Management**	DESIGNER:	DW
	PROJECT: **Home Fire Studio, Malaga** **Whiteman Park, Malaga**	CHECKED:	MO
		REVISION:	4
	TITLE: **HA04 Falling Head Permeability Test**	DATE:	9/03/2022
		PROJECT:	PER2022-0024

Specifications - Open-Ended Tube

Length L_1:	1.45	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0.38	m

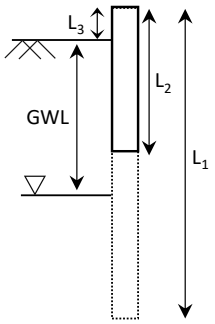
Ground Conditions

GWL: 1.3 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h / k_v}$

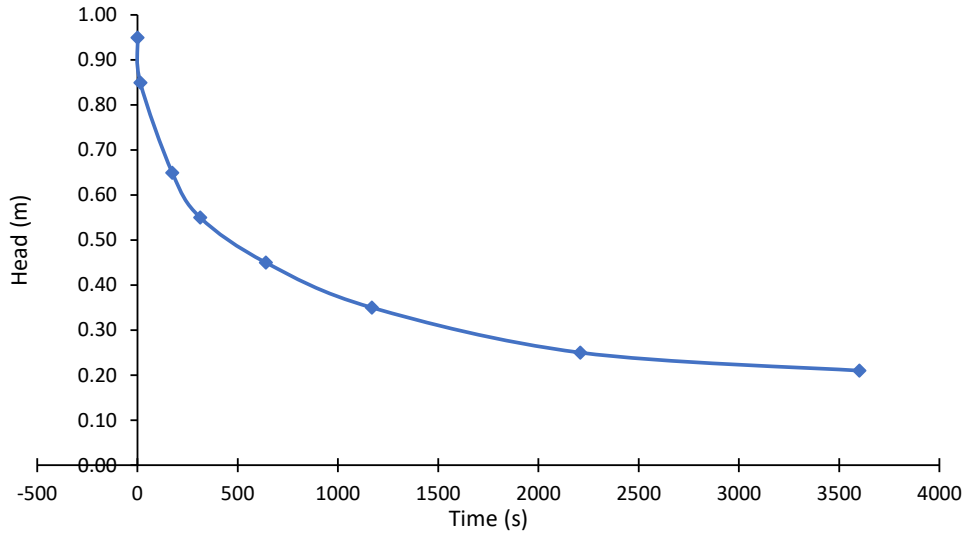
Bottom of Test Hole: 1.07 m BGL



Hydraulic Conductivity (k)

CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 3.26E-05 ms^{-1} = 2.82 m/day



STRATIGRAPHIC LOG

Sand

EOH @ 1.07m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0	0.500	0.950				
14	0.600	0.850	0.900		2.68E-05	1.48E-04
173	0.800	0.650	0.750		6.42E-06	3.14E-05
313	0.900	0.550	0.600		5.23E-06	2.18E-05
640	1.000	0.450	0.500		3.00E-06	1.11E-05
1169	1.100	0.350	0.400		2.64E-06	8.42E-06
2208	1.200	0.250	0.300		2.10E-06	5.59E-06
3600	1.240	0.210	0.230		9.20E-07	2.06E-06

Appendix D
Laboratory Test Results

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

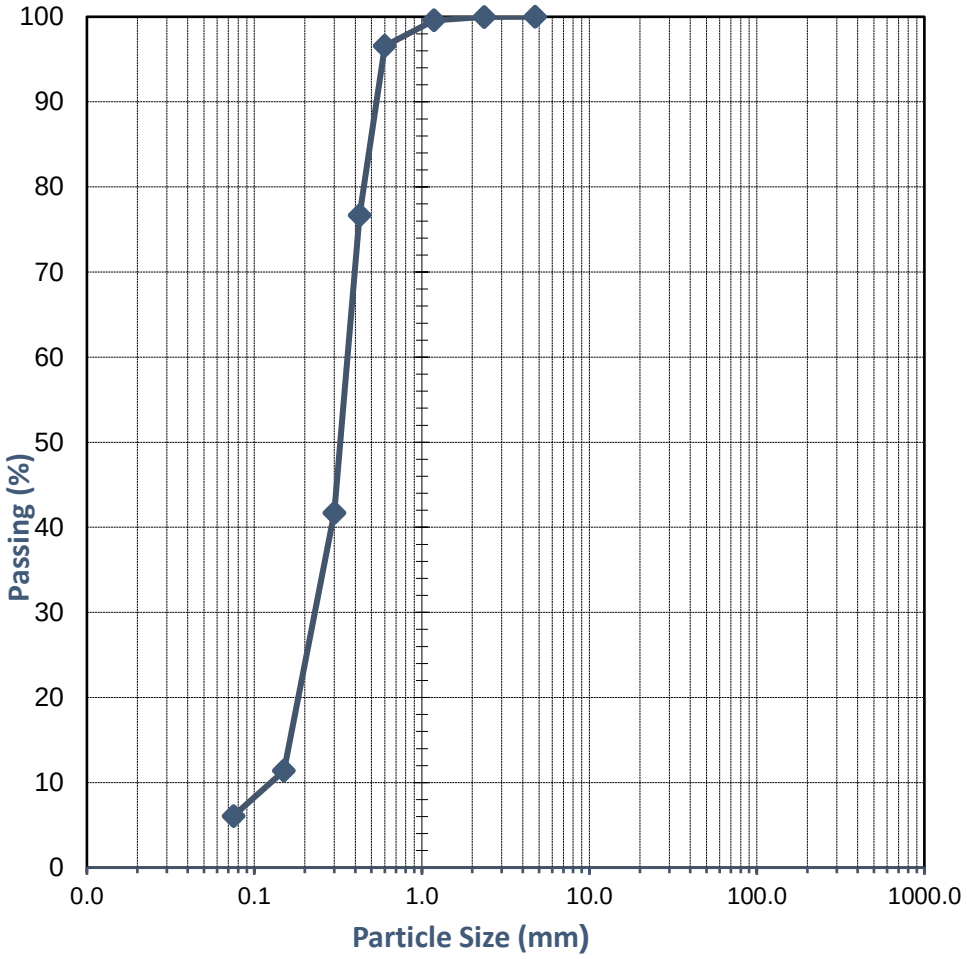
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3972_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3972
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP01 0-0.2M	*Date Tested:*	21/3-22/3/22

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	100
2.36	100
1.18	100
0.600	97
0.425	77
0.300	42
0.150	11
0.075	6



Comments:

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 22/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

