

TECHNICAL NOTE

JBA Project Code	2024s0489
Contract	
Client	ABK Architects
Day, Date and Time	15/04/2024
Author	Euan Riddle
Reviewer / Sign-off	Alex Jones
Subject	Lehaunstown Hydrogeological Assessment



1 Introduction

1.1 Background

JBA Consulting Ltd (“JBA”) have been commissioned by ABK Architects to provide a hydrogeological assessment of the proposed Lehaunstown Residential Development at Cherrywood Planning Scheme area. This assessment follows the Appendix E: Tufa Spring Mitigation Requirements of the Cherrywood Planning Scheme 2014 (updated July 2023).



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2 Development

2.1 Proposed Development

The proposed development comprises 110 residential properties, associated roadways and car parking and public open space as part of the Cherrywood Planning Scheme area. The total site area is approximately 35,822m² (3.58 hectares). 110 residential properties comprise approximately 55% of the total site area and will consist of green infrastructure. There are six separate units, with associated roads of The Square in the centre of the site and The Mall located towards the south-west. Access to the site is via The Mall.

Approximately 15% of the total site area will comprise public open space. The Park is located to the east of the site, with two communal gardens present in the north-east and south and a playground located in the south-west corner. The area to the east of the site towards the valley will comprise Pond 2A, an attenuation feature. Numerous trees are planned throughout the scheme and areas of soft landscaping are located at the periphery of the site boundary.

The southern area of Block C falls within the protected Tufa Spring catchment (approximately 5% of the total site area).

JBA have reviewed the following drawings to inform this assessment:

- Ground Investigations Ireland, Lehaunstown Cabinteely Housing Site, Ground Investigation Interpretative Report, November 2023 (Ref 12914-06-23);
- 232250-PUNCH-XX-XX-DR-X-0151, PUNCH Consulting Engineers, 2024;
- 232250-PUNCH-XX-XX-DR-X-0201, PUNCH Consulting Engineers, 2024; and
- 232250-PUNCH-XX-XX-SK-S-001, PUNCH Consulting Engineers, 2024.

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3 Guidance

3.1 Rationale

The development is situated in the Cherrywood Planning Scheme area and any development falls under its planning scheme. Appendix E¹ of the scheme includes a Tufa Springs Mitigation Requirement assessment to be undertaken if any work is to take place within the Tufa Spring catchment area.

Appendix E states that any development within the catchment area "Will not significantly impact on the Tufa Springs (Tufa Spring No. 5 is a mature developed tufa formation which is a priority EU Annex Habitat which is considered important at county level and has been given a High Rating under the Draft National Level assessment carried out by NPWS, 2020)".

3.2 Zones

The site and surrounding area have been subject to numerous phases of ground investigation. Following a review of the available ground investigation data, along with published geological mapping and topography data, the underlying geology of the Till formation has been previously classified.

The classification zones are shown below in Figure 3-1.

¹ Dún Laoghaire-Rathdown County Council, 2023. Cherrywood SDZ Planning Scheme. Available at <https://www.dlrco.ie/planning/cherrywood-sdz> Accessed 26th March 2024

