REPORT TO

FOREST CENTRAL BUSINESS PARK PTY LTD

ON

HYDROGEOLOGICAL INVESTIGATION AND ANALYSIS

FOR

PROPOSED MEDICAL CENTRE

AT

Lot 7, DP1020015,
FOREST CENTRAL BUSINESS PARK,
49 FRENCHS FOREST ROAD EAST,
FRENCHS FOREST, NSW

Date: 3 August 2020
Ref: 32505BMrpt2

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For and on behalf of
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DOCUMENT REVISION RECORD

Report Reference	Report Status	Report Date
32505BMrpt2	Final Report	3 August 2020

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ATTACHMENTS

1 INTRODUCTION

This report presents the results of a hydrogeological investigation and analysis for the proposed medical centre known as 'Project Maui Oncology' at Lot 7, DP1020015, which is part of Forest Central Business Park, 49 Frenchs Forest Road East (also known as 502B Warringah Road), Frenchs Forest, NSW. A site location plan is presented as Figure 1. The investigation was commissioned by Ms Joanna Karamihas of Ascot Project Management, on behalf of Forest Central Business Park Pty Ltd. The commission dated 30 June 2020 was on the basis of Scope Items 2.2 and 2.3 of our fee proposal (Ref: P52067BM dated 23 June 2020).

We previously completed a geotechnical investigation of the site as detailed in our report dated 17 February 2020 (Ref: 32505BMrpt Rev4). Reference should be made to our previous geotechnical investigation report for the subsurface profile and our recommendations for design and construction of the proposed development. The purpose of this additional investigation was to install 3 groundwater monitoring wells in order to record seepage inflows to estimate groundwater permeability and record groundwater levels. The results of the investigation were then used to carry out 2D seepage analysis of a section through the proposed basement to assess the potential seepage volumes into the basement excavation during construction and in the long term. The analysis was carried out using the 2D finite element computer program Seep/W 2019 (from Geo-Slope International Ltd).

The groundwater quality has also been assessed by JK Environments as detailed in their separate report, Ref E32505BTrpt3 dated August 2020, which also provides advice on any treatment required prior to potential discharge of groundwater from the site.

2 PROPOSED DEVELOPMENT

From the previously supplied DA drawings (Project No. 856, Drawing No. DA-099 $^{Rev\ 1}$, 100 to 103 $^{Rev\ 6}$, and 300 & 301 $^{Rev\ 4}$, all dated 4 December 2019) prepared by Team 2 Architects we understand the development includes excavation for 4 basement levels, the lowest being at RL 146.95m requiring excavation to depths ranging from about 12m to 14m below the existing surface levels. The proposed basement outline is indicated on Figure 2.

3 PREVIOUS GEOTECHNICAL INVESTIGATION

We previously carried out a detailed geotechnical investigation and report on this site for the proposed development (Ref: 32505BMrpt Rev4, dated 17 February 2020). The geotechnical investigation included the drilling of 11 boreholes (BH1 to BH9 and BH101 and BH102) to maximum depths of 17.3m. Reference should be made to our previous report for detailed descriptions of the subsurface conditions encountered. However, copies of the boreholes logs are provided in Appendix A, together with Section B. Section A is provided as Figure 6, which has had the monitoring wells and measured groundwater levels added to the section provided within our previous geotechnical investigation report.

In summary, the subsurface profile comprises silty clay fill overlaying residual silty clay grading into weathered siltstone at depths of about 1.4m to 3.2m below surface levels. The weathered siltstone was underlain by sandstone bedrock below depths of 4.75m to 5.12m.

A groundwater monitoring well was installed in BH7 as part of our previous geotechnical investigation and groundwater was measured at a depth of 5.5m on the completion of core drilling (where water is introduced in the ground as part of the drilling process). The well was then pumped dry to allow the groundwater to recharge, with the recharge rate measured using a data logger to assess the permeability of the weathered sandstone. A site visit was again made 26 days after pumping it dry and groundwater was measured in the well at a depth of 7.05m (≈RL152.3m). A final site visit was made on 3 days after pumping and groundwater was measured at a depth of 7.8m (≈RL151.5m).

Based on the recharge rate into the well in BH7, the permeability of the weathered sandstone bedrock was calculated to be about 6 x 10^{-8} m/s, which is in the order expected for sandstone bedrock with relatively few defects. The actual water level measured may have been artificially high due to the water used in the drilling of the borehole.

Since the above geotechnical investigation was completed the well in BH7 has been destroyed by others.

4 ADDITIONAL GROUNDWATER INVESTIGATION AND MONITORING

In accordance with WaterNSW guidelines, and to assist with the groundwater seepage analysis the following was undertaken:

- Installation of 3 new groundwater monitoring wells (M201, M202 and M203) in auger drilled boreholes at the locations shown on the attached Figure 2. No water was used in the drilling process of these holes and all wells were dry on installation. The well construction details are presented on the attached Monitoring Well logs. The subsurface profile within the wells was not logged in detail due to the amount of geotechnical information already available. Therefore, the descriptions given on the monitoring well logs are approximate only,
- Continuous groundwater level monitoring using electronic data loggers in each of the wells and a site specific barometer, over an approximate 2 week period between 3 July and 16 July 2020, and
- Using the recorded infiltration from initially dry conditions to steady water levels to assess the permeability of the sandstone. The results of the groundwater monitoring have been plotted against rainfall and are presented in the attached Figures 3 to 5.

The results of the above monitoring have been used to develop a groundwater flow direction and approximate contour plan, as shown in Figure 2. The contours are very approximate as they are based on only three monitoring well locations inside the site boundaries. The water levels are also shown in the attached Section A, Figure 6.

Based on the results, the direction of groundwater flow appears to be down towards the south, from RL152.0m at M201 to RL150.0m at M203, as shown on Figure 2.

Using established correlations, we have estimated the bulk permeability of the weathered sandstone within each of the three monitoring wells. The estimated coefficients of permeability are summarised in the table below.

Well	Material	Coefficient Permeability, k, Range (m/sec)
M201	Sandstone Bedrock	1×10^{-7} to 5×10^{-8}
M202	Sandstone Bedrock	9×10^{-8} to 4×10^{-8}
M203	Sandstone Bedrock	3×10^{-8} to 1×10^{-8}

The total range for each of the three wells was 1×10^{-7} to 1×10^{-8} m/sec.

5 HYDROGEOLOGICAL MODEL

5.1 Subsurface Profile

Based on the results of the geotechnical investigation and the details of the proposed development, a geotechnical model was developed as shown in the attached Figure 7. The section was predominantly based on Section A.

5.2 Hydraulic Model and Boundary Conditions

The saturated coefficient of permeability values adopted in the geotechnical model for the rock unit within which groundwater was identified were assessed based on the calculated coefficients given in Section 4 above. The results indicate a coefficient of permeability ranging from 1×10^{-7} to 1×10^{-8} m/sec and the analysis has been completed by varying the coefficient of permeability within the estimated range. The results of the analysis are not sensitive to the permeability of the fill, soil, and siltstone as the groundwater table is entirely within the sandstone bedrock profile and as such the permeability of these layers has not been varied.

Based on experience, seepage through the rock mass would dominantly occur within the defects. The most common continuous defect in the Hawksbury Sandstone and Ashfield Shale are near horizontal bedding partings. Therefore, it is appropriate to apply a lower vertical permeability value than that of the horizontal permeability. Therefore, for the purposes of the analysis we have varied the ratio of vertical to horizontal permeability (k_y/k_x) from 0.1 to 0.5.

The groundwater table adopted for the analysis has been taken as the measured groundwater level within the wells of RL152m at the northern end of the site to RL150m at the southern end. As the model boundaries extend beyond the site boundaries, the adopted groundwater level was extrapolated to the model boundaries. In order to model a potential rise in the groundwater level, analysis has also been completed for a groundwater level 1m higher than the measured levels, i.e. RL153m at the northern end to RL151m at the southern end.

5.3 Shoring System

We expect the shoring system around the perimeter of the proposed basement will likely be a soldier pile shoring system with reinforced shotcrete panels. Therefore, seepage will flow between the piles. In the permanent case we have assumed that drainage placed at the rear of the shotcrete panels will collect seepage and divert the seepage to an underfloor drainage system. As a result we have modelled the excavation to allow seepage to flow freely from the excavation faces and base.

If the basement was to be tanked, the temporary soldier pile shoring system would allow the same temporary drainage so the same seepage model and results which is expressed as a rate (ML/year) would apply to a temporary dewatering case. The total estimated volume of seepage during the construction period may be determined by multiplying the estimated seepage by the length of the construction period.

6 RESULTS OF ANALYSIS

As discussed above, several analysis cases have been carried out by varying the coefficient of permeability, the ratio of vertical permeability to horizontal permeability and the groundwater level. An example of the plots showing the Total Head Contours and the Water Flow Contours from the analysis for Case 1.1 are presented as Figures 8 and 9, respectively. For each case we have assessed the expected inflow for the section per metre width and then calculated the total inflow by multiplying the inflow through the base by the approximate average width of excavation of about 35m and the inflow through the sides by the permitter of the basement of about 70m.

Case	Groundwater Level (RLmAHD)	Horizontal Permeability k_x (m/sec)	K_y/K_x	Rate of Inflow, Q (ML/yr)
1.1 Measured groundwater levels, highest calculated permeability, lowest vertical permeability	152 to 150	1×10^{-7}	0.1	0.4
1.2 Measured groundwater levels, highest calculated permeability, highest vertical permeability	152 to 150	1×10^{-7}	0.5	0.9
1.3 Measured groundwater levels, lowest calculated permeability, lowest vertical permeability	152 to 150	1×10^{-8}	0.1	0.04
1.4 Measured groundwater levels, lowest calculated permeability, highest vertical permeability	152 to 150	1×10^{-8}	0.5	0.1
2.1 Elevated groundwater levels, highest calculated permeability, lowest vertical permeability	153 to 151	1×10^{-7}	0.1	0.4
2.2 Elevated groundwater levels, highest calculated permeability, highest vertical permeability	153 to 151	1×10^{-7}	0.5	1.0

Case	Groundwater Level (RLmAHD)	Horizontal Permeability k_x (m/sec)	K_y/K_x	Rate of Inflow, Q (ML/yr)
2.3 Elevated groundwater levels, lowest calculated permeability, lowest vertical permeability	153 to 151	1×10^{-8}	0.1	0.04
2.4 Elevated groundwater levels, lowest calculated permeability, highest vertical permeability	153 to 151	1×10^{-8}	0.5	0.1

The above results show little difference in the total seepage volume with variations in the groundwater level, or the ratio of vertical permeability to horizontal permeability. The main parameter that affects the measured seepage is the permeability adopted for the weathered sandstone.