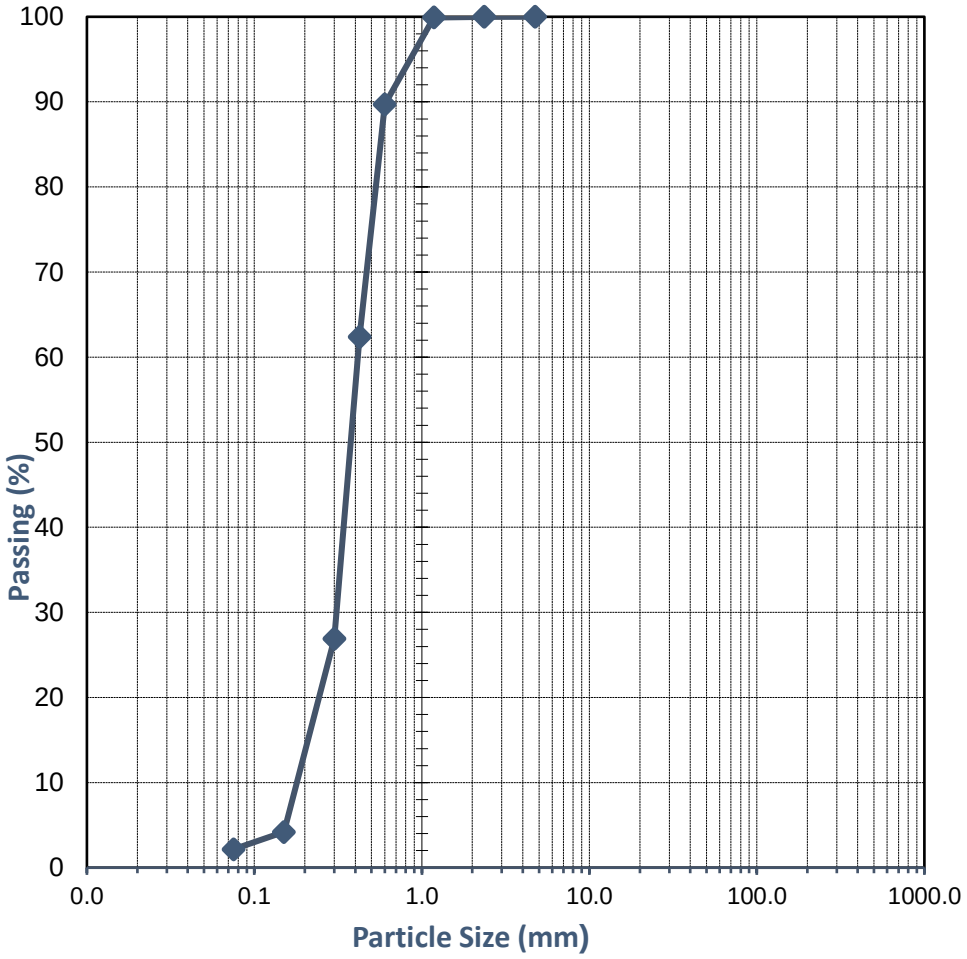
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3973_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3973
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP01 0.6-1m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	100
2.36	100
1.18	100
0.600	90
0.425	62
0.300	27
0.150	4
0.075	2



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

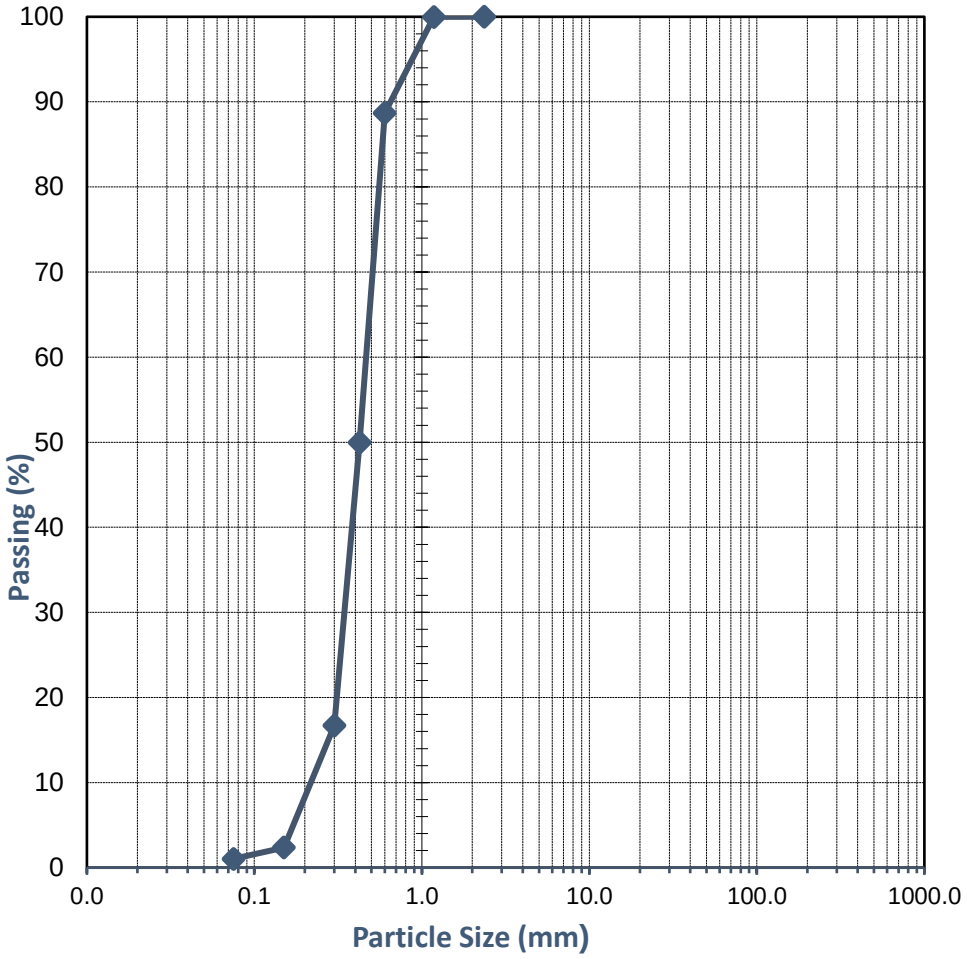
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3974_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3974
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP02 0.5-1m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	
2.36	100
1.18	100
0.600	89
0.425	50
0.300	17
0.150	2
0.075	1



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

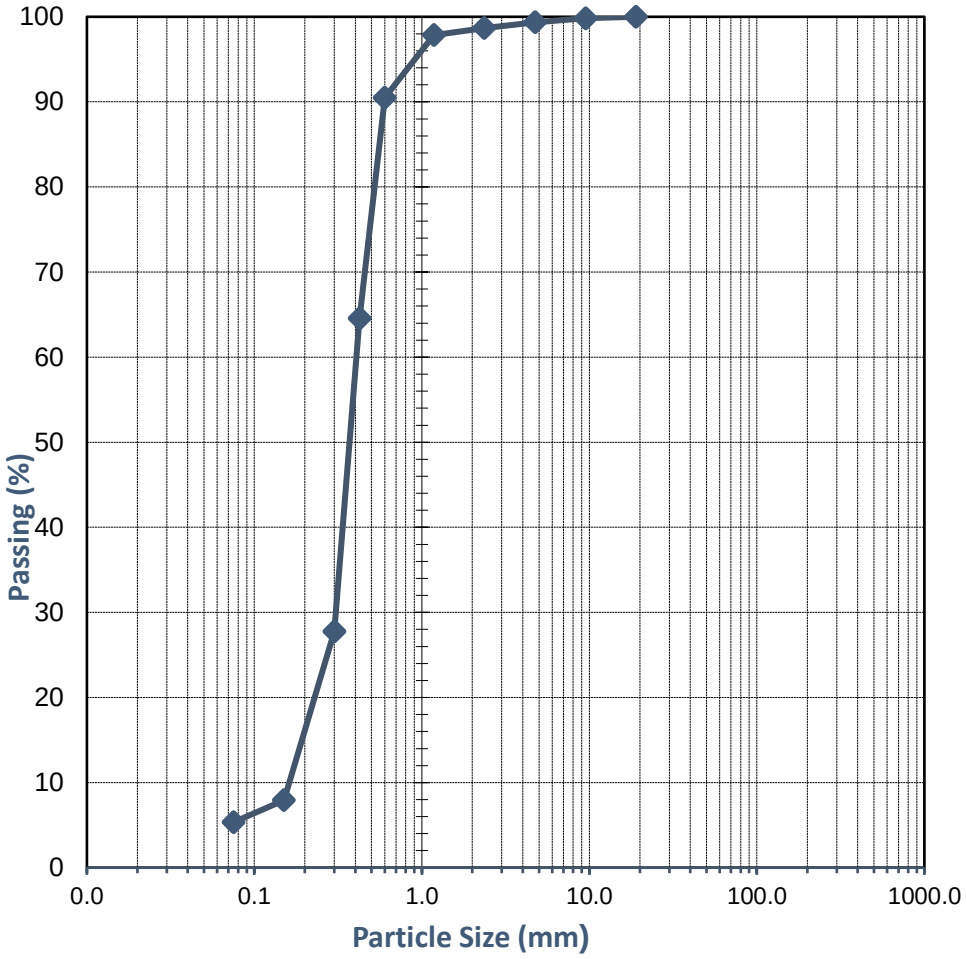
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3975_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3975
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP12 1-1.2m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	100
9.5	100
4.75	99
2.36	99
1.18	98
0.600	91
0.425	65
0.300	28
0.150	8
0.075	5