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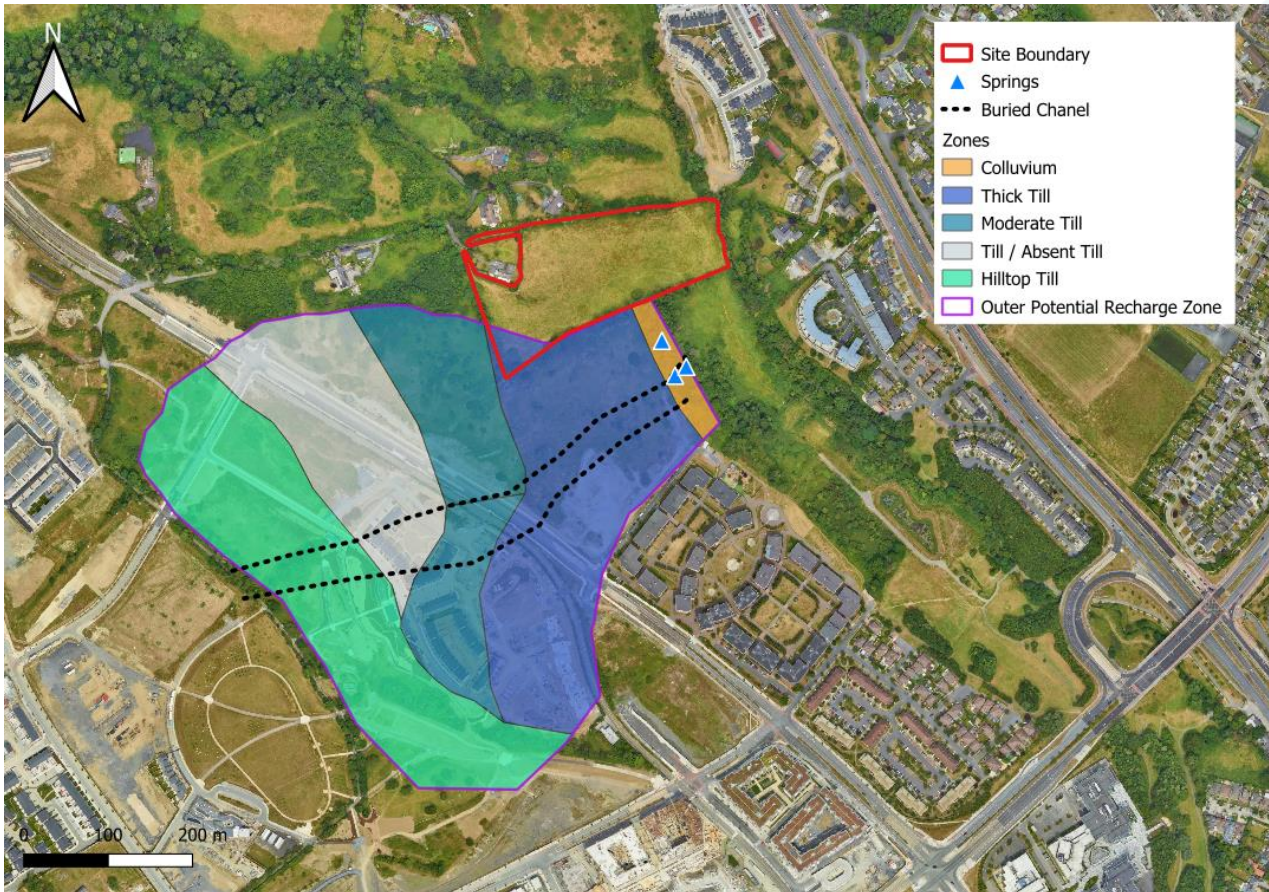


Figure 3-1 Catchment Sensitivity Classification

The zones demarcate areas where a development may potentially impact the recharge potential and flow potential of the Till and Tufa Spring. Figure 3-1 Indicates that a small area of the development will be situated within the catchment area (approximately 5% of the total site area). The development is located within Zone 2 (thick Till), and according to Table 3-2 in the guidance, potential impacts regarding the recharging and flow of the low permeability Till are deemed unlikely unless there are deep excavations.

For the proposed development, deep piling is required. As such, there is a potential zone of excavation below 2.5m. The last row of Table 3-2 takes into account large scale development works such as extensive and deep excavations (more than 2.5m deep) that could fundamentally alter the groundwater system and therefore the future status of the springs. Further analysis is required to assess the potential impact to the catchment.