7 COMMENTS

The results of the seepage analysis show that for the measured range of permeability of the weathered sandstone that seepage into the basement for the measured groundwater is expected to be in the order of 0.1ML/year to 0.9ML/year. When the groundwater levels were raised by 1m the estimated seepage into the basement was of about the same order of 0.1ML/year to 1ML/year.

We note that since the basement will be excavated into the sandstone bedrock the flow will occur through defects, such as joints and bedding parting, within the rock and will vary throughout the excavation due to the jointing present in different areas of the excavation. The estimates given above assume homogenous materials and in practice lower and higher inflows may be experienced. We recommend that the inflow into the excavation by monitored during construction.

All the analysed inflows are well below 3ML/year, which in this regard would comply with the WaterNSW exemption from a Construction Dewatering Licence, as detailed in the WaterNSW Fact Sheet provided in Appendix B.

8 GENERAL COMMENTS

The analysis detailed in this report is only related to seepage analysis and not stability analysis or design of the shoring system or other geotechnical issues relating to the proposed development. Reference should be made to the geotechnical investigation report for comments on other geotechnical issues.

Occasionally, the subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on

our report. However, there may be design features we are not aware of or have not commented on for a variety of reasons. The designers should satisfy themselves that all the necessary advice has been obtained. If required, we could be commissioned to review the geotechnical aspects of contract documents to confirm the intent of our recommendations has been correctly implemented.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in this report then all recommendations should be reviewed. Copyright in this report is the property of JK Geotechnics. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

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MONITORING WELL LOG

Borehole No.
M201
1 / 2

Client: FOREST CENTRAL BUSINESS PARK PTY LTD

Project: PROPOSED MEDICAL CENTRE

Location: LOT 7 DP1020015, FRENCHS FOREST ROAD EAST, FRENCHS FOREST, NSW

Job No.: 32505BM **Method:** SPIRAL AUGER **R.L. Surface:** ~160.3 m

Date: 3/7/20 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** W.S./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Well Details	Remarks and Well Details
DRY ON COMPLETION						160	0			FILL: /Soil. Refer to nearest borehole log (BH8) for description				1	Gatic Cover
															Concrete
						159	1								
															50mm DIA. PVC Standpipe
						158	2								
															Cuttings
						157	3								
							4		-	SANDSTONE:					
						156									
							5								Bentonite
						155									
							6								
						154									Start of Class 18 Machine Slotted Screen

JKGeotechnics

MONITORING WELL LOG

Borehole No.
M201
2 / 2

Client: FOREST CENTRAL BUSINESS PARK PTY LTD

Project: PROPOSED MEDICAL CENTRE

Location: LOT 7 DP1020015, FRENCHS FOREST ROAD EAST, FRENCHS FOREST, NSW

Job No.: 32505BM **Method:** SPIRAL AUGER **R.L. Surface:** ~160.3 m

Date: 3/7/20 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** W.S./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Well Details	Remarks and Well Details
						153	8		-	SANDSTONE: *(continued)*					
						152									
							9								
						151									2mm Sand
							10								
						150									
							11								
						149									
							12								
						148									
							13								
						147									End Cap
										END OF BOREHOLE AT 13.50 m					

JKGeotechnics

MONITORING WELL LOG

Borehole No.
M202
1 / 2

Client: FOREST CENTRAL BUSINESS PARK PTY LTD

Project: PROPOSED MEDICAL CENTRE

Location: LOT 7 DP1020015, FRENCHS FOREST ROAD EAST, FRENCHS FOREST, NSW

Job No.: 32505BM **Method:** SPIRAL AUGER **R.L. Surface:** ~159.2 m

Date: 3/7/20 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** W.S./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Well Details	Remarks and Well Details
DRY ON COMPLETION						159	0			FILL: /Soil. Refer to nearest borehole log for description					Gatic Cover
															Concrete
						158	1								
															50mm DIA. PVC Standpipe
						157	2								Cuttings
						156	3								
						155	4		-	SANDSTONE:					Bentonite
						154	5								
						153	6								Start of Class 18 Machine Slotted Screen

JK 9.02.4 LIB:GLB Log JK AUGERHOLE - MASTER 32505S2 FRENCHSFOREST.GPJ <<DrawingFile>> 31/07/2020 14:53 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

JKGeotechnics

MONITORING WELL LOG

Borehole No.
M202
2 / 2

Client: FOREST CENTRAL BUSINESS PARK PTY LTD

Project: PROPOSED MEDICAL CENTRE

Location: LOT 7 DP1020015, FRENCHS FOREST ROAD EAST, FRENCHS FOREST, NSW

Job No.: 32505BM **Method:** SPIRAL AUGER **R.L. Surface:** ~159.2 m

Date: 3/7/20 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** W.S./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Well Details	Remarks and Well Details
						152	8		-	SANDSTONE: *(continued)*					
						151									
							9								2mm Sand
						150									
							10								
						149									
							11								
						148									
							12								
						147									
							13			END OF BOREHOLE AT 12.70 m					End Cap
						146									

JKGeotechnics

MONITORING WELL LOG

Borehole No.
M203
1 / 2

Client: FOREST CENTRAL BUSINESS PARK PTY LTD

Project: PROPOSED MEDICAL CENTRE

Location: LOT 7 DP1020015, FRENCHS FOREST ROAD EAST, FRENCHS FOREST, NSW

Job No.: 32505BM **Method:** SPIRAL AUGER **R.L. Surface:** ~158.2 m

Date: 3/7/20 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** W.S./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Well Details	Remarks and Well Details
DRY ON COMPLETION						158	0			FILL: /Soil. Refer to nearest borehole log (BH1) for description					Gatic Cover
															Concrete
						157	1								
															50mm DIA. PVC Standpipe
															Cuttings
						156	2								
						155	3								
															Bentonite
						154	4								
						153	5		-	SANDSTONE:					
						152	6								Start of Class 18 Machine Slotted Screen

JK 9.02.4 LIB:GLB Log JK AUGERHOLE - MASTER 32505S2 FRENCHSFOREST.GPJ <<DrawingFile>> 31/07/2020 14:53 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

JKGeotechnics

MONITORING WELL LOG

Borehole No. M203 2 / 2

Client: FOREST CENTRAL BUSINESS PARK PTY LTD

Project: PROPOSED MEDICAL CENTRE

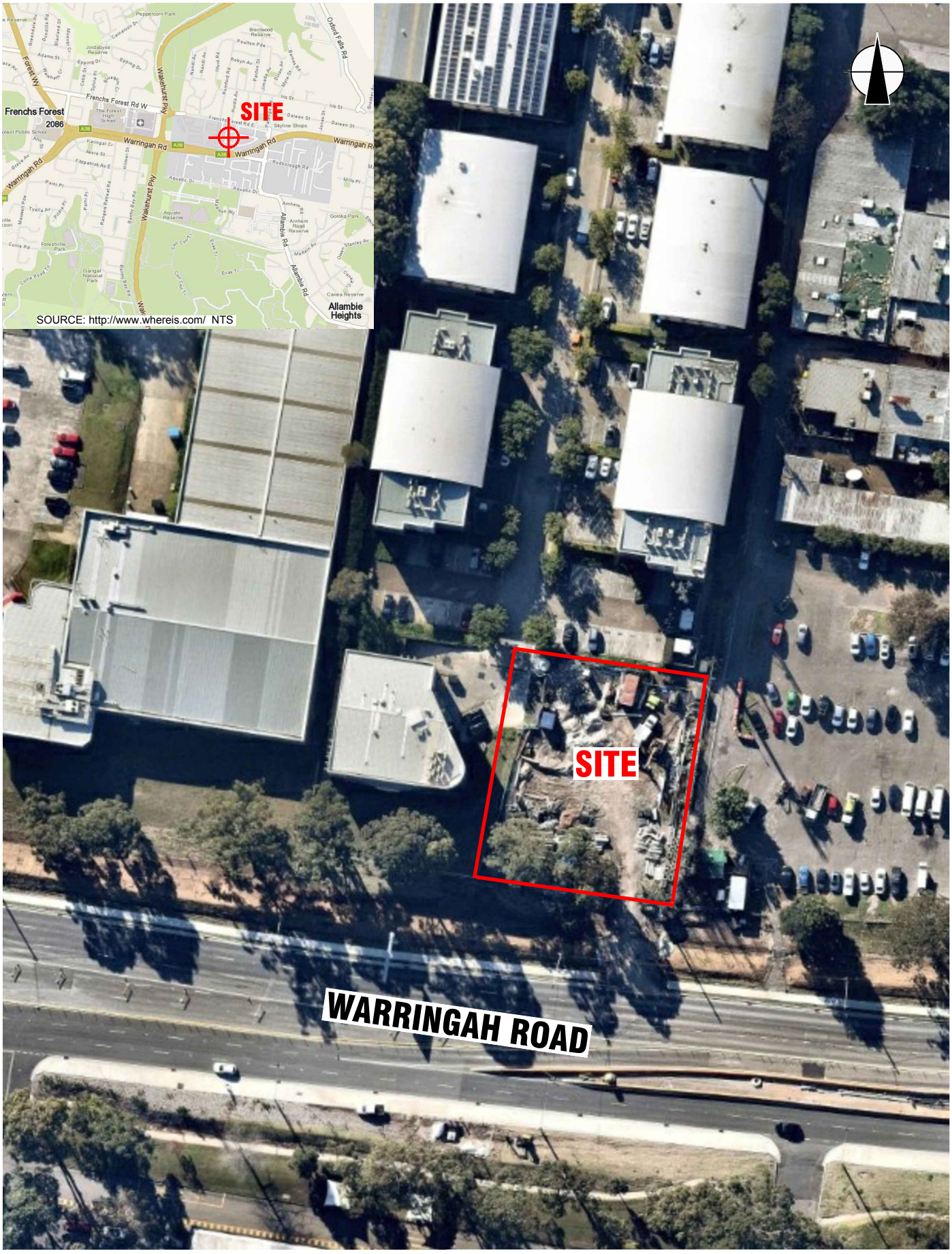
Location: LOT 7 DP1020015, FRENCHS FOREST ROAD EAST, FRENCHS FOREST, NSW

Job No.: 32505BM **Method:** SPIRAL AUGER **R.L. Surface:** ~158.2 m

Date: 3/7/20 **Datum:** AHD

Plant Type: JK305 **Logged/Checked By:** W.S./M.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Well Details	Remarks and Well Details
						151			-	SANDSTONE: *(continued)*					
							8								
						150									2mm Sand
							9								
						149									
							10								
						148									
							11								
						147									
							12								
						146				END OF BOREHOLE AT 12.20 m					End Cap
							13								
						145									



AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 10 20 30 40 50

SCALE 1:1000 @A4 METRES

This plan should be read in conjunction with the JK Geotechnics report.

