Joint Witness Statement
Stormwater management

Ashbourne [FTAA-2507-1087]
11 December 2025

Facilitated by: No Facilitator
Recorded by: Clare Houlbrooke

Attendance

The list of participants for this expert conferencing is included in the schedule at the end of this Statement.

Basis of Attendance and Environment Court Practice Note 2023

All participants agree to the following:

(a) The Environment Court Practice Note 2023 provides relevant guidance and protocols for the expert conferencing session;

(b) They will comply with the relevant provisions of the Environment Court Practice Note 2023.

The hydrogeologists have considered two points under the Matters Considered at Conferencing under B (d).

Matters Considered at Conferencing – Agenda and Outcomes

B. <u>Groundwater</u>

d. *Advice to MPDC concludes (Memorandum 2) that "the information provided to date has not demonstrated that the abnormal groundwater conditions at the Ashbourne site have been adequately allowed for within the proposed design".*

Experts are to address the following matters:

- *It appears that the design groundwater levels will need to increase from those used in the design to allow for climate change, etc.*

Response:

Key points that have been agreed between the hydrogeologists Tony Cowbourne (TC), Jon Williamson (JW) and Clare Houlbrooke (CH):

- Groundwater levels are shallow in some periods of the year. The latest groundwater levels are presented in Figure 1, it shows 3-months of data for four sites and 1-year of data for one site.

- JW states that whilst the data is useful, it is limited in duration which he considers important for understanding the frequency, duration and intensity that drains will be required to be operational. Jon recommends a longer term synthesised groundwater hydrograph to assist in providing this understanding (added to consent condition points below).
- In the low-lying areas drainage is needed to control groundwater levels.
- Farm drains are currently suppressing groundwater levels.
- Under the proposed development, reduced recharge associated with housing development (43 to 46% impervious surfaces), closer drain spacing (for example 75 m in the RV compared to current spacing of 100 m for farm drains) and deeper drain depths (1 m BGL compared to 0.8 m of current farm drains) will act to lower groundwater level peaks.
- The mechanism of drainage is changing from an open farm drain to a sub-soil drain.
- Our understanding of the proposed drainage network is that it has two sub-soil drains underlying the main roads (in both the RV and residential area) and one drain within the smaller roads within the RV (Maven design drawings: C340 for Residential C3300 for the RV).

CH presented some model results to clarify and demonstrate the sensitivity of the various drainage configurations with assessed hydraulic conductivity and moderately conservative recharge:

- The existing farm drain network is affecting the current groundwater levels (Figure 2, Figure 3 and Figure 4).
- With the base case hydraulic conductivity and recharge scenario and groundwater levels 0.1 mBGL (i.e. higher than previous modelling), the modelling indicates that groundwater levels between the proposed drains (modelled at 75 m apart) will be approximately 0.5 m below the existing ground level (Figures 5 and 6).
- Additional modelling covers sensitivity analysis on the aquifer parameters, aquifer depth and recharge, as discussed in the following section.
- This sensitivity analysis modelling indicates that under some of the scenarios tested (e.g. low hydraulic conductivity and high recharge scenarios), there is some uncertainty as to whether the 75 m drain spacing is adequate.

In summary, WGA have carried out modelling with starting groundwater levels at 0.1 m below ground level which is a hypothetical level for the low-lying areas for winter/spring conditions (essentially assumes full saturation). However, these areas are currently suppressed by farm drains to approximately 0.5 m below ground level. It is effectively a naturalised scenario without any drainage. It is a model scenario to check the effectiveness of the drainage system during high groundwater conditions. TC and JW agree that this is useful as a naturalised baseline case.

Sensitivity Analysis

WGA have carried out further sensitivity analysis including aquifer thickness (4 m to 12 m), hydraulic conductivity (1.50E-05 to 1.37E-06 m/s) and recharge (250 mm to 500 mm). The results of the analysis are presented in **Appendix A**. These results indicate detailed design of the subsoil drains will need to be carefully considered where:

- the aquifer is thin (i.e. 4 m to aquitard layer),
- when low hydraulic conductivity layers are encountered (i.e. silt layers), or
- high recharge conditions (high rainfall winter/spring periods).