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Table 3-1 Sensitivity Zone Classification (adapted from Appendix E guidance)

Table 3-2: Sensitivity Zone Classification

Zone	Recharge Impact Potential	Flow Impact Potential
1 - Colluvium	Zone 1 represents the slope where spring flow occurs and should be avoided in all cases	
2 – Thick Till	Unlikely – No further analysis is likely to be required.	Unlikely – No further analysis is likely to be required. Note area may be more suitable for deeper excavations further analysis would be required.
3 – Moderate Till	Unlikely – No further analysis is likely to be required	Unlikely – No further analysis is likely to be required
4 Till / Absent	Likely – Areas of proposed hardstanding and other low permeability cover will require further analysis to establish the extent of impact on recharge to the spring. Where areas can be shown to have a significant layer of low permeability till no further analysis would be required.	Likely – Excavations that are expected to reach the gravel (weathered bedrock) and bedrock layers would require further analysis to establish the extent of impact on the groundwater flow to the spring.
5 Hilltop Till	Likely – Areas of proposed hardstanding and other low permeability cover will require further analysis to establish the extent of impact on recharge to the spring.	Likely – Excavations that are expected to reach saturated deposits would require further analysis to establish the extent of impact on the groundwater flow to the spring.
All Zones	Large scale excavations (>2.5m deep) – further analysis requirement	

3.3 Screening Assessment

Table 4-1 in the Tufa Springs Mitigation Requirements guidance provides a framework of stages potentially required. Prior to construction, the conclusions of the assessment carried out by the applicant/develop will need to be presented and agree with DLRCC. The area under Block C (south of the site) and within the vicinity to the south are within the Tufa Spring catchment. Consequently, activities that are associated with the proposed development including deep piling more 2.5m deep may impact the recharge and flow of the underlying Till and affect the Tufa Spring Catchment system.

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Table 3-2 Framework of Assessment Required (adapted from Appendix E guidance)

Table 4-1 – Framework of Studies Required

Stage	Activity	Consider if Enough Information has been gathered
1	Screening assessment Are there activities that might affect the tufa springs through changes in recharge or groundwater flow pattern?	If there is no potential source of impact no further assessment required <u>If potential impacts continue to stage 2</u>
2	Develop initial hydrogeological conceptual model based on available data	
3	Review nature of the development	
4	Review mitigation measures available Outline Hydrogeological Impact assessment	If no feasible impact linkage identified, no further assessment is required (only valid if conservative assumptions are made) <u>If potential impacts are possible continue to stage 5</u>
5	Design and conduct site investigation to improve conceptual model Depending on the mitigation measures require this may include ongoing monitoring to capture the range of groundwater conditions the site experiences, or quantitative (e.g. modelling) assessments.	
6	Develop the conceptual model, mitigation measures and risk assessment further Support the risk assessment with quantitative assessment if appropriate	If impact linkages can be demonstrated to lead to no significant impacts, no further assessment is required. If this is not possible repeat Stages 5 and 6 until no significant impacts can be demonstrated

The following elements of the design of the proposed development have been identified as potential sources of impacts:

- Deep piles (up to a maximum depth of half a meter into bedrock); and
- Excavations: current ground level around Block C is 45.35m OD and the proposed formation level will be 42.35m OD. The proposed formation level for the upper section of Block C which lies within the Tufa catchment is 44.50m OD

Therefore, to assess the potential impact from the development a hydrogeological conceptual model based on available data should be produced according to Stage 2 of the framework. It should be noted that Block C upper and lower floor levels have been specifically designed to limit the potential for impact on the tufa springs.

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4 Review of Piling and Works in the Catchment

4.1 Foundation Design

The proposed development will have deep piles to support the structure. As only Block C is located within the Tufa Springs catchment area, all other Blocks and areas requiring piles have been omitted.

Block C has two blocks, one at ground level and upper level. The ground level block will be supported by a 300mm retaining wall on piles whereas the upper level will be supported by ground beams and piles.

The piling design comprises 350x350mm concrete driven piles spaced 3m.

Piles will be sunk approximately 6m to a depth of circa 0.5m into bedrock.

4.2 Ground Conditions within the Catchment

The nearest borehole log to Block C was BH06 during the 2023 investigation. This borehole was located within the area of Block C, and showed topsoil underlain by firm to stiff gravelly clay to 3.2m bgl. A layer of dense brownish grey medium gravel was identified between 3.2m to 4.3m bgl followed by gravelly clay to 5.9m bgl. The borehole was terminated at 6m bgl due to an obstruction (likely tough bedrock).