Title: **SITE LOCATION PLAN**

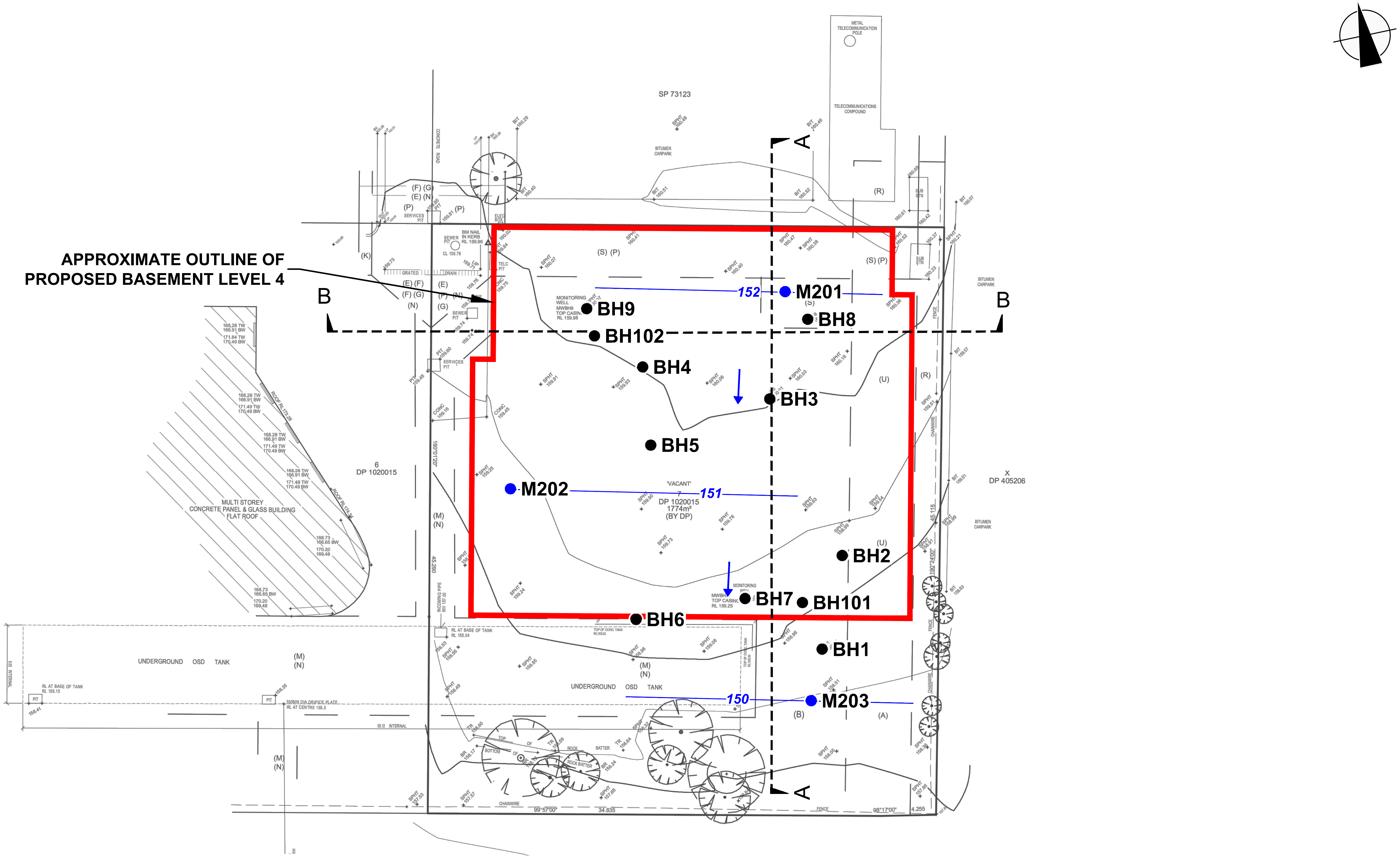
Location: FRENCHS FOREST BUSINESS PARK
FRENCHS FOREST, NSW

Report No: 32505BMrpt2

Figure: 1

JKGeotechnics

PLOT DATE: 20/08/2019 3:18:10 PM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\32000'S\32505S FRENCHS FORESTI\CAD\32505S.DWG



LEGEND

Symbol	Description
● (black)	BOREHOLE
● (blue)	GROUNDWATER MONITORING WELL
00	APPROXIMATE GROUNDWATER CONTOURS (m)
→	INFERRED GROUNDWATER FLOW DIRECTION

SCALE 0 3 6 9 12 15 METRES 1:300 @A3

This plan should be read in conjunction with the JK Geotechnics report.