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

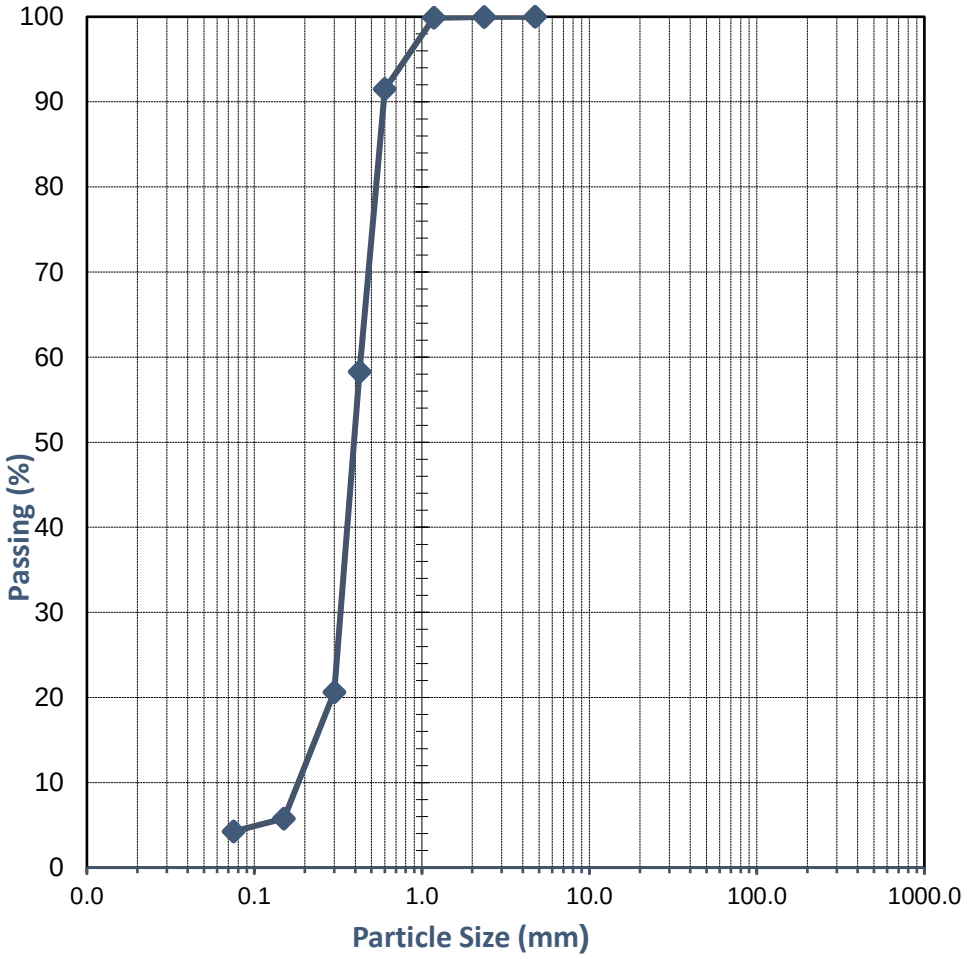
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3976_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3976
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP13 0.2-0.5m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	
4.75	100
2.36	100
1.18	100
0.600	92
0.425	58
0.300	21
0.150	6
0.075	4



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

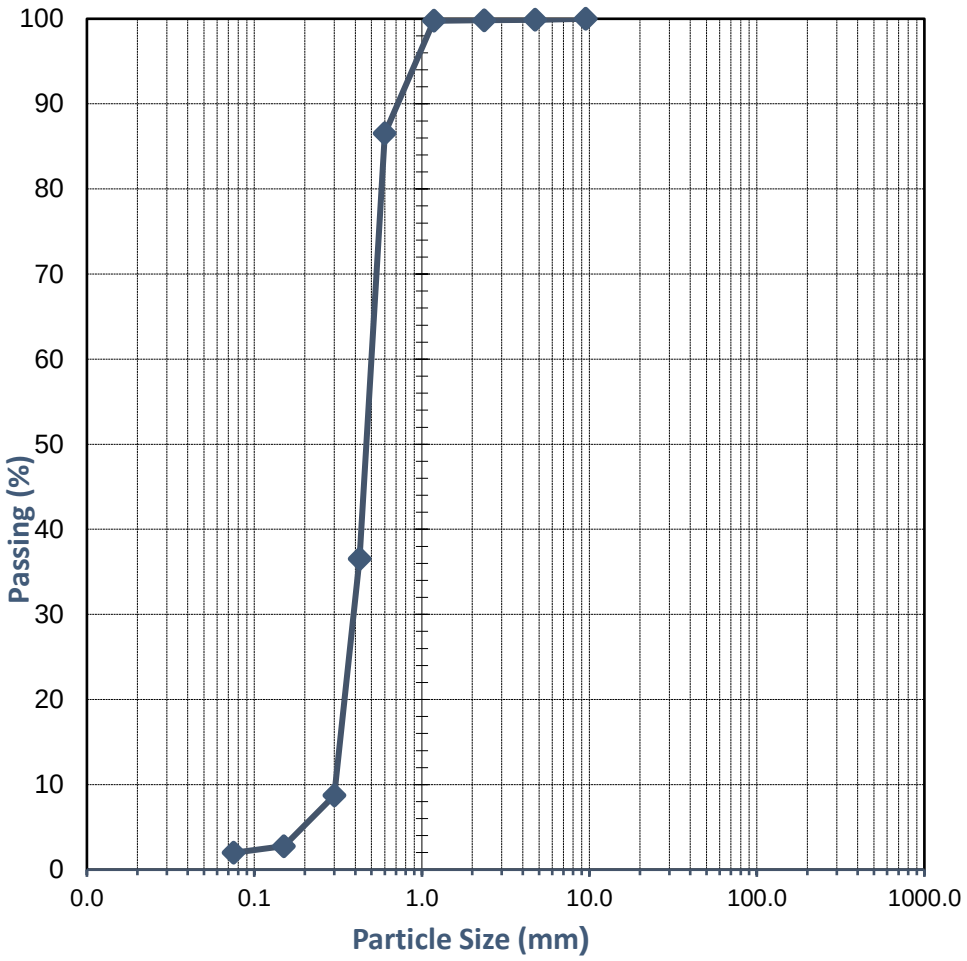
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3977_1_PSD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3977
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP17 0.2-0.5m	*Date Tested:*	21/03/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	
19.0	
9.5	100
4.75	100
2.36	100
1.18	100
0.600	87
0.425	37
0.300	9
0.150	3
0.075	2



Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 22/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - ASTM D2974-14 (Test Method C)

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3972_1_ORG
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3972
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	Various - See Below	*Date Tested:*	21-03-2022

TEST RESULTS - Organic Content

Sampling Method: Sampled by Client, Tested as Received

Testing Completed By: WGLS - JG

Furnace Temperature (°C): 440

Sample Number	Sample Identification	Ash Content (%)	Organic Content (%)
WG22.3972	TP01 0-0.2m	97.0	3.0
WG22.3973	TP01 0.6-1m	82.3	17.7
WG22.3974	TP02 0.5-1m	99.8	0.2
WG22.3975	TP12 1-1.2m	95.7	4.3
WG22.3976	TP13 0.2-0.5m	99.4	0.6
WG22.3977	TP17 0.2-0.5m	98.0	2.0

Comments:

Approved Signatory:

Name: Brooke Elliott

Date: 22-March-2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3972_1_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3972
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP01 0-0.2m	*Date Tested:*	21-03-2022