BH06 was located at an elevation of 45.35m OD and proposed formation level within the vicinity of Block C is 42.35m OD. The proposed formation level for the upper section of Block C which lies within the Tufa catchment is 44.50m OD. Therefore, there is at least 2.9m of clay (Till) overlying the high permeability weathered upper granite margin.

If piling in the upper Block C level is to extend into bedrock the piling will interact with the Tufa Spring catchment. However, due to the width (350mm) and spacing (3m intervals) would likely allow for groundwater to flow around the piles and would not impact groundwater flow.

The upper Block C level piles will interact with the Tufa Spring catchment.

Figure 4-1 below denotes the typical piling foundation design

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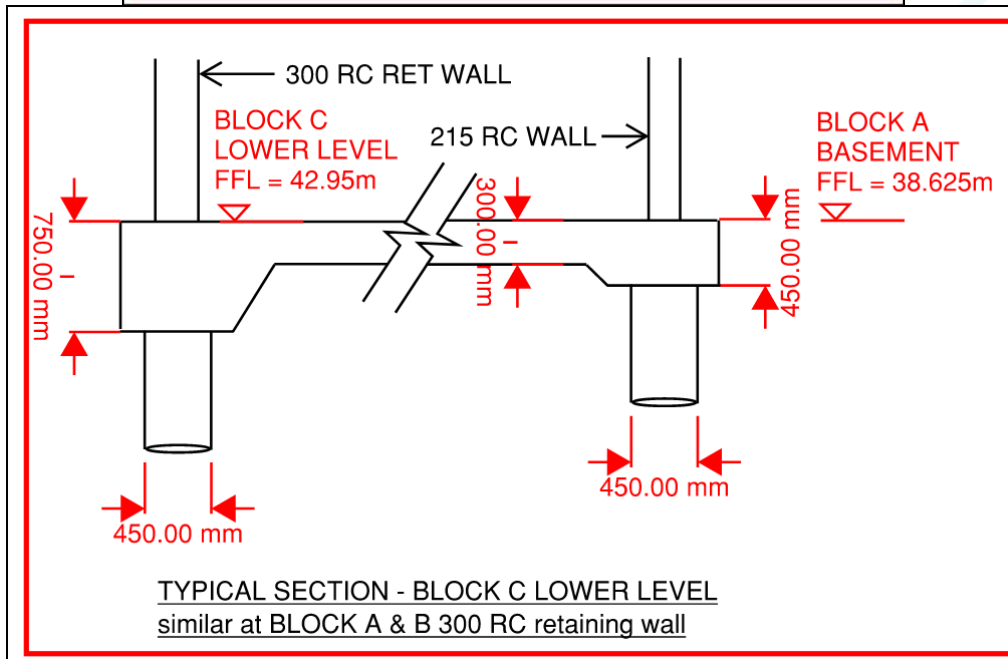
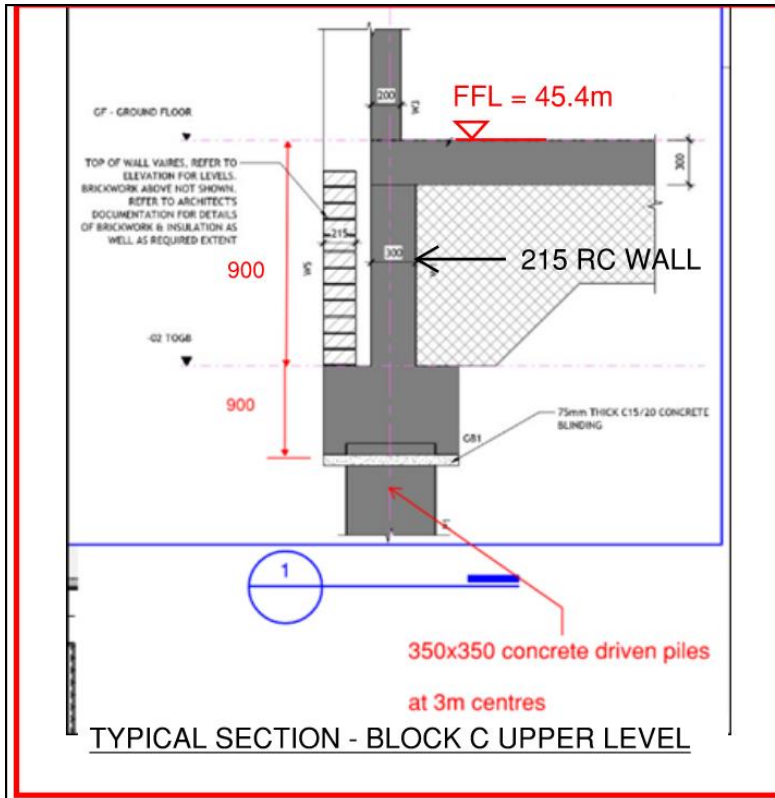