Title: **INVESTIGATION LOCATION PLAN**

Location: FRENCHS FOREST BUSINESS PARK FRENCHS FOREST, NSW

Report No: 32505BMrpt2

Figure: 2

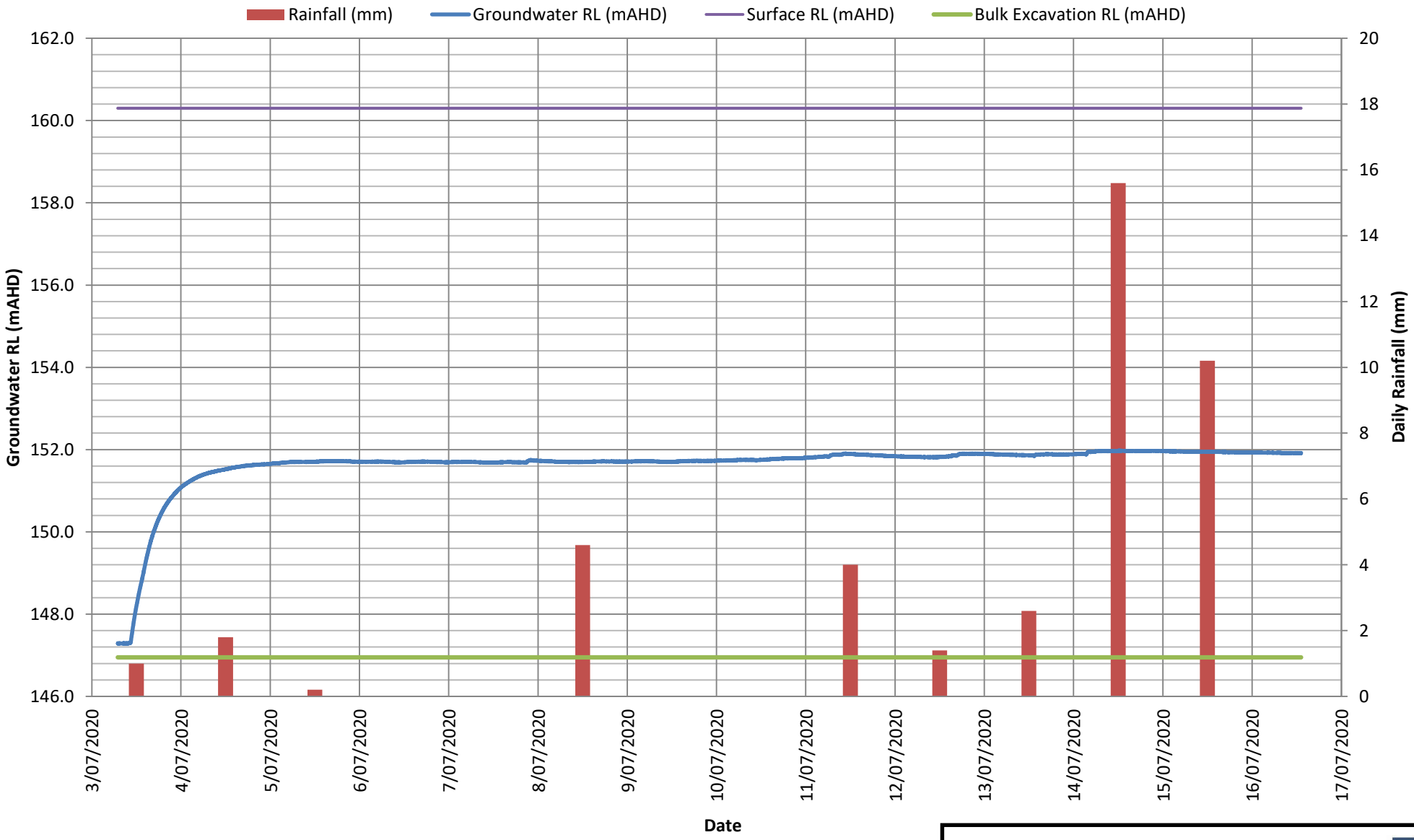
JKGeotechnics

PLOT DATE: 30/07/2020 5:05:19 PM DWG FILE: Y:\32000's\32505S FRENCHS FOREST\CAD\32505BM.DWG

File Name: 32505BM Monitoring Well Data
Date Printed: 31/07/2020

Groundwater Level and Daily Rainfall -v- Time Plot

M201



Rainfall data from Belrose, Evelyn Place, Station number : 066188

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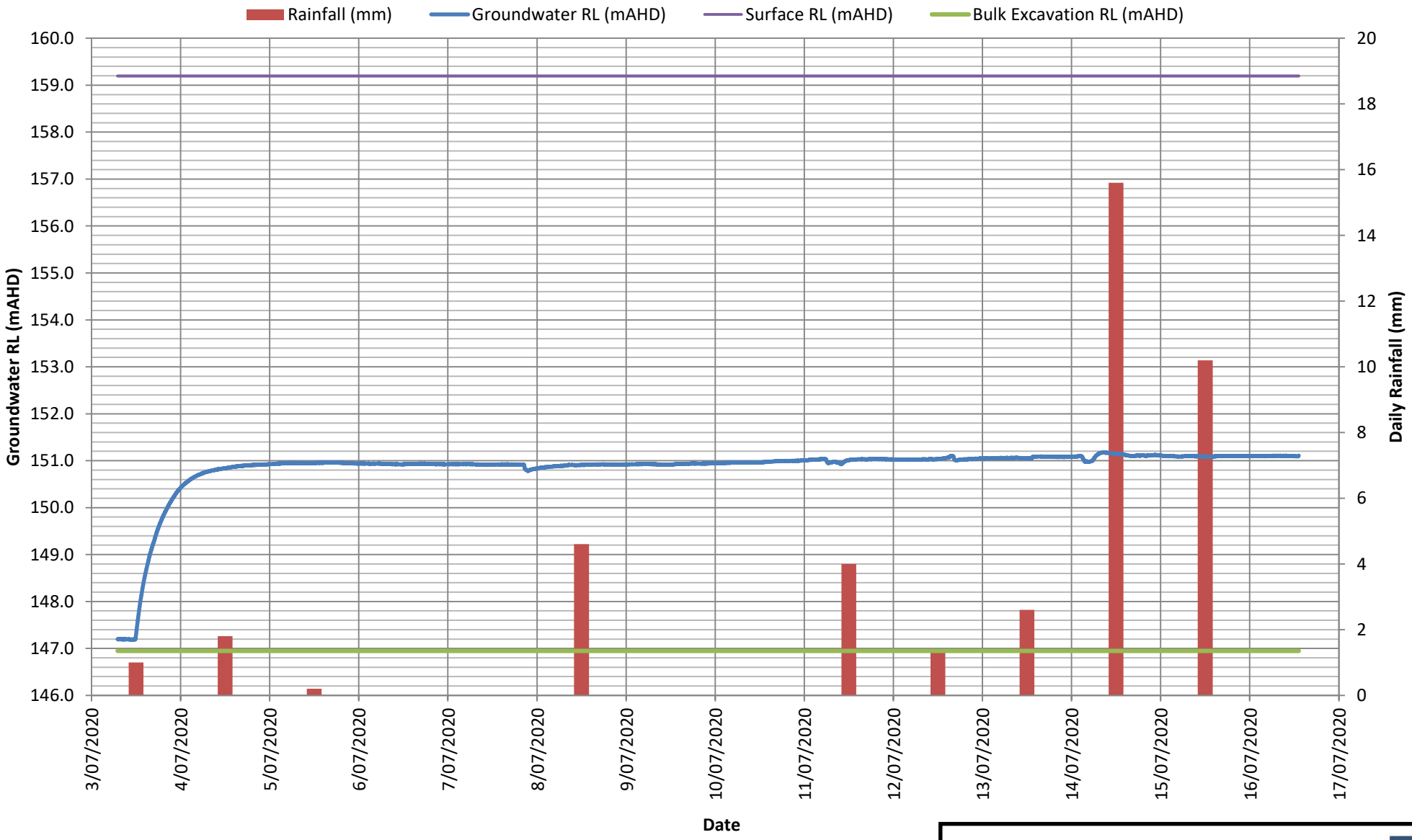
Report No. 32505BM **Figure No.3**

File Name: 32505BM Monitoring Well Data
Date Printed: 31/07/2020

Groundwater Level and Daily Rainfall -v- Time Plot

M202



Rainfall data from Belrose, Evelyn Place, Station number : 066188

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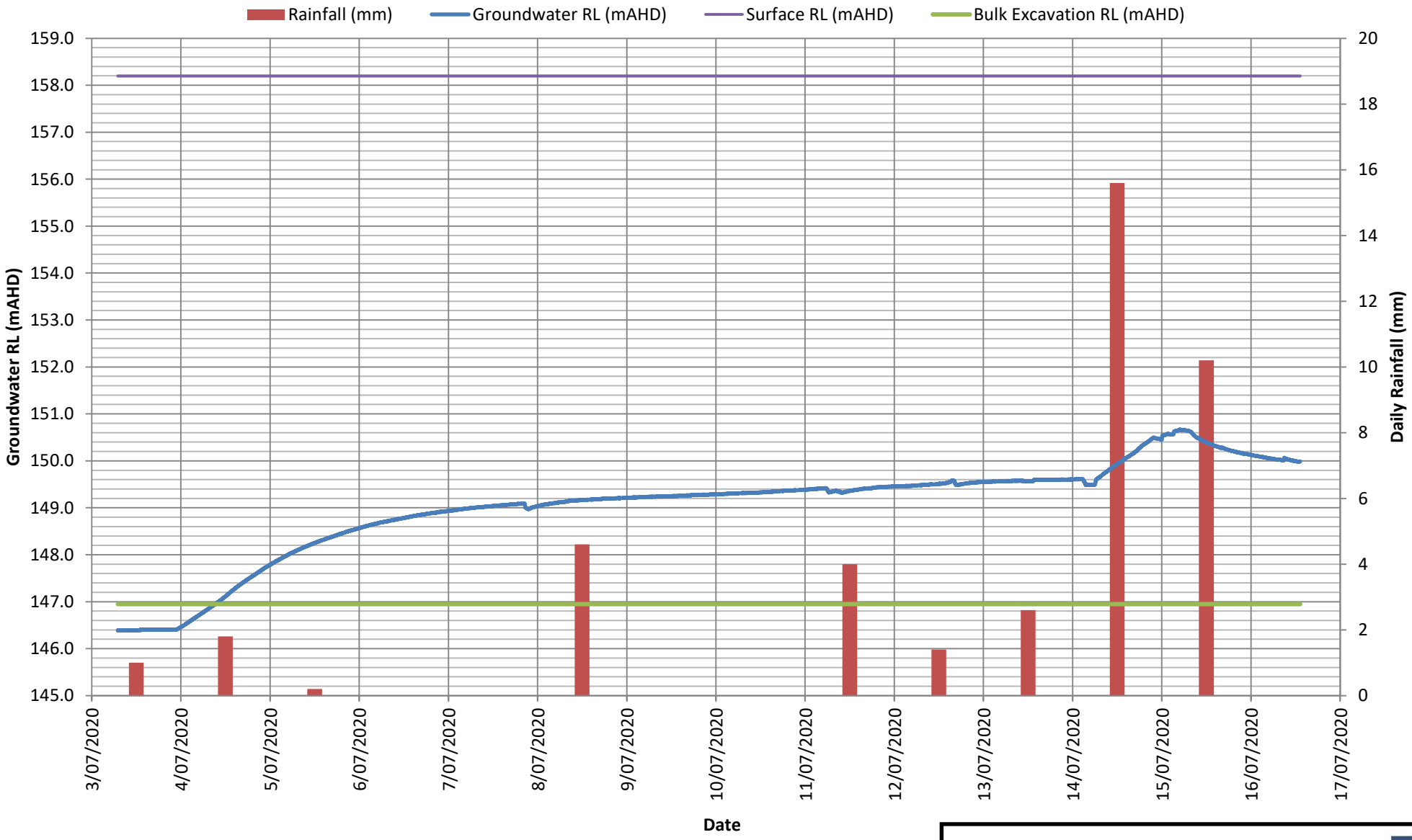
Report No. 32505BM **Figure No.4**