In terms of the high winter recharge rate for design purposes, this will be further analysed based on nearby and site groundwater monitoring. This is further discussed below in the recommendations.

Any climate effect will be accommodated in the modelling that has been carried out.

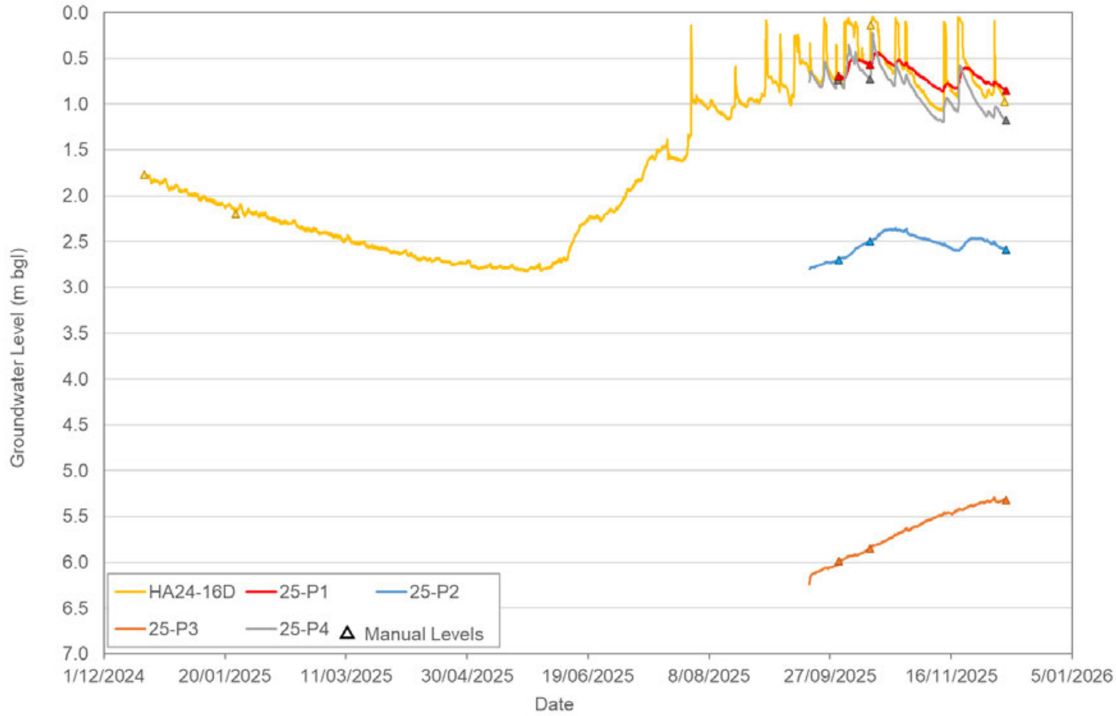


Figure 1: Updated Monitored Groundwater Levels.