Figure 4-1 Typical Piling Foundation and Retaining Wall Design

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5 Conceptualisation

5.1 Hydrogeological Conceptual Model

The hydrogeological conceptual model has been established through numerous phases of ground investigation. Refer to Annex B within the guidance document for more detail.

Additional ground investigations have been undertaken in 2023 on the subject site. The ground investigation comprised three trial pits to a maximum depth of 4m bgl and two cable percussive boreholes to a maximum depth of 6m bgl (Ground Investigations Ireland, 2023).

The geology encountered during the ground investigation is comparable with previous ground investigation findings as well as published geological maps.

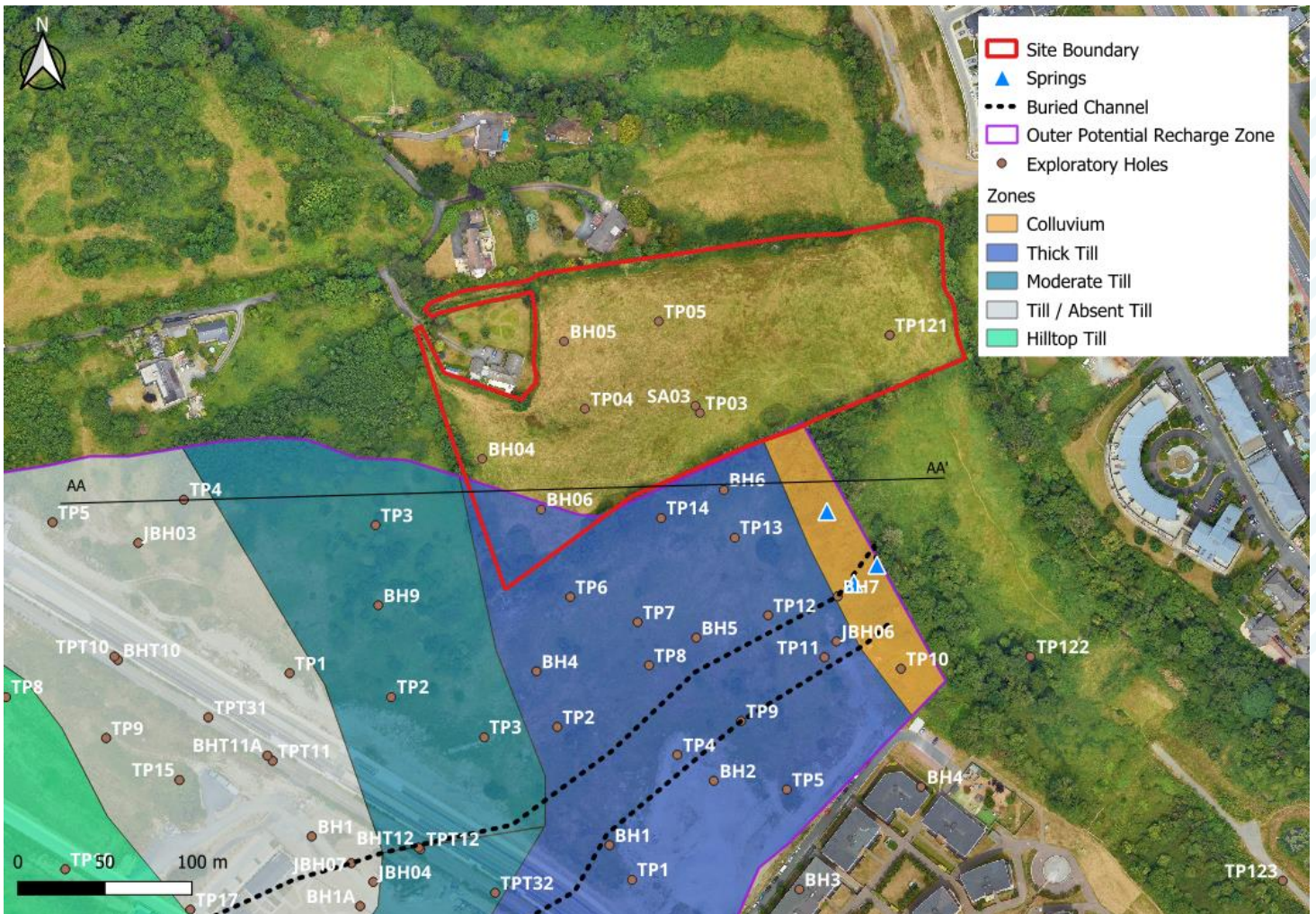


Figure 5-1 Ground Investigation Exploratory Hole Locations

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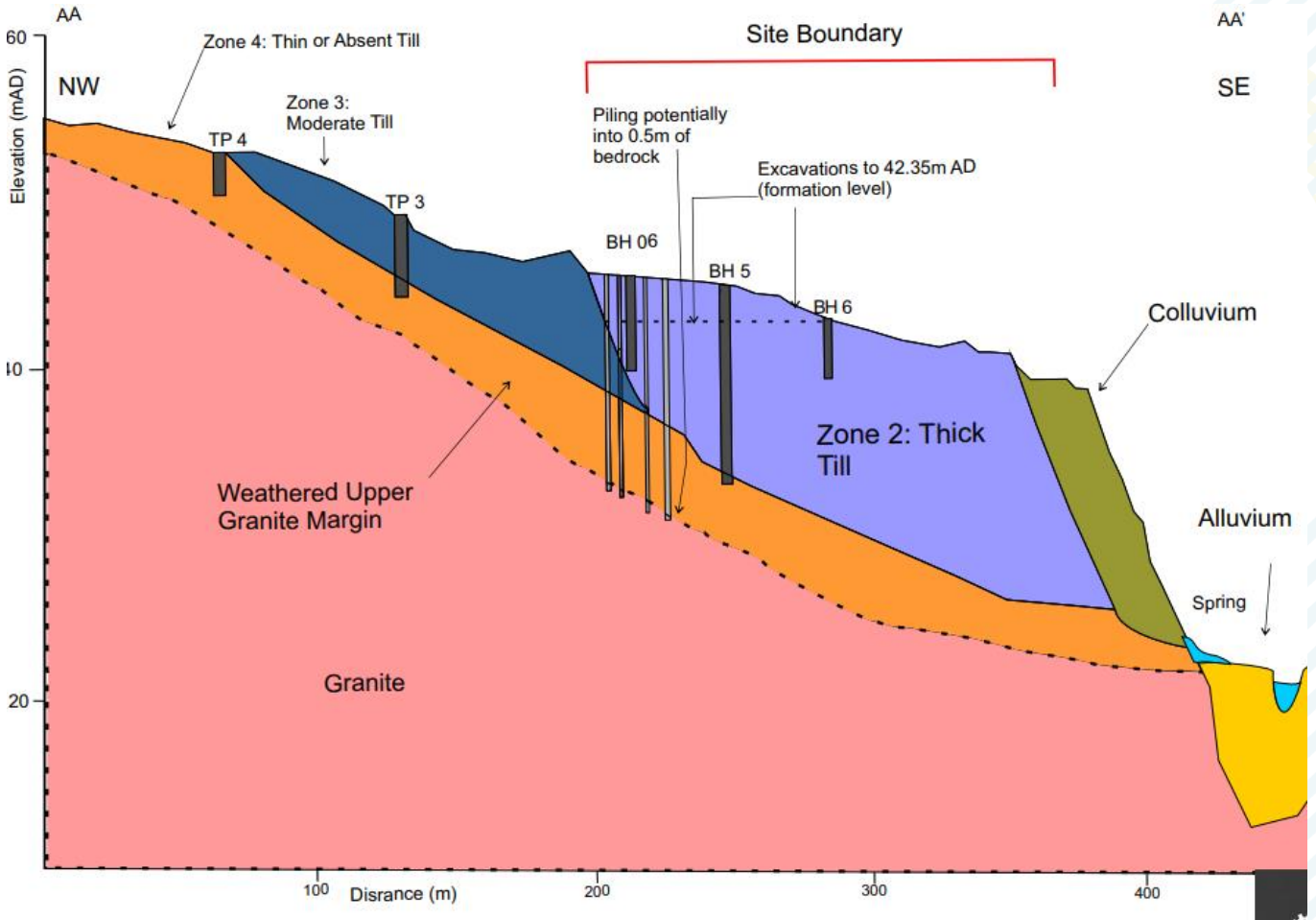