File Name: 32505BM Monitoring Well Data
Date Printed: 31/07/2020

Groundwater Level and Daily Rainfall -v- Time Plot

M203



Rainfall data from Belrose, Evelyn Place, Station number : 066188

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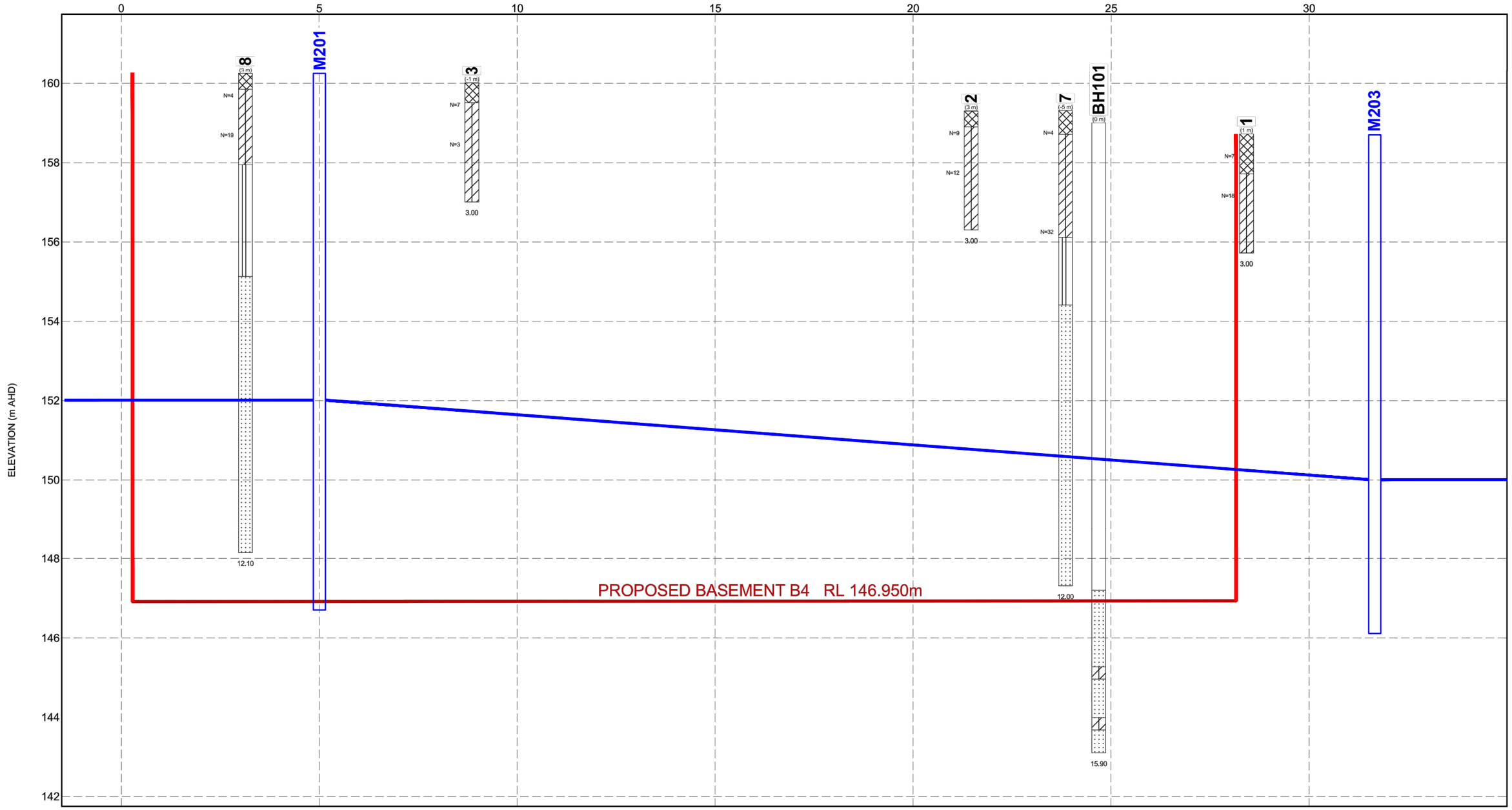
Report No.32505BM **Figure No.5**



MATERIAL GRAPHIC

- SILTY CLAY (CL, CI, CH)
- SILTSTONE
- FILL
- SANDSTONE

SCALE 0 1 2 3 4 5 METRES 1:100 @A3

This plan should be read in conjunction with the JK Geotechnics report.

Title: **GRAPHICAL BOREHOLE SUMMARY**

Location: FRENCHS FOREST BUSINESS PARK
FRENCHS FOREST, NSW

Report No: 32505BMrpt2

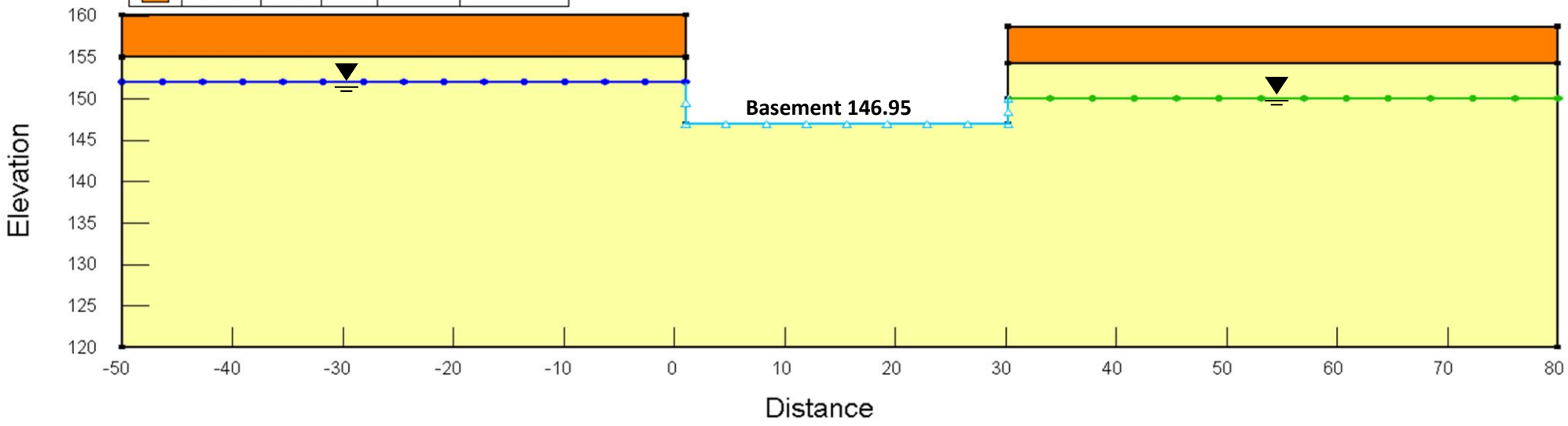
Figure: 6

JKGeotechnics

PLOT DATE: 31/07/2020 4:12:52 PM DWG FILE: Z:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\32000's\32505S FRENCHS FOREST\CAD\32505BM.DWG

Color	Name	Category	Kind	Parameters
	RL150	Hydraulic	Water Total Head	150 m
	RL152	Hydraulic	Water Total Head	152 m
	Seepage Face	Hydraulic	Water Rate	0 m³/sec

Color	Name	Sat Kx (m/sec)	Ky'/Kx' Ratio	Volumetric Water Content	Compressibility (/kPa)
	Sandstone	1e-07	0.1	0	0
	Silty Clay	5e-06	1	0	0



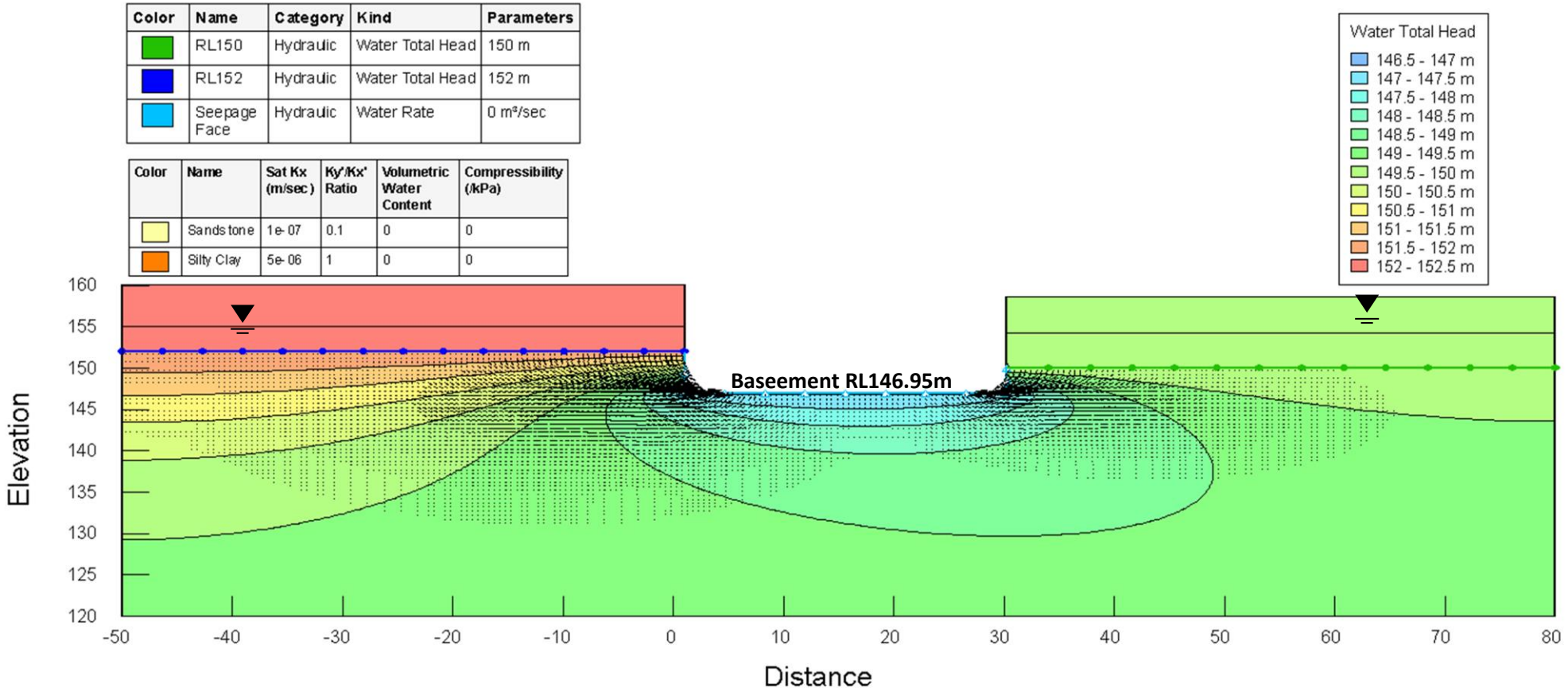
Section A-A – Hydrogeological Model

JKGeotechnics

Report No. 32505BMrpt2 Figure No. 7

Color	Name	Category	Kind	Parameters
	RL150	Hydraulic	Water Total Head	150 m
	RL152	Hydraulic	Water Total Head	152 m
	Seepage Face	Hydraulic	Water Rate	0 m³/sec