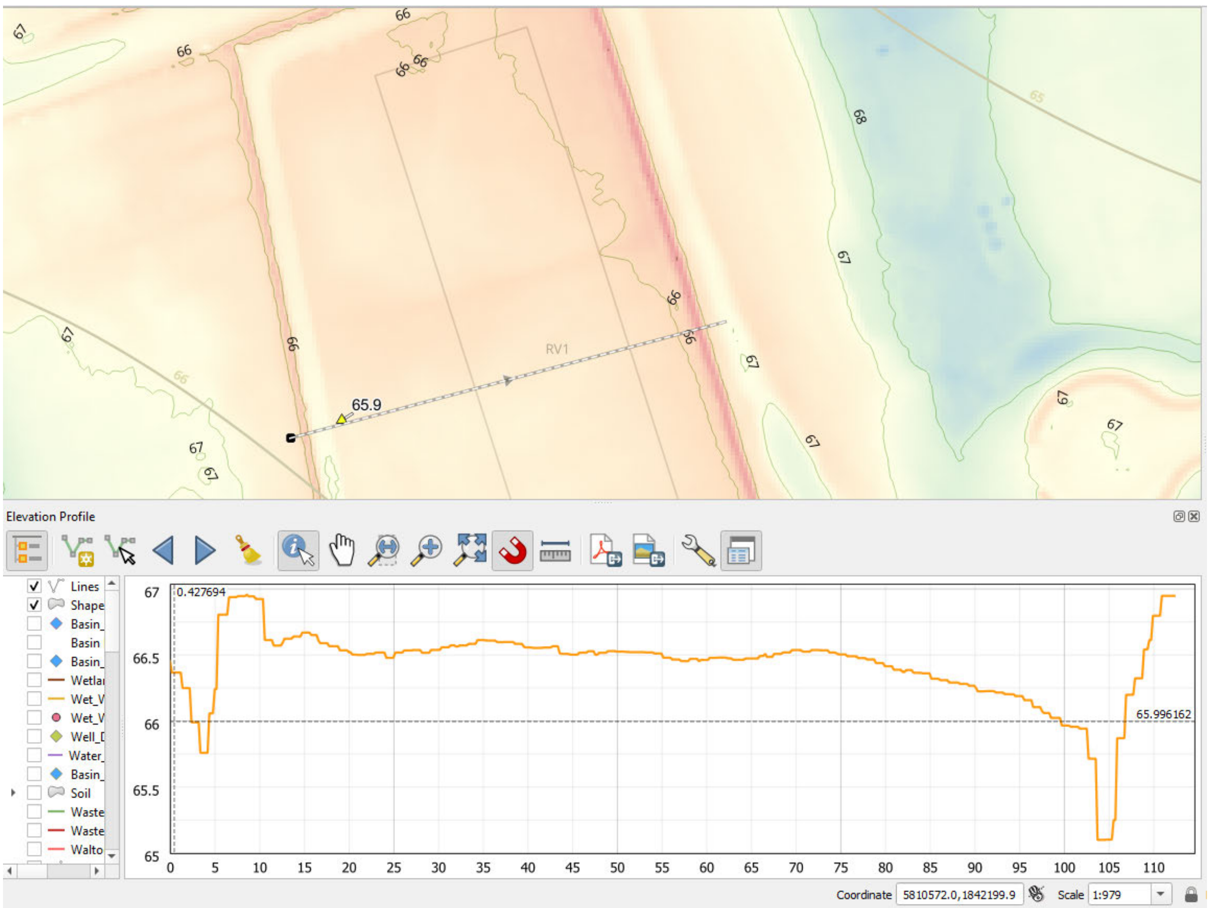


Figure 2: Exisiting Topography in area of Proposed Retirement Village.