Figure 5-2 Hydrogeological Conceptual Model of the Lehaunstown Site Pre-Development

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6 Impact Assessment

6.1 Impact of Pile Design on Till Formation

The pile design are 350mm in width and driven at 3m intervals. This is effectively 11% of the aquifer along the line of the piles blocked by the piles (based on 350mm/3000mm). The impact on groundwater flow patterns will be limited as water will be able to flow around and under the piles.

Additionally, excavations from the area of upper Block C to achieve formation level is proposed to go to a maximum depth of 43.60m OD and 42.20m OD in the area of lower Block C which lies outside the Tufa Spring catchment line. It was proven in the 2023 ground investigation that the Till in the vicinity of Block C extended to a maximum depth of 39.45mOD. Consequently, there are nearly 3m thick deposits of thick impermeable Till to protect the groundwater in the Weathered Upper Granite Margin.

Figure 6-1 below shows the updated hydrogeological model including the piling design and excavation zone outline.

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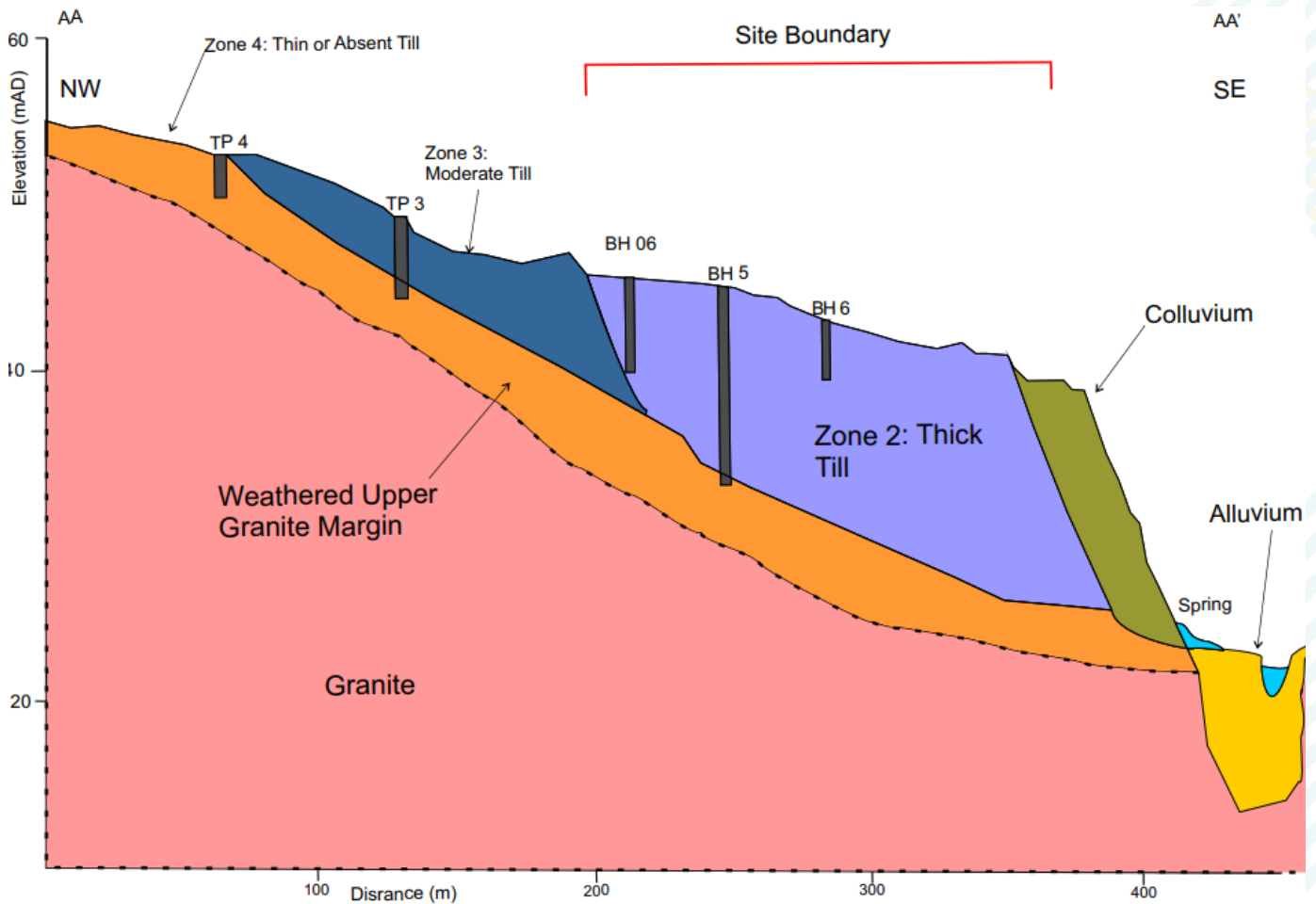


Figure 6-1 Hydrogeological Conceptual Model Post Development

Only a small percentage of the total site area (5%) is located within the Tufa Springs Catchment area. The area is confined to Block C, and the effects of deep piling or excavations are unlikely to impact groundwater flow and recharge of the Tufa Spring Catchment due to the presence of thick Till. Overall, the risk of impacts from the proposed development to groundwater is low.

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7 Conclusion