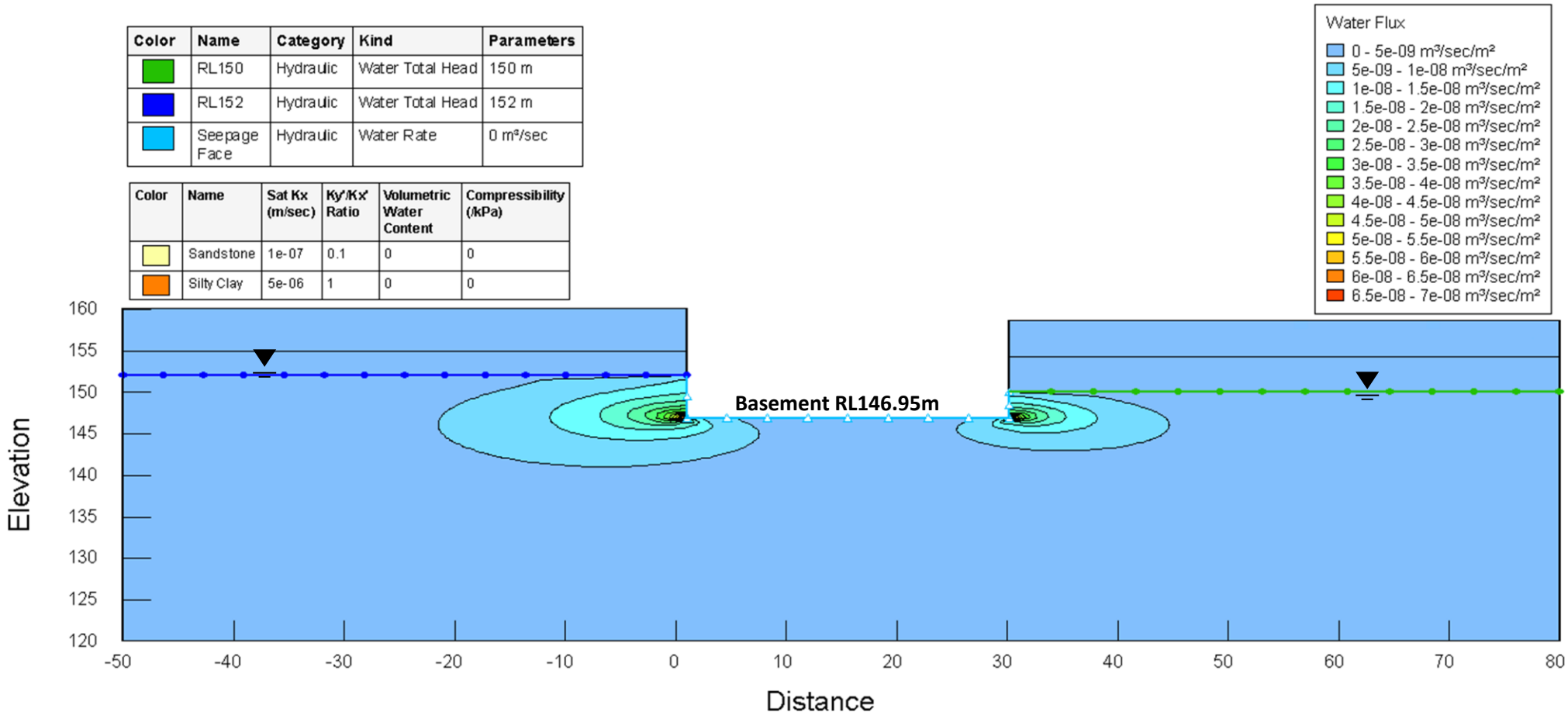
Color	Name	Sat Kx (m/sec)	Ky'/Kx' Ratio	Volumetric Water Content	Compressibility (/kPa)
	Sandstone	1e-07	0.1	0	0
	Silty Clay	5e-06	1	0	0



Section A-A – Seepage Analysis Results – Total Head Contours

Color	Name	Category	Kind	Parameters
	RL150	Hydraulic	Water Total Head	150 m
	RL152	Hydraulic	Water Total Head	152 m
	Seepage Face	Hydraulic	Water Rate	0 m³/sec

Color	Name	Sat Kx (m/sec)	Ky'/Kx' Ratio	Volumetric Water Content	Compressibility (/kPa)
	Sandstone	1e-07	0.1	0	0
	Silty Clay	5e-06	1	0	0



Section A-A – Seepage Analysis Results – Water Flow Contours

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Report No. 32505BMrpt2 Figure No. 9

APPENDIX A

JKGeotechnics

BOREHOLE LOG

Borehole No. 1

1 / 1

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 158.72 m

Date: 1/8/19 **Datum:** AHD

Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION					N = 7 3,4,3	158	1			FILL: Silty gravelly clay, medium plasticity, dark grey and red brown, fine to medium grained igneous gravel.	w>PL			GRASS COVER APPEARS MODERATELY COMPACTED
					N = 18 11,9,9	157	2		CH	Silty CLAY: high plasticity, orange brown mottled red brown.	w>PL	St		RESIDUAL
						156	3			as above, but light grey.	w~PL	VSt - Hd	350 450 480	
						155	4			END OF BOREHOLE AT 3.00 m				
						154	5							
						153	6							
						152								

JKGeotechnics

BOREHOLE LOG

Borehole No. 2

1 / 1

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 159.3 m

Date: 1/8/19 **Datum:** AHD

Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						159				FILL: Silty clay, medium plasticity, dark brown, trace of fine to medium grained igneous gravel and ash.	w>PL			GRAVEL COVER
					N = 9 7,4,5		1		CH	SILTY CLAY: high plasticity, red brown mottled orange brown, trace of fine to medium grained ironstone gravel.	w>PL	VSt - Hd	450 550 540	RESIDUAL
						158				SILTY CLAY: high plasticity, yellow brown.				
					N = 12 5,6,6					as above, but light grey.	w~PL		520 550 600	
						157	2			as above, but light grey and red brown.				
							3			END OF BOREHOLE AT 3.00 m				
						156	4							
						155	5							
						154	6							
						153								

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BOREHOLE LOG

Borehole No. 3

1 / 1

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 160.01 m

Date: 1/8/19 **Datum:** AHD

Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION	■			■						FILL: Silty clay, medium plasticity, dark grey and brown, with fine to coarse grained igneous gravel.	w>PL			GRAVEL COVER
				■	N = 7 4,4,3				CH	Silty CLAY: high plasticity, light grey and red brown, trace of fine to medium grained ironstone gravel.	w>PL	St	300 350 510	RESIDUAL
						159	1							
				■	N = 3 1,2,1					Silty CLAY: high plasticity, pale grey.	w~PL	F - St	100 150 160	
						158	2							
						157	3			END OF BOREHOLE AT 3.00 m				
						156	4							
						155	5							
						154	6							

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BOREHOLE LOG

Borehole No. 4

1 / 1

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 160.0 m

Date: 1/8/19 **Datum:** AHD

Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION	■									FILL: Silty clay, dark brown, medium plasticity, trace of fine to medium grained igneous gravel.	w>PL			
									CH	Silty CLAY: high plasticity, light grey mottled orange brown and red brown.	w>PL	VSt - Hd		REFUSAL
	■			■	N = 8 4,4,4								450 500 550	
						159	1							
										as above, but mottled light grey and orange brown.	w~PL	Hd		
				■	N = 14 5,6,8								500 560 >600	
						158	2							
						157	3			END OF BOREHOLE AT 3.00 m				
						156	4							
						155	5							
						154	6							

JKGeotechnics

BOREHOLE LOG

Borehole No. 5
1 / 1

Client: ERILYAN
Project: PROPOSED MEDICAL CENTRE
Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 159.9 m
Date: 1/8/19 **Datum:** AHD
Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION										FILL: Silty clay, medium plasticity, dark brown, trace of fine to medium grained igneous gravel and ash.				
					N = 16 19,10,6	159	1		CH	SILTY CLAY: high plasticity, light grey mottled orange brown.	w~PL	Hd	>600 >600 >600	RESIDUAL
										as above, but light grey and orange brown.		VSt		
					N = 11 5,5,6	158	2						480 520 530	
										as above, but light grey.				
						157	3							
										END OF BOREHOLE AT 3.00 m				
						156	4							
						155	5							
						154	6							
						153								

JKGeotechnics

BOREHOLE LOG

Borehole No. 6

1 / 1

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 159.3 m

Date: 1/8/19 **Datum:** AHD

Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						159				FILL: Silty clay, medium plasticity, dark brown, with fine to medium grained igneous gravel.	w>PL			
					N = 11 11,6,5		1		CH	Silty CLAY: high plasticity, light grey mottled orange brown and red brown, trace of root fibres.	w~PL	VSt	400 350	RESIDUAL
					N = 10 4,4,6	158						Hd	>600 >600 >600	
						157	2							
							3			END OF BOREHOLE AT 3.00 m				
						156	4							
						155	5							
						154	6							
						153								

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BOREHOLE LOG

Borehole No. 7

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 159.31 m

Date: 1/8/19 **Datum:** AHD

Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
						159				FILL: Silty clay, medium plasticity, dark brown, trace of fine to medium grained igneous and ironstone gravel, and ash.	w>PL			
					N = 4 9,2,2				CH	Silty CLAY: high plasticity, light grey mottled orange brown and red brown.	w>PL	VSt	300 350	RESIDUAL
						158	1							
										as above, but light grey.				
						157	2							
▽ ON COMPLETION OF CORING					N = 32 11,16,16		3							
						156			-	Extremely Weathered siltstone: silty CLAY, high plasticity, light grey.	XW	Hd	300 550 >600	HAWKESBURY SANDSTONE VERY LOW 'TC' BIT RESISTANCE
							4							MODERATE RESISTANCE
						155								
							5			REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 12.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 12.0m TO 9.0m. CASING 9.0m TO 0m. 2mm SAND FILTER PACK 12.0m TO 8.0m. BENTONITE SEAL 8.0m TO 0.1m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						154								
							6							
						153								

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CORED BOREHOLE LOG

Borehole No. 7 **2 / 3**

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Core Size:** NMLC **R.L. Surface:** 159.31 m

Date: 1/8/19 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK250 **Bearing:** N/A **Logged/Checked By:** W.S./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
		155			START CORING AT 4.90m						
AFTER 26 DAYS		154	5		SANDSTONE: fine to medium grained, orange brown, red brown and light grey, bedded at 0-35°.	HW	VL - L	0.10		(5.06m) Be, 11°, P, R, Cn (5.09m) Be, 4°, P, R, Clay Ct (5.23m) Be, 4°, P, R, Clay Ct (5.30m) Be, 6°, P, R, Fe Sn (5.39m) Be, 11°, P, R, Fe Sn (5.46m) XWS, 20°, 50 mm.t	
		153	6					0.20 0.030		(5.72m) Be, 19°, P, R, Cn (6.22-6.32m) CS, 6°, 100 mm.t	
			7		SANDSTONE: fine to medium grained, light grey and orange brown, bedded at 0-20°.			0.090		(6.76m) CS, 6°, 10 mm.t	
0% RETURN		152			as above, but light grey.			0.10		(7.25m) Be, 4°, P, R, Clay Ct	Hawkesbury Sandstone
		151	8					0.20 0.050		(8.57m) Be, 12°, P, R, Clay Vn (8.63m) Be, 12°, Ir, R, Clay Vn (8.70m) Be, 14°, P, R, Cn	
		150	9					0.10 0.070		(9.57-9.65m) XWS, 14°	
		149	10		SANDSTONE: fine to medium grained, light grey.			0.050 0.20 0.20		(9.95-10.00m) XWS, 6°	