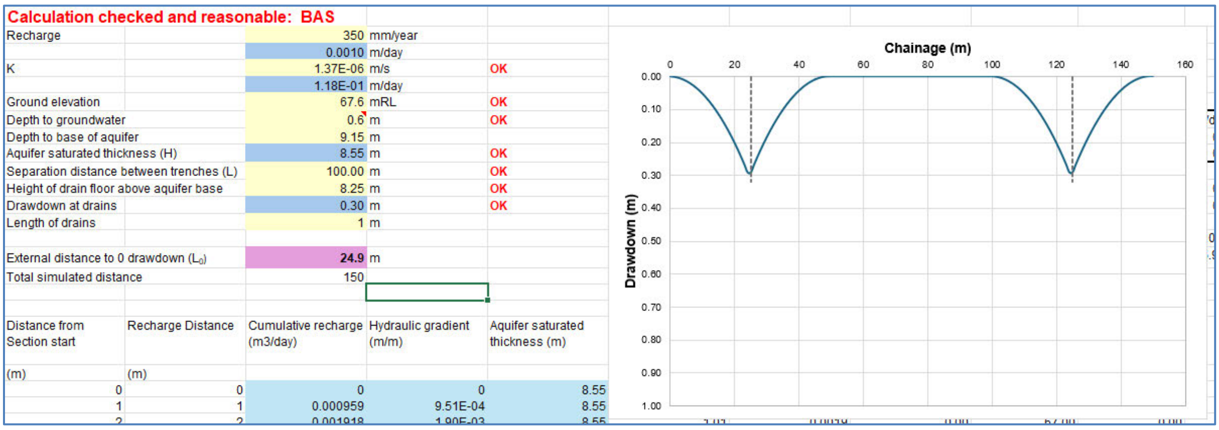


Figure 3: Current farm drains with starting GW depth 0.6 m BGL

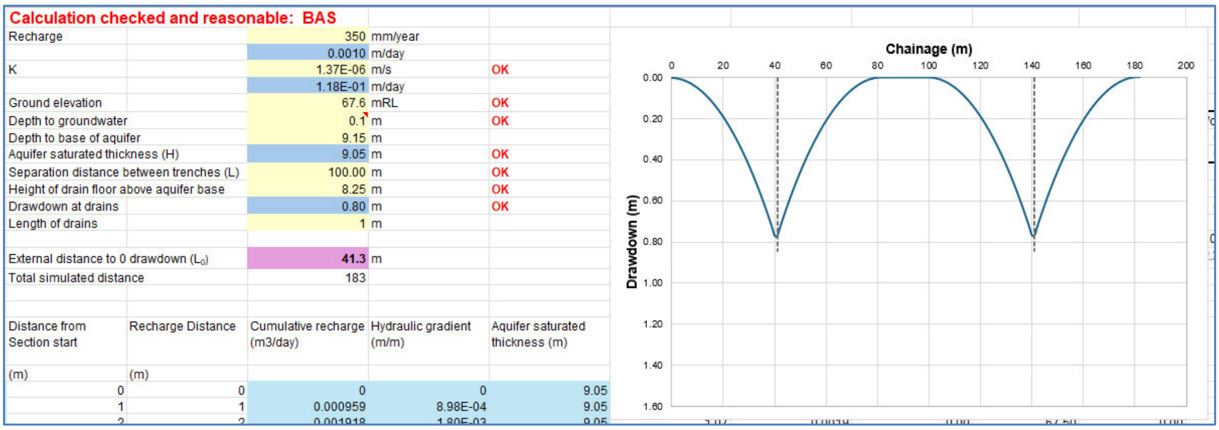


Figure 4: Current farm drains with starting GW depth 0.1 m BGL

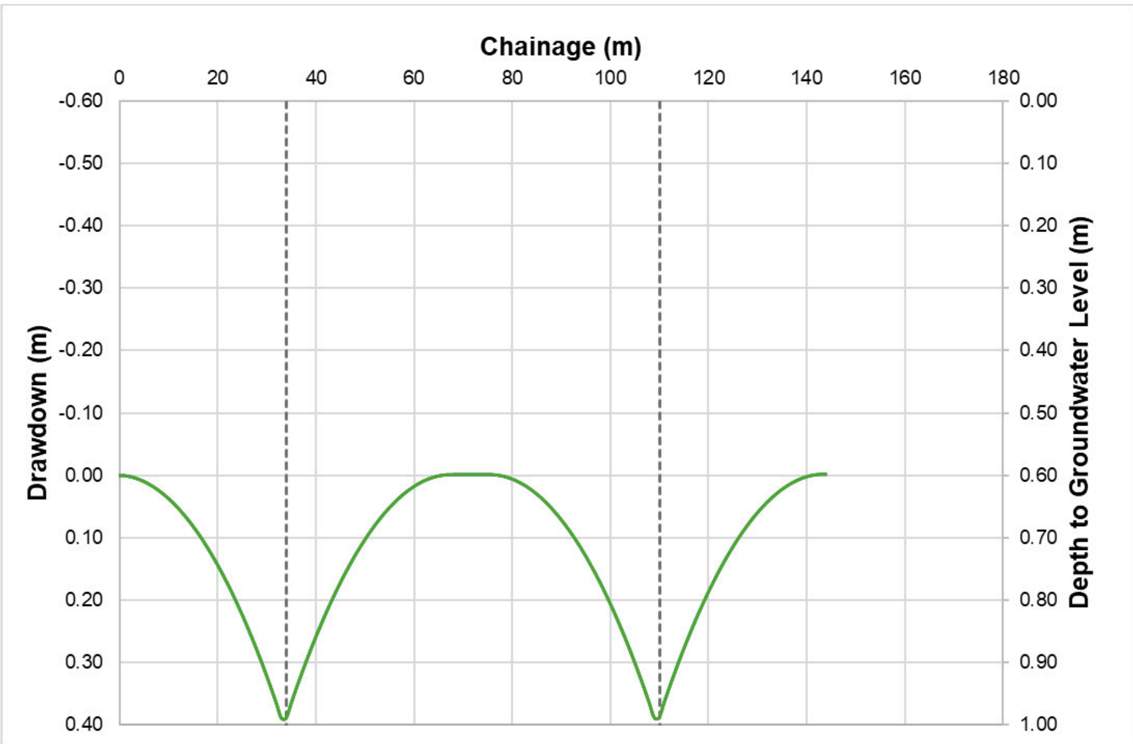


Figure 5: Projected drawdown with a starting groundwater level of 0.6 m BGL, resulting in a groundwater level of 0.6 m BGL between drains 75 m apart.

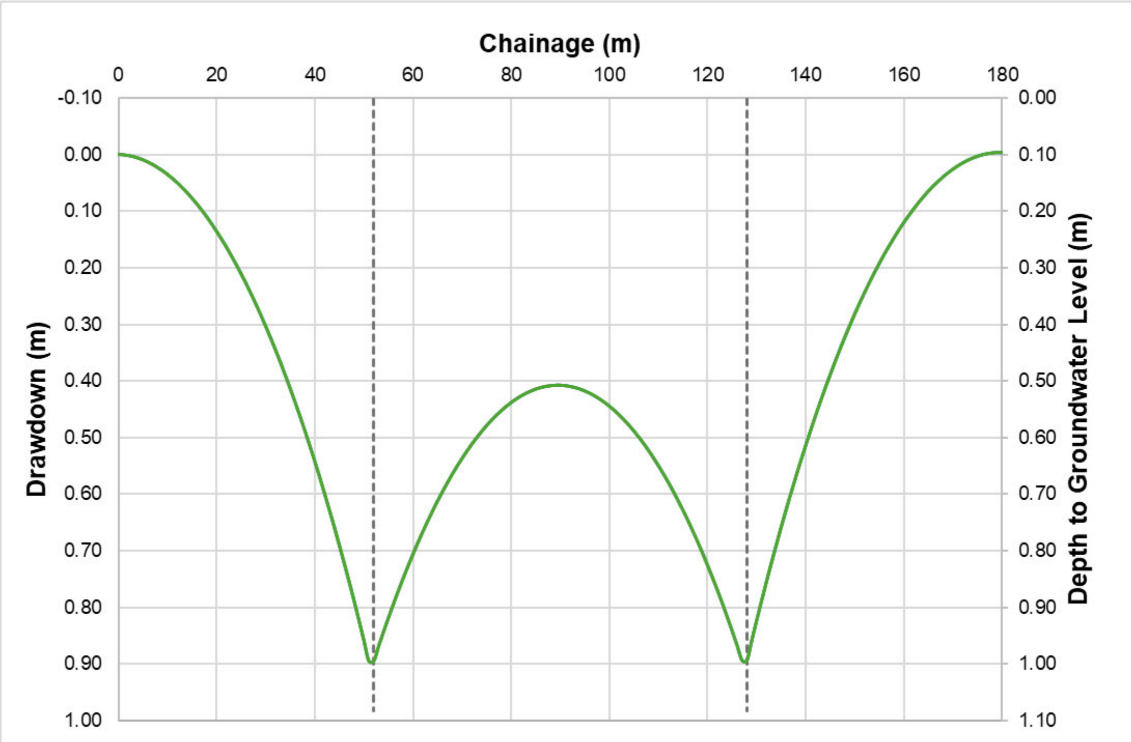


Figure 6: Projected drawdown with a starting groundwater level of 0.1 m BGL, resulting in a groundwater level of 0.5 m BGL between drains 75 m apart.

Experts are to address the following matter:

- *Whether information provided by the Applicant is sufficient to demonstrate viability of using proposed subsoil drainage as a suitable active control on groundwater levels to ensure disposal of stormwater via proposed soakage trenches remains viable.*

Response:
We consider the question posed has two parts. Part 1: "Whether information provided by the Applicant is sufficient to demonstrate viability of using proposed subsoil drainage as a suitable active control on groundwater levels". We have elected to address the first part of the question in detail because only the higher areas above the winter groundwater levels are being considered for soakage in the design. In the low-lying areas with shallow groundwater level (i.e. RV and northern area of the Residential Development), we understand that the stormwater is a piped network. There are peripheral areas which have "soakage" but these will be only be operational as soakage devices when groundwater levels are lower (i.e. summer/autumn). When groundwater levels are higher the drainage network will direct water to the wetlands and stormwater basins (Maven diagram SK4001). The first part of the question is addressed below.