JBA was commissioned by ABK Architects to provide a hydrogeological assessment of the proposed Lehaunstown Residential Development at Cherrywood Planning Scheme area. The proposed development will comprise 110 residential properties and associated roads, car parking and green space. The southern area of Block C falls within the protected Tufa Spring catchment (approximately 5% of the total site area).

The Tufa Spring Catchment has previously been classified into separate zones based off the underlying geology and potential impacts from developments onto groundwater recharge and flow. The proposed development and Block C all falls within the thick Till. According to the Appendix E guidance, no further analysis would be required if developments were to take place within the thick Till. However, the proposed development will comprise foundation support in the form of deep piling and excavations to formation level (>2.5m deep).

Available ground investigation data within the vicinity of the proposed development have been utilised to construct a hydrogeological assessment and conceptual model to assess the potential impacts from the proposed development.

The hydrogeological conceptual model has informed that potential piling over 2.5m deep as well as excavations to formation level will not affect the underlying permeable water bearing strata (Weathered Upper Granite Margin) due to the thickness of the impermeable Till. Therefore, the presence of piles and earthworks will not significantly impact the groundwater flow or groundwater recharge at the site or affect the Tufa Springs Catchment area.

Based on the staged outline in Table 4-1 of Appendix E of the Planning Scheme, it is recommended that than no further stages of investigation are required.