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 7 **3 / 3**

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Core Size:** NMLC **R.L. Surface:** 159.31 m

Date: 1/8/19 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK250 **Bearing:** N/A **Logged/Checked By:** W.S./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ (VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	DEFECT DETAILS: SPACING (mm) (600, 200, 60, 20)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
0% RETURN		148	12		SANDSTONE: fine to medium grained, light grey. *(continued)*	DW	VL	0.080; 0.010			
		147			END OF BOREHOLE AT 12.00 m						
		146	13								
		145	14								
		144	15								
		143	16								
		142	17								

JK 9.02.4 LIB:GLB Log JK CORED BOREHOLE - MASTER 32505S FRENCHSFOREST.GPJ <<DrawingFile>> 03/09/2019 14:29 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JK Geotechnics
Job No 325055 BH7 Start Depth at 4.90m
4
5
6
7
8
9
10
11
End of Borehole at 12.0m

JKGeotechnics

BOREHOLE LOG

Borehole No. 8 1 / 2

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 160.25 m

Date: 2/8/19 **Datum:** AHD

Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING						160				FILL: Silty clayey gravel, fine to medium grained sub-angular igneous gravel, trace of fine to medium grained sand.	M			GRAVEL COVER
					N = 4 3,2,2		1		CL	Silty CLAY: high plasticity, red brown and orange brown, trace of fine to medium grained ironstone gravel and root fibres.	w>PL	St - VSt	150 350 450	RESIDUAL
						159				Silty CLAY: high plasticity, light grey.	w~PL	VSt - Hd		
					N = 19 6,8,11		2						420 550 >600	
						158			-	Extremely Weathered siltstone: silty CLAY, high plasticity, light grey.	XW	Hd		HAWKESBURY SANDSTONE
						157	3							
						156	4							
							5			SILTSTONE: dark grey.	HW	L		LOW RESISTANCE
						155				REFER TO CORED BOREHOLE LOG				MODERATE RESISTANCE
						154	6							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 8

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S | **Core Size:** NMLC | **R.L. Surface:** 160.25 m

Date: 2/8/19 | **Inclination:** VERTICAL | **Datum:** AHD

Plant Type: JK250 | **Bearing:** N/A | **Logged/Checked By:** W.S./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness)	Formation
100% RETURN		155	6		SANDSTONE: fine to medium grained, light grey, red brown and orange brown, bedded at 0-20°.	MW	L - M	0.40; 0.060; 0.50; 0.10		(6.19m) Jh, 18°, Cn; (6.26-6.48m) XWS, 10°	Hawkesbury Sandstone
		154									
		153	7		SANDSTONE: fine to medium grained, red brown and light grey, bedded at 0-20°.	HW	M	0.80; 0.30		(6.90-7.03m) XWS, 6°; (7.12m) Be, 8°, P, R, Fe Sn; (7.47m) Be, 6°, P, R, Clay Ct; (7.57m) Be, 12°, P, R, Clay Vn; (7.58m) Be, 12°, P, R, Clay Vn; (7.82m) Be, 20°, P, R, Clay Vn	
		152	8		as above, but light grey.		VL	0.080; 0.070; 0.040; 0.060		(8.63m) Jh, 41°, Ir, R, Cn; (8.74m) J, 44°, Ir, R, Cn; (9.00-9.20m) FRACTURED ZONE; (9.33m) J, 55°, Ir, R, Cn; (9.45m) J, 57°, Ir, R, Cn	
		151	9								
		150	10				VL - L	0.060; 0.10			
		149	11		SANDSTONE: fine to medium grained, light grey.			0.020; 0.10		(11.80m) Be, 4°, P, S, Clay Ct	
			12							(12.04m) J, 78°, Ir, R, Cn	

END OF BOREHOLE AT 12.10 m

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JK Geotechnics
JOB No. 325055 BH8 START DEPTH AT 5.12m
5
6
7
8
9
10
11
12
END OF BOREHOLE AT 12.10m

JKGeotechnics

BOREHOLE LOG

Borehole No. 9

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Method:** SPIRAL AUGER **R.L. Surface:** 159.98 m

Date: 2/8/19 **Datum:** AHD

Plant Type: JK250 **Logged/Checked By:** W.S./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING										FILL: Silty clay, medium plasticity, dark grey, with fine to medium grained igneous gravel, trace of sand.	w>PL			
									CH		w>PL			RESIDUAL
					N = 11 6,6,5	159	1			Silty CLAY: high plasticity, light grey, dark grey and orange brown, trace of fine to medium grained ironstone gravel, ash and root fibres.			350 400 500	
										Silty CLAY: high plasticity, light grey.				
					N > 7 16,7/ 10mm REFUSAL				-	Extremely Weathered siltstone: silty CLAY, high plasticity, light grey.	XW	Hd	>600 >600 >600	HAWKESBURY SANDSTONE
						158	2			SILTSTONE: light grey.	HW	VL - L		VERY LOW 'TC' BIT RESISTANCE
						157	3							
						156	4							
						155	5			REFER TO CORED BOREHOLE LOG				GROUNDWATER MONITORING WELL INSTALLED TO 12.1m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 12.1m TO 9.1m. CASING 9.1m TO 0m. 2mm SAND FILTER PACK 12.1m TO 8.0m. BENTONITE SEAL 8.0m TO 0.1m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						154	6							

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 9 **2 / 3**

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Core Size:** NMLC **R.L. Surface:** 159.98 m

Date: 2/8/19 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK250 **Bearing:** N/A **Logged/Checked By:** W.S./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 4.75m						
100% RETURN		155	5		SANDSTONE: fine to medium grained, light grey and orange brown, bedded at 0-25°.	MW	M	0.30		(4.85m) Be, 24°, P, R, Clay Vn (4.95m) Be, 8°, P, S, Clay Vn	Hawkesbury Sandstone
						HW	VL - L	0.040		(5.24-5.44m) XWS, 6°	
		154	6					0.10 0.030		(6.29-6.38m) XWS, 7°	
								0.090		(6.60-6.73m) XWS, 0°	
		153	7					0.040		(6.81m) Be, 16°, Ir, R, Fe Sn	
		152	8		as above, but light grey and red brown.			0.050 0.040		(8.20m) Be, 14°, P, R, Clay Vn	
					SANDSTONE: fine to medium grained, light grey, bedded at 0-20°.					(8.55m) Be, 9°, C, R, Cn (8.75m) Be, 14°, P, R, Clay Vn	
		151	9					0.090		(9.18-9.31m) XWS, 18°	
								0.090			
		150	10		SANDSTONE: fine to medium grained, light grey.			0.10 0.020		(9.97-10.05m) XWS, 16°	
								0.060			

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

CORED BOREHOLE LOG

Borehole No. 9 3 / 3

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHS FOREST, NSW

Job No.: 32505S **Core Size:** NMLC **R.L. Surface:** 159.98 m

Date: 2/8/19 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK250 **Bearing:** N/A **Logged/Checked By:** W.S./P.S.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ VL -0.1 L -0.3 M -1 H -3 VH -10 EH	DEFECT DETAILS SPACING (mm) 600 200 60 20 DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
100% RETURN		148	12		SANDSTONE: fine to medium grained, light grey. as above, but light grey and red brown.	HW	VL - L	0.060 0.10		Hawkesbury Sandstone
		147	13		END OF BOREHOLE AT 12.10 m					
		146	14							
		145	15							
		144	16							
		143	17							

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS


JK Geotechnics
JOB No. 325055 BH9 · START DEPTH AT 4.75m
4
5
6
7
8
9
10
11
12
END OF BOREHOLE AT 12.10m

JKGeotechnics

CORED BOREHOLE LOG

Borehole No.
BH101
1 / 1

Client: ERILYAN
Project: PROPOSED MEDICAL CENTRE
Location: FOREST CENTRAL BUSINESS PARK, FRENCHES FOREST, NSW

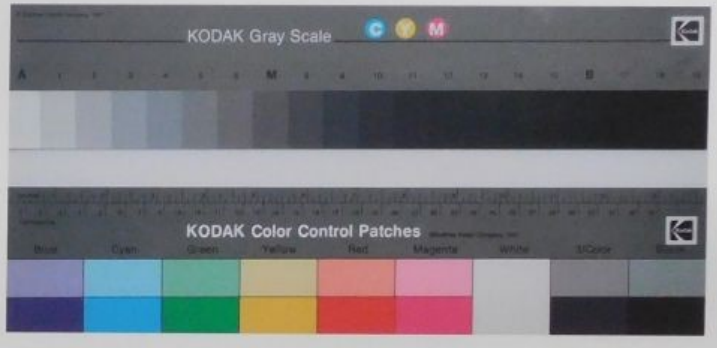
Job No.: 32505S2 **Core Size:** NMLC **R.L. Surface:** ~159.0 m
Date: 22/1/20 **Inclination:** VERTICAL **Datum:** AHD
Plant Type: JK305 **Bearing:** N/A **Logged/Checked By:** W.S./M.P.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$ VL 0.1 L 0.3 M 1 H 3 VH 10 EH	DEFECT DETAILS SPACING (mm) 600 200 60 20 DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
		148	11		START CORING AT 11.80m				WATER LEVEL AFTER CORING APPROX. 3.2m	
100% RETURN		147	12		SANDSTONE: fine to medium grained, light grey, bedded at 0-10°.	MW	VL - L	0.20 0.20 0.060 0.090 0.080	(12.61m) J, 14°, Ir, R, Cn	Hawkesbury Sandstone
		146	13							
		145	14		Silty CLAY: medium plasticity, light grey.	RS	Hd		(13.80m) HPR: >550kPa	Hawkesbury Sandstone
					SANDSTONE: fine to medium grained, light grey, bedded bedded at 0-10°.	MW	VL - L	0.30 0.10	(14.30m) Be, 8°, P, R, Clay Vn (14.40m) J, 12°, Ir, R, Cn (14.80-14.86m) XWS, 0°, 60 mm.t	
		144	15		Silty CLAY: medium plasticity, light grey.	RS	Hd		(15.20m) HPR: >600kPa	Hawkesbury Sandstone
					SANDSTONE: fine to medium grained, light grey, bedded at 0-10°.	MW	VL - M	0.050 0.40	(15.88m) J, 17°, Ir, R, Cn	
		143	16		END OF BOREHOLE AT 15.90 m					