CH, JW and TC agree that to assess the groundwater level response to the drainage system, WGA have carried out cross-section modelling of the proposed 1 m deep drains and the local hydraulic conditions. The results demonstrate that sub-soil drainage is a viable design for groundwater control, dependent upon confirmation of detailed design, including the number of drains, levels, gradients and other design details, by Maven (as designer).
TC and JW expressed that whilst the analytical modelling provided comfort that groundwater could be managed, the detailed design is important to ensure the long-term integrity and operation of the drains perform as envisaged. TC and JW consider it imperative that there is a detailed design certification process with the regulatory authorities prior to construction, with particular focus on both the civil and hydrogeological (including water chemistry, hydraulic conductivity and recharge) aspects of the sub-soil drains. Furthermore, a management plan is required to describe how the drains will be monitored and maintained.

The results of the sensitivity analysis indicates that further considerations of drain configuration may be required if:

- the localized hydraulic parameters differ from the assumed parameters e.g. hydraulic conductivity and thickness of the Hinuera Formation; and
- the longer term groundwater level and recharge analysis recommended below indicates that higher rates of recharge (than used in the base case analysis) occur during wet periods at this site.

Our recommendation is that consent conditions should include:

- Five additional groundwater level monitoring sites equipped with datalogger pressure sensors to be constructed on site including two nested piezometers in the deepest part of the basin, as shown in Figure 7.
- Applicant to prepare a groundwater level synthetic hydrograph and peak recharge analysis (i.e. intensity and recurrence intervals) for the site to inform detail design.
- Detailed design phase certification process with MPDC and WRC.
- A requirement for a management plan covering maintenance and operation of the

drainage network including hydrogeologist input.

Figure 7: Five additional piezometer locations shown by orange stars.

<u>Confirmed in person:</u> 11 December 2025

Expert's name and expertise	Party	Expert's confirmation
Clare Houlbrooke	Matamata Development Ltd	[redacted]
Tony Cowbourne (TC)	Matamata-Piako District Council	
Jon Williamson (JW)	Panel-appointed hydrology and hydrogeology expert	

Appendix A:

Sensitivity Analysis for Evaluating Subsoil Drain Design

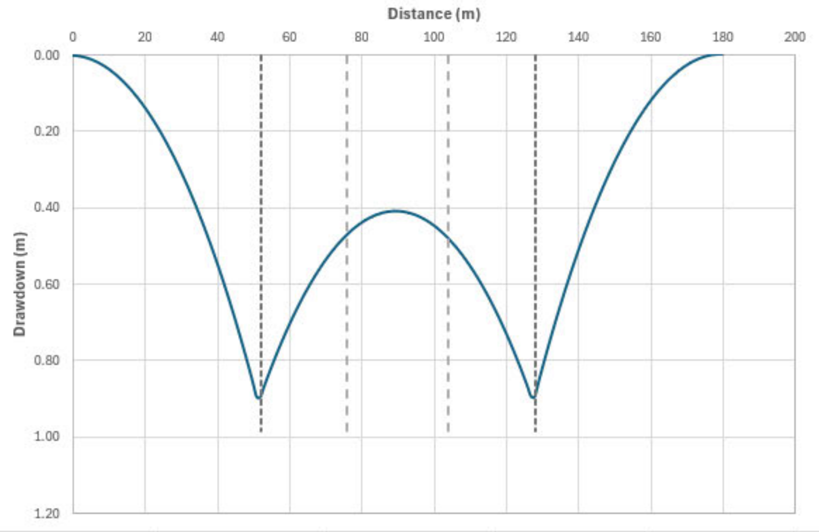
WGA have carried out further sensitivity analysis including aquifer thickness (4 m to 12 m), hydraulic conductivity (1.50E-05 to 1.37E-06 m/s) and recharge (250 mm to 500 mm).

K (m/s)	K (m/s)	Recharge (mm/