TEST RESULTS - Modified Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

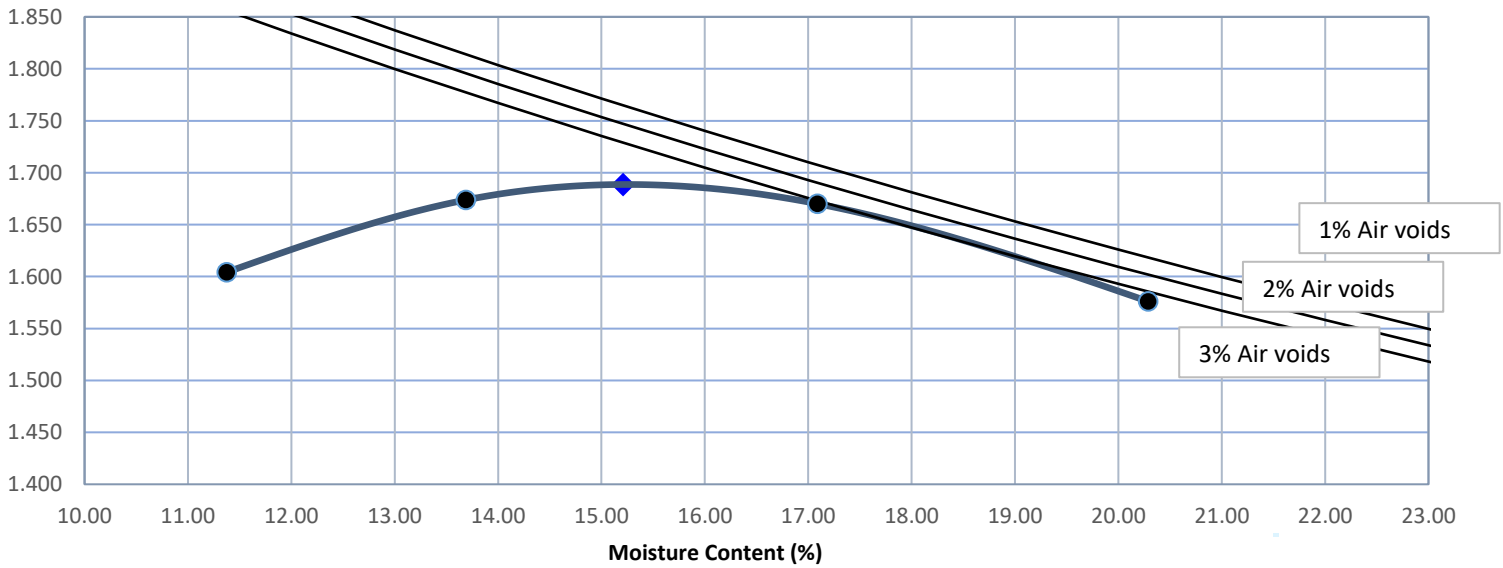
Sample Curing Time: 2 hrs

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	**11.4**	**13.7**	**17.1**	**20.3**	
Dry Density (t/m³)	**1.604**	**1.674**	**1.670**	**1.576**	

Dry Density (t/m³)



Modified Maximum Dry Density (t/m³) **1.69**

Optimum Moisture Content (%) **15.0**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.446 t/m³*

Approved Signatory:

Name: Brooke Elliott

Date: 22-March-2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3974_1_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3974
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP02 0.5-1m	*Date Tested:*	18/03/2022

TEST RESULTS - Modified Maximum Dry Density

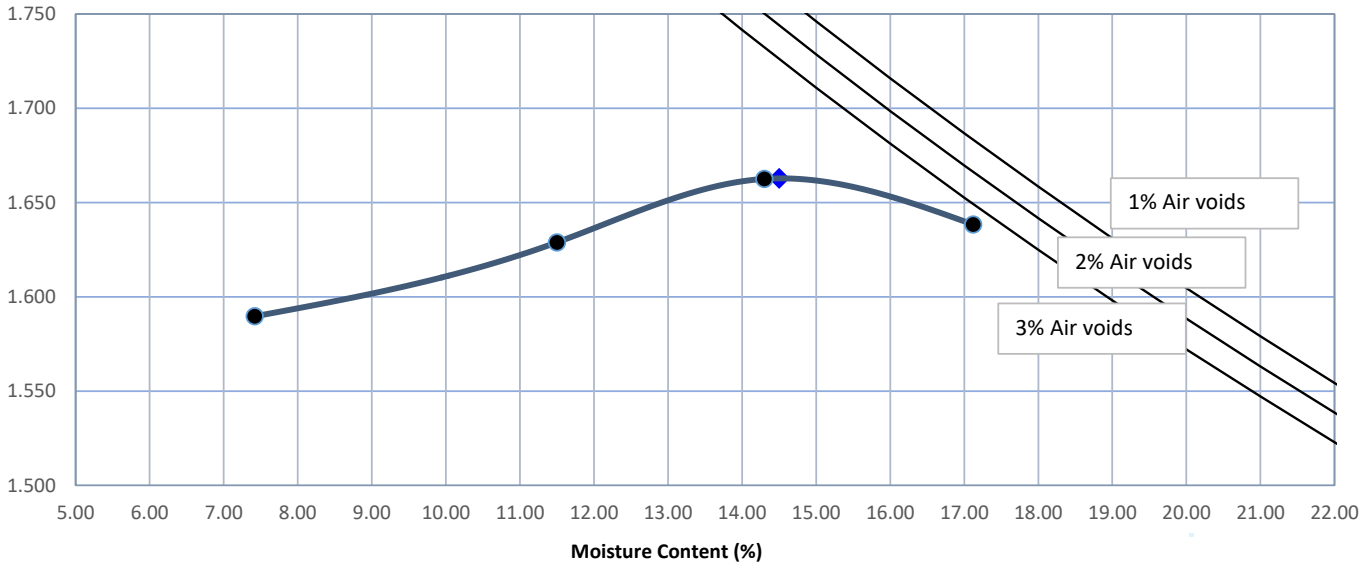
Sampling Method: Sampled by Client, Tested as Received

Sample Curing Time: 2 Hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	7.4	11.5	14.3	17.1	
Dry Density (t/m³)	1.590	1.629	1.663	1.638	



Modified Maximum Dry Density (t/m³) **1.66**

Optimum Moisture Content (%) **14.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.398 t/m³*

Approved Signatory:

Name: Cody O'Neill

Date: 21/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3975_2_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3975
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP12 1.0-1.2m	*Date Tested:*	21/03/2022

TEST RESULTS - Modified Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

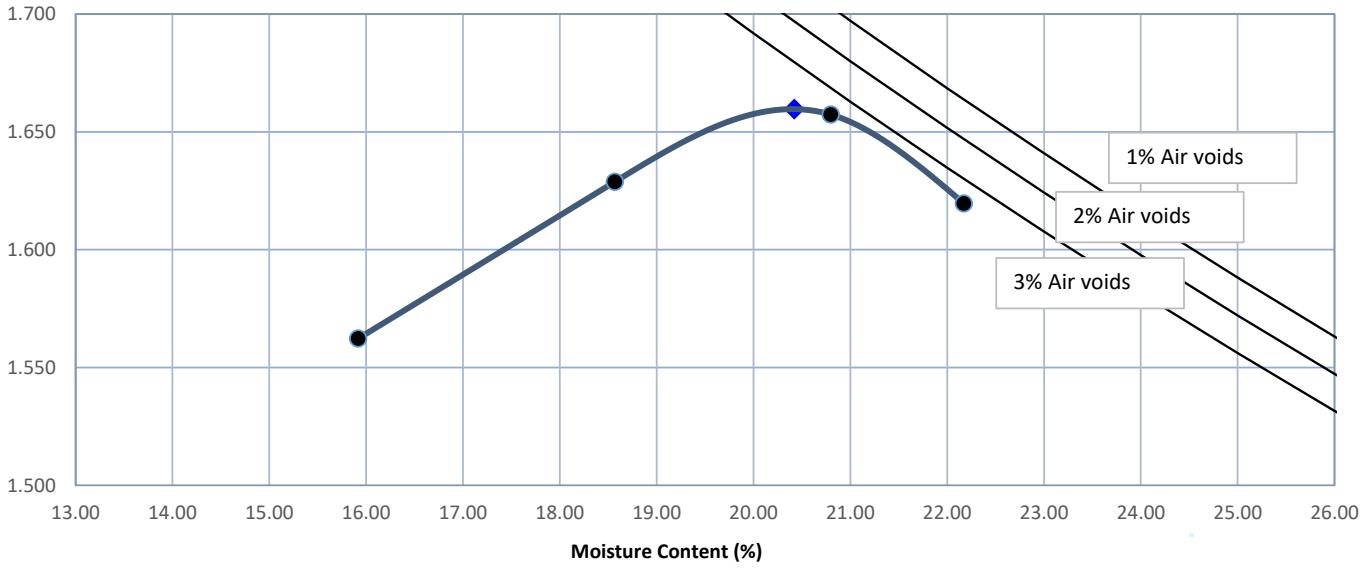
Sample Curing Time: 2 Hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	15.9	18.6	20.8	22.2	
Dry Density (t/m³)	1.562	1.629	1.657	1.620	