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

Job No: 325055
Borehole No: 101
Depth: 11.8m – 15.9m



JKGeotechnics

CORED BOREHOLE LOG

Borehole No. BH102 1 / 1

Client: ERILYAN

Project: PROPOSED MEDICAL CENTRE

Location: FOREST CENTRAL BUSINESS PARK, FRENCHES FOREST, NSW

Job No.: 32505S2 **Core Size:** NMLC **R.L. Surface:** ~160.0 m

Date: 22/1/20 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK305 **Bearing:** N/A **Logged/Checked By:** W.S./M.P.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS: SPACING (mm)	DEFECT DETAILS: DESCRIPTION (Specific / General)	Formation
					START CORING AT 12.00m					WATER LEVEL AFTER CORING APPROX. 4.7m	
100% RETURN		148	12		NO CORE 1.55m						
		147	13								
		146	14		SANDSTONE: fine to medium grained, light grey and brown, bedded between 0-10°.	MW	VL	0.060 0.070			Hawkesbury Sandstone
							L	0.20			
		145	15		Extremely weathered sandstone: silty sandy CLAY, medium plasticity, light grey, with occasional low strength bands.	XW	Hd	0.20		(14.80m) HPR: 380kPa (15.21m) HPR: >600kPa	
		144	16					0.020 0.030		(15.71m) HPR: 530kPa (16.16m) HPR: >600kPa	
		143	17		SANDSTONE: fine to medium grained, light grey, bedded between 0-10°.	MW	L - M	0.40		(16.52m) J, 26°, Ir, R, Fe Sn	
					Extremely weathered sandstone: silty sandy CLAY, medium plasticity, light grey.	XW	(Hd)	0.40		(17.05m) HPR: ????kPa	
					SANDSTONE: fine to medium grained, light grey, bedded between 0-10°.	MW	L - M				
					END OF BOREHOLE AT 17.30 m						

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

JKGeotechnics

Job No: 325055
Borehole No: 102
Depth: 12.0m – 17.3m

JOB No. 325055 BH102 START AT 12.0m

12 NO CORE 1.55m

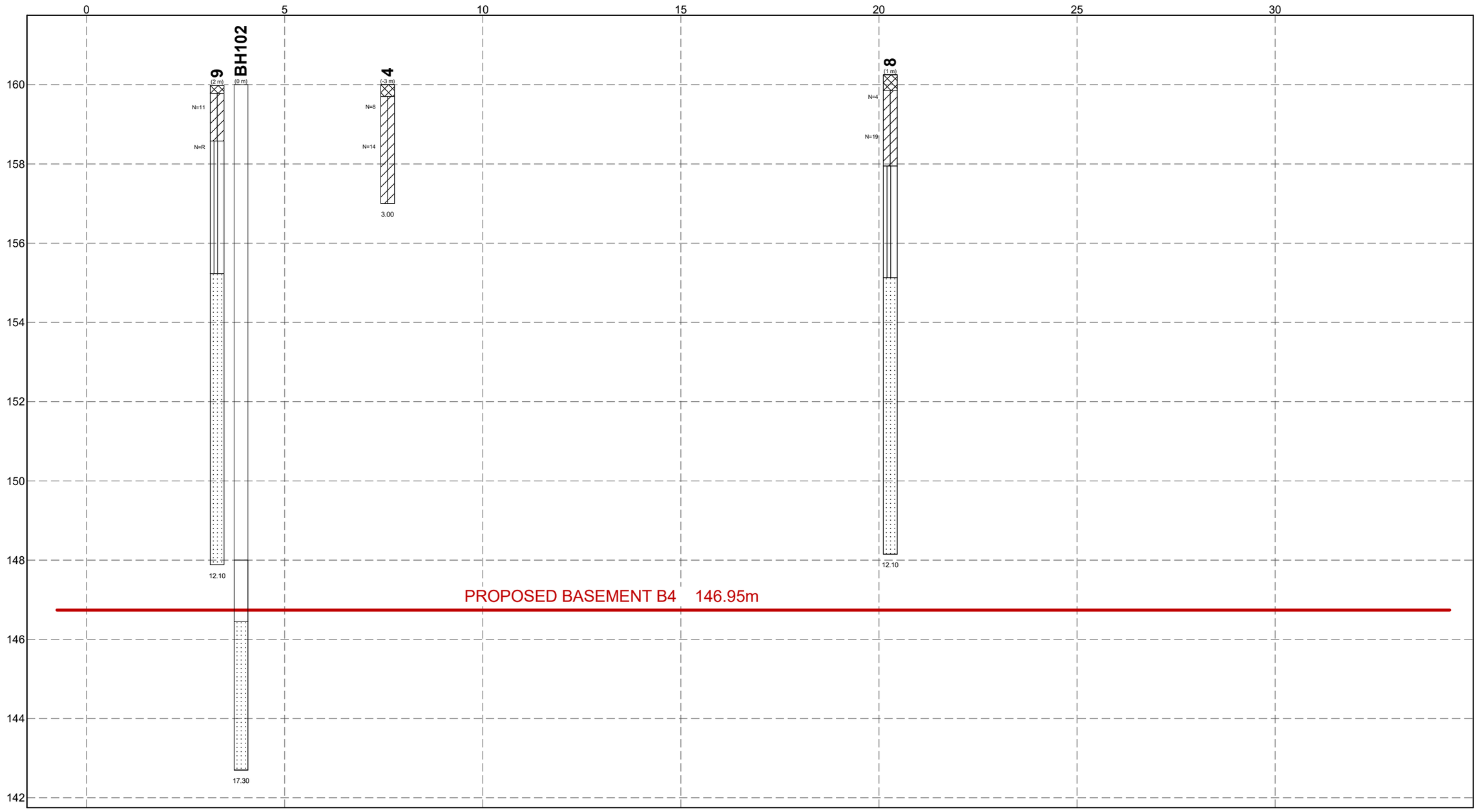
13

14

15

16

17 END OF BOREHOLE AT 17.3m



SECTION B-B

MATERIAL GRAPHIC

- NO CORE
- SILTY CLAY (CL, CI, CH)
- FILL
- SANDSTONE
- SILTSTONE

GRAPHICAL BOREHOLE SUMMARY
ERILYAN
FOREST CENTRAL BUSINESS PARK,
FRENCHES FOREST, NSW
PROPOSED MEDICAL CENTRE

DRAWN	D.M.	DATE	18/02/2020
CHECKED	M.P.	DATE	18/02/2020
SCALE	H 1:100 V 1:100		A3
PROJECT No	32505BMrev4	FIGURE No	4

APPENDIX B

Fact sheet

Exemptions

Construction dewatering

This fact sheet provides information to local authorities and applicants seeking development consent that may involve dewatering activities. It outlines exemptions from the need to obtain certain approvals/licences under the *Water Management Act 2000* (WMA). This fact sheet should be read in conjunction with the Dewatering information for councils and applicants fact sheet.

If intending to rely on one of the exemptions below, it is necessary to understand requirements that may involve recording water extraction and the time limits that apply to the exemption. **It is important to obtain any further advice before commencing the development application process.**

Note that as part of dewatering works you may need other approvals included under the *Local Government Act 1993* or *Roads Act 1993* to dispose of the water into council drains, use any part of the public footpath or carriageway or undertake any work within the public road.

There are two exemptions that apply from 6 December 2019.

Exemption 1: For extraction of less than 3 ML of water per year

When water extraction is taken as part of approved development (or exempt development), up to 3 ML of water may be taken in any one year (commencing on 1 July each year) without the need for:

- a water access licence (WAL)
- a water use approval.

A water supply work approval will be required for any works that are to be constructed or used to drain or pump the water.

To rely on this exemption, certain requirements must be met to record the water extraction and ensure that less than 3 ML of water is taken.

These requirements are set out in clause 21(6) of the *Water Management (General) Regulation 2018* and include requirements to:

- record the water take within 24 hours in the approved form and manner (see the Completion report fact sheet)
- keep the water take records for a period of five years
- provide the water take records to the Minister (or WaterNSW) by no later than 28 July for the year ending 1 July during which the water was taken.

Exemptions
Construction dewatering

Exemption 2: For construction activities that take water from the Botany Sands Groundwater Source only

When water extraction is taken as part of construction activities for a building, road or other infrastructure from the Botany Sands Groundwater Source, it may not require:

- a water access licence (WAL) or
- a water use approval

if a water supply work approval (e.g. for a pump) has already been obtained.

The water supply work approval is required to specify the maximum amount of water that can be taken during a year.

This exemption is only applicable until the earlier of:

- a controlled allocation of the water in the water source is opened by the Department of Industry, Planning and Environment (DPIE)
- 1 July 2021.

This exemption cannot be relied upon if construction activity is likely to continue beyond 1 July 2021 (unless the law changes).

In order to take water after 1 July 2021, the required water allocation must be purchased in the water market from that water source (or a transferable water source allocation).

To rely on the exemption, the conditions of the water supply work approval must be met and may require metering of the water take.

A water supply work approval will still need to be obtained for any works that are to be constructed or used to drain or pump the water.

Currently, the exemption only applies to the Botany Sands Groundwater Source, but other sources may be added and it is best to check with WaterNSW for the latest information.

More information

If you have any questions, please contact one of our friendly Customer Service team on 1300 662 077 or email Customer.Helpdesk@waternsw.com.au