Dry Density (t/m³)



Modified Maximum Dry Density (t/m³) **1.66**

Optimum Moisture Content (%) **20.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.678 t/m³*

Report replaces WG22.3975_1_MMDD. Report reissued due to updated sample identification.

Approved Signatory:

Name: Cody O'Neill

Date: 23/March/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3976_1_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3976
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP13 0.2-0.5m	*Date Tested:*	18/03/2022

TEST RESULTS - Modified Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

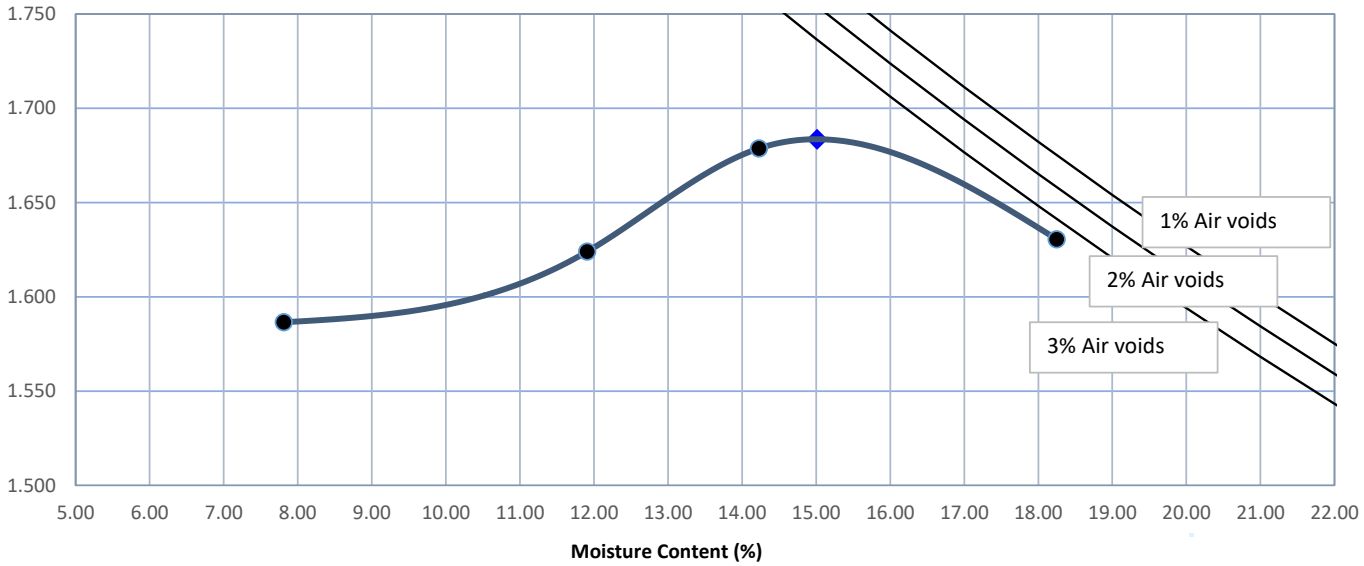
Sample Curing Time: 2 Hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	**7.8**	**11.9**	**14.2**	**18.2**	
Dry Density (t/m³)	**1.586**	**1.624**	**1.679**	**1.631**	

Dry Density (t/m³)



Modified Maximum Dry Density (t/m³) **1.68**

Optimum Moisture Content (%) **15.0**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.448 t/m³*

Approved Signatory:

Name: Cody O'Neill

Date: 21/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3977_1_MMDD
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3977
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP17 0.2-0.5m	*Date Tested:*	18/03/2022

TEST RESULTS - Modified Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

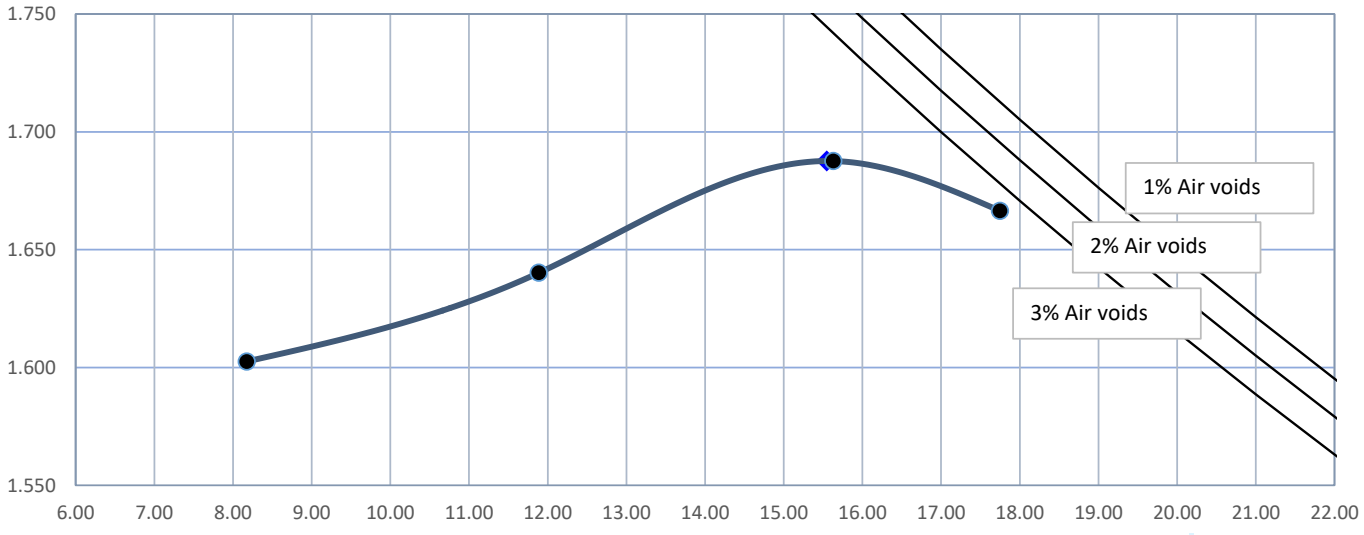
Sample Curing Time: 2 Hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	**8.2**	**11.9**	**15.6**	**17.7**	
Dry Density (t/m³)	**1.603**	**1.640**	**1.688**	**1.666**	

Dry Density (t/m³)



Modified Maximum Dry Density (t/m³) **1.69**

Optimum Moisture Content (%) **15.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.496 t/m³*

Approved Signatory:

Name: Cody O'Neill

Date: 21/March/2022

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Accreditation No. 20599

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

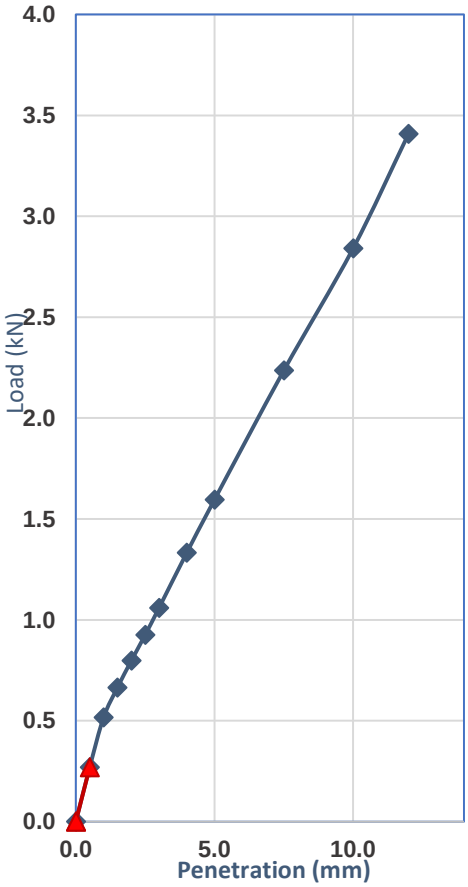
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3972_1_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3972
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP01 0-0.2m	*Date Tested:*	21/3-26/3/222

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	2.0
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.69	Optimum Moisture (%)	15.0
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.61	Moisture Content (%)	15.0
Density Ratio (%)	95.0	Moisture Ratio (%)	98.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.61	Dry Density Ratio (%)	95.0
Moisture Content (%)	19.0	Moisture Ratio (%)	125.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	16.6	Remaining Depth (%)	19.1

Correction applied to Penetration: 0mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 8%

Comments:

Approved Signatory: Coneill

Name: Cody O'Neill

Date: 28/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

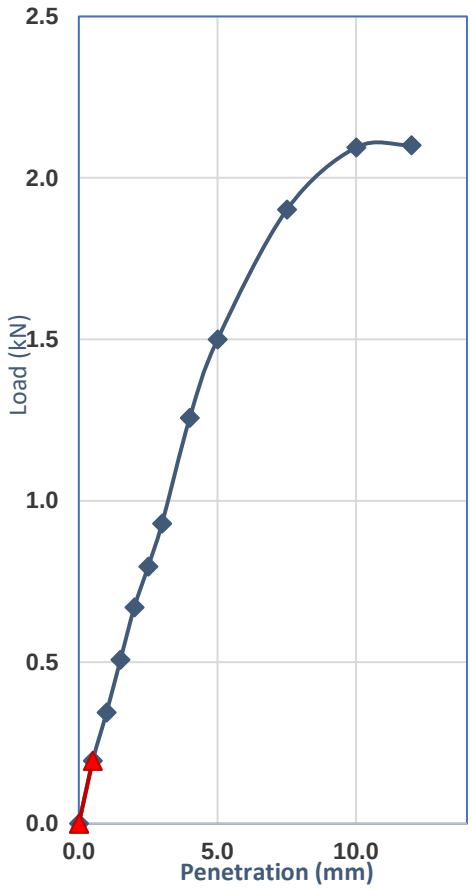
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3974_1_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3974
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP02 0.5-1m	*Date Tested:*	25/03/2022

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	3 hrs
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.66	Optimum Moisture (%)	14.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.58	Moisture Content (%)	14.9
Density Ratio (%)	95.0	Moisture Ratio (%)	102.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.58	Dry Density Ratio (%)	95.0
Moisture Content (%)	18.9	Moisture Ratio (%)	130.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	16.9	Remaining Depth (%)	17.5

Correction applied to Penetration: 0mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 8%

Comments:

Approved Signatory:

Name: Cody O'Neill

Date: 28/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

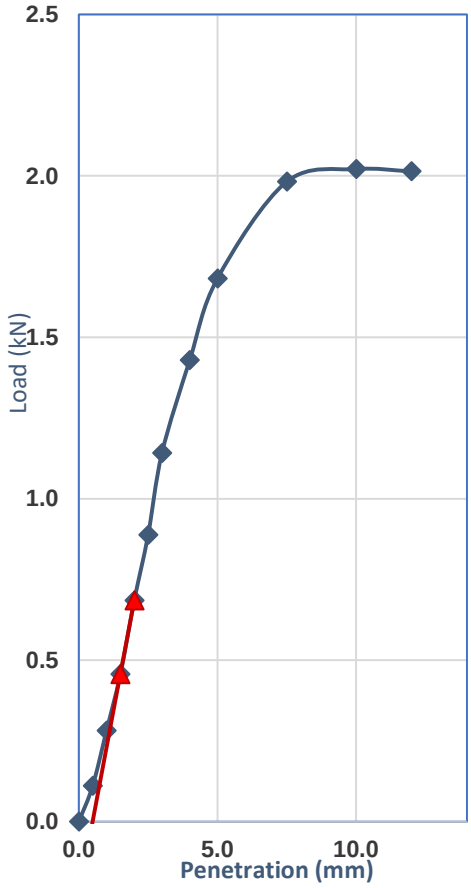
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3975_1_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3975
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP13 0.2-0.5m	*Date Tested:*	21/3-26/3/22

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	2.0
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.66	Optimum Moisture (%)	20.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.58	Moisture Content (%)	20.1
Density Ratio (%)	95.5	Moisture Ratio (%)	98.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.58	Dry Density Ratio (%)	95.5
Moisture Content (%)	23.9	Moisture Ratio (%)	117.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	22.4	Remaining Depth (%)	23.3

Correction applied to Penetration: 0.5mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 9%

Comments:

Approved Signatory:

Name: Cody O'Neill

Date: 28/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

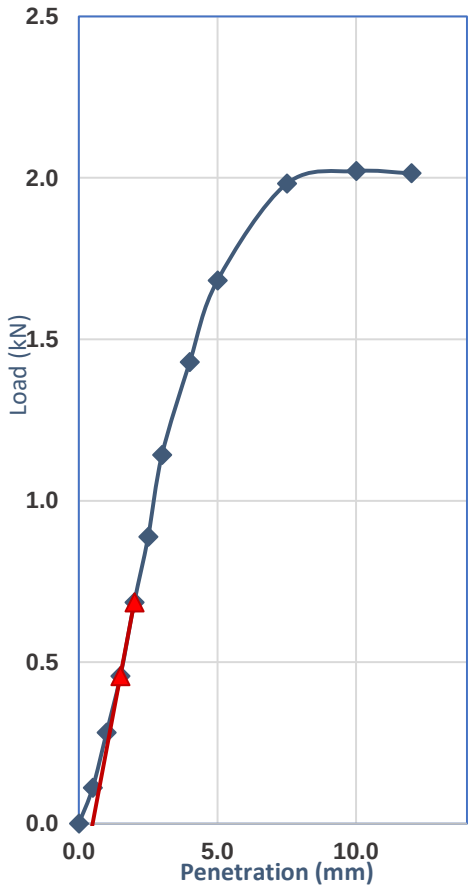
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3975_2_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3975
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP12 1.0-1.2m	*Date Tested:*	21/3-26/3/22

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	2.0
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.66	Optimum Moisture (%)	20.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.58	Moisture Content (%)	20.1
Density Ratio (%)	95.5	Moisture Ratio (%)	98.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.58	Dry Density Ratio (%)	95.5
Moisture Content (%)	23.9	Moisture Ratio (%)	117.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	22.4	Remaining Depth (%)	23.3

Correction applied to Penetration: 0.5mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 9%

Comments: Report replaces WG22.3975_1_SCBR. Report reissued due to updated sample identification.

Approved Signatory:

Name: Cody O'Neill

Date: 28/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

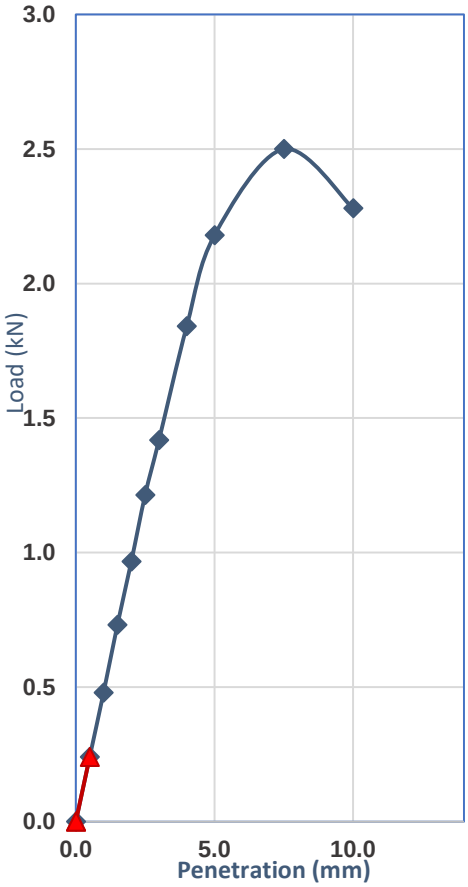
Client:	CMW Geosciences	*Ticket No.*	S5771
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.3977_1_SCBR
Project:	Home Fire Studio, Malaga	*Sample No.*	WG22.3977
Location:	Malaga	*Date Sampled:*	Not Specified
Sample Identification:	TP17 0.2-0.5m	*Date Tested:*	18/3-25/3/22

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Sand

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	3.5 hrs
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.69	Optimum Moisture (%)	15.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.60	Moisture Content (%)	15.8
Density Ratio (%)	95.0	Moisture Ratio (%)	102.0

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	4.50	Measured Swell (%)	0.0
Dry Density (t/m³)	1.60	Dry Density Ratio (%)	95.0
Moisture Content (%)	18.3	Moisture Ratio (%)	118.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	16.4	Remaining Depth (%)	17.9

Correction applied to Penetration: 0mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 11%

Comments:

Approved Signatory:

Name: Cody O'Neill

Date: 28/March/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

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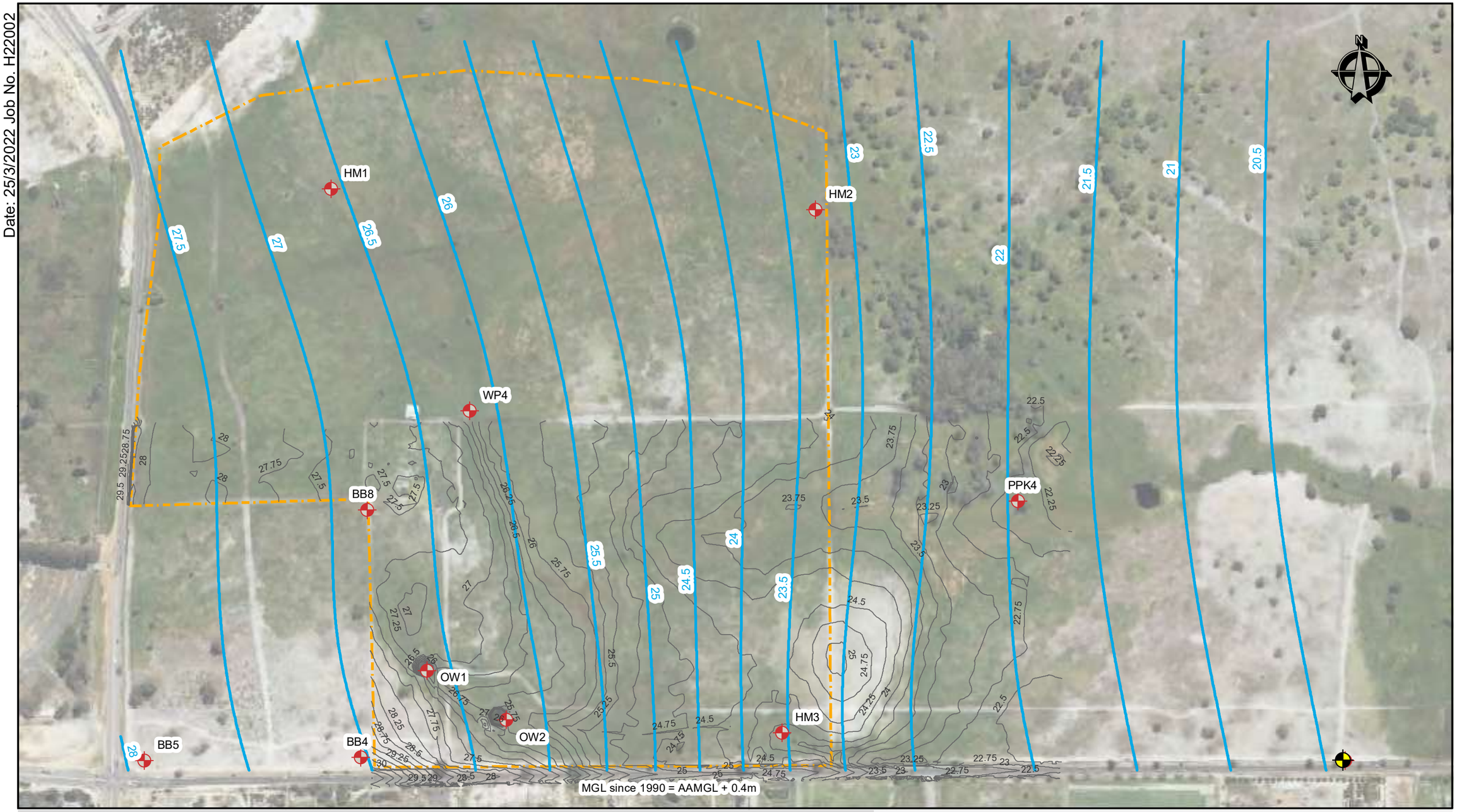
Appendix E
Refined Groundwater Mapping

Date: 25/3/2022 Job No. H22002



Site

MNG Survey Contours 0.25m (mAHD)

DWER Historical Maximum Groundwater Contours (mAHD)

AAMGL GW Contours (mAHD)
GW levels based on MNG Survey

MGL since 1990 = AAMGL + 0.4m

0 50 100 150 200 Meters

hyd2o

Home Fire Studios Malaga Hydrological Due Diligence

Groundwater Mapping Refinement Based on Local Data

Figure 2

Appendix D – Stormwater Drainage Drawing

N

BASIN 1
TOP OF BASIN RL 26.60
BOTTOM OF BASIN RL 26.00
TOP WATER LEVEL 26.50
VOLUME 575m³
BATTER SLOPE 1:4

BASIN 2
TOP OF BASIN RL 26.30
BOTTOM OF BASIN RL 25.50
TOP WATER LEVEL 25.95
VOLUME 600m³
BATTER SLOPE 1:4

BASIN 3
TOP OF BASIN RL 26.30
BOTTOM OF BASIN RL 25.50
TOP WATER LEVEL 25.95
VOLUME 325m³
BATTER SLOPE 1:4

BASIN 4
TOP OF BASIN RL 26.30
BOTTOM OF BASIN RL 25.00
TOP WATER LEVEL 25.55
VOLUME 375m³
BATTER SLOPE 1:4

BASIN 5
TOP OF BASIN RL 26.30
BOTTOM OF BASIN RL 24.90
TOP WATER LEVEL 25.55
VOLUME 375m³
BATTER SLOPE 1:4

BASIN 6
TOP OF BASIN RL 25.20
BOTTOM OF BASIN RL 24.50
TOP WATER LEVEL 25.00
VOLUME 80m³
BATTER SLOPE 1:4

BASIN 7
TOP OF BASIN RL 25.20
BOTTOM OF BASIN RL 24.00
TOP WATER LEVEL 25.10
VOLUME 1100m³
BATTER SLOPE 1:4

BASIN 8
TOP OF BASIN RL 25.50
BOTTOM OF BASIN RL 24.50
TOP WATER LEVEL 25.00
VOLUME 325m³
BATTER SLOPE 1:4

BASIN 9
TOP OF BASIN RL 25.20
BOTTOM OF BASIN RL 24.00
TOP WATER LEVEL 25.00
VOLUME 700m³
BATTER SLOPE 1:4

BASIN 10
TOP OF BASIN RL 25.20
BOTTOM OF BASIN RL 23.75
TOP WATER LEVEL 25.10
VOLUME 9000m³
BATTER SLOPE 1:4

U/S INV 25.90
900 x 300 / 0.50%
12.0m / CULVERT
D/S INV 25.80

U/S INV 25.80
900 x 300 / 0.50%
21.6m / CULVERT (x2)
D/S INV 25.70

U/S INV
900 x 300 / 0.50%
125.5m / CULVERT
D/S INV

U/S INV 25.30
900 x 300 / 0.50%
14.4m / CULVERT (x2)
D/S INV 25.20

U/S INV 25.20
900 x 300 / 0.50%
45.6m / CULVERT
D/S INV 25.10

U/S INV 24.30
900 x 300 / 0.50%
24.0m / CULVERT (x3)
D/S INV 24.10

U/S INV 24.40
Φ600 / 0.50%
17.8m / RCP
D/S INV 24.30

U/S INV 24.30
900 x 300 / 0.50%
14.4m / CULVERT (x3)
D/S INV 24.21

U/S INV 24.80
900 x 300 / 0.50%
9.6m / CULVERT
D/S INV 24.70

U/S INV 24.80
900 x 300 / 0.50%
9.6m / CULVERT
D/S INV 24.70

U/S INV 25.05 Φ450 / 0.50% 21.9m / RCP D/S INV 24.94
U/S INV 24.94 Φ450 / 0.50% 31.8m / RCP D/S INV 24.78
U/S INV 24.78 Φ450 / 0.50% 34.5m / RCP D/S INV 24.60
U/S INV 24.60 Φ450 / 0.50% 46.3m / RCP D/S INV 24.37
U/S INV 24.37 Φ600 / 0.50% 14.4m / RCP D/S INV 24.30
U/S INV 24.41 Φ600 / 0.67% 13.4m / RCP D/S INV 24.30
U/S INV 24.58 Φ450 / 0.67% 25.5m / RCP D/S INV 24.41
U/S INV 24.82 Φ450 / 0.67% 35.5m / RCP D/S INV 24.58
U/S INV 25.16 Φ450 / 1.00% 34.5m / RCP D/S INV 24.82

U/S INV 24.88 Φ450 / 0.50% 19.9m / RCP D/S INV 24.78
U/S INV 25.00 Φ450 / 0.50% 22.8m / RCP D/S INV 24.88
U/S INV 25.11 Φ450 / 0.50% 22.8m / RCP D/S INV 25.00
U/S INV 25.22 Φ450 / 0.50% 22.8m / RCP CLASS 4 D/S INV 25.11
U/S INV 25.34 Φ450 / 0.50% 22.8m / RCP CLASS 4 D/S INV 25.22

U/S INV 24.87 Φ450 /1.00% 25.6m / RCP D/S INV 24.61
U/S INV 25.10 Φ450 / 1.00% 23.0m / RCP D/S INV 24.87
U/S INV 25.10 Φ450 / 0.50% 23.1m / RCP D/S INV 24.98
U/S INV 24.98 Φ450 / 0.50% 34.5m / RCP D/S INV 24.81
U/S INV 24.95 Φ450 / 0.50% 12.8m / RCP D/S INV 24.88
U/S INV 24.81 Φ450 / 0.50% 12.8m / RCP D/S INV 24.75

U/S INV 24.95 Φ450 / 0.67% 19.9m / RCP D/S INV 24.82
U/S INV 25.10 Φ450 / 0.67% 22.8m / RCP D/S INV 24.95
U/S INV 25.10 Φ450 / 1.00% 22.8m / RCP D/S INV 24.87
U/S INV 24.87 Φ450 / 1.00% 22.8m / RCP D/S INV 24.64
U/S INV 24.64 Φ450 / 1.00% 20.4m / RCP D/S INV 24.45

U/S INV 25.10 Φ450 / 1.00% 31.8m / RCP D/S INV 24.78

U/S INV 25.10 Φ300 / 0.50% 30.8m / RCP D/S INV 24.95
U/S INV 24.75 Φ450 / 0.50% 33.6m / RCP D/S INV 24.58
U/S INV 24.58 Φ450 / 0.50% 35.5m / RCP D/S INV 24.40

U/S INV 25.00 Φ300 / 0.50% 14.1m / RCP D/S INV 24.93
U/S INV 24.93 Φ300 / 0.50% 13.4m / RCP D/S INV 24.86
U/S INV 24.86 Φ300 / 0.50% 22.5m / RCP D/S INV 24.75
U/S INV 24.75 Φ300 / 0.50% 27.1m / RCP D/S INV 24.61
U/S INV 24.61 Φ300 / 0.50% 28.9m / RCP D/S INV 24.47
U/S INV 24.47 Φ300 / 0.50% 33.4m / RCP D/S INV 24.30

U/S INV 25.00 Φ300 / 1.00% 15.0m / RCP D/S INV 24.85
U/S INV 24.85 Φ300 / 1.00% 5.0m / RCP D/S INV 24.80

Φ525mm RCP, 28.3m LONG

FUTURE ROAD RESERVE BOUNDARY

MARSHALL ROAD

BORE

NOTES

1. DO NOT SCALE DRAWINGS.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL GRATED GULLY PITS ON ROAD PAVEMENTS TO HAVE CLASS D GRATED LIDS.

LEGEND

- CADASTRAL BOUNDARY
- DRAINAGE PIPE WITH FLOW ARROW
- CULVERT WITH FLOW ARROW
- GRATED GULLY PIT
- MANHOLE
- PRECAST CONCRETE HEADWALL WITH 20m² OF MORTARED STONE PITCHING
- (G1) DRAINAGE STRUCTURE NUMBER
- U/S INV 25.11 Φ450 / 0.50% 22.8m / RCP D/S INV 25.00 — DRAINAGE INFORMATION
  - UPSTREAM INVERT LEVEL (m)
  - DIAMETER (mm) / GRADE
  - LENGTH (m) / TYPE & CLASS
  - DOWNSTREAM INVERT LEVEL (m)

WARNING
BEWARE OF UNDERGROUND/OVERHEAD SERVICES. THE LOCATIONS OF UNDERGROUND/OVERHEAD SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

BEFORE YOU DIG www.byda.com.au

0 5 10 15 20 25 30 35 40 45m
SCALE 1:750 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
C	08.03.23	BONEYARD MODIFIED	CB
B	17.02.23	ISSUED FOR DESIGN DEVELOPMENT	CB
A	08.02.23	ISSUED FOR INFORMATION	CB

REV	DATE	DESCRIPTION	RVD

CLIENT: Built

Perth *Office*—
Level 19, Kings Square 1
556 Wellington St, Perth WA 6000
P /+61 8 6364 3300
E / info@bgeeng.com
bgeeng.com—

BG&E

PROJECT: HOME FIRE FILM STUDIOS
MARSHALL ROAD, MALAGA WA 6090

STATUS: ISSUED FOR DESIGN DEVELOPMENT
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
JS	CB		

DATUM	GRID	SCALE	
AHD	PCG94	1:750	AT A1 SIZE

TITLE: OVERALL DRAINAGE PLAN

PROJECT No: P21062
DRAWING No: SPF-BG&E-CV-00-354-010
REV: C

P:\P21062 FREMANTLE FILM STUDIOS\100 DRAWINGS\102 CIVIL\AUTOCAD\SPF-BG&E-CV-00-354-010.DWG
8/03/2023 11:38:33 AM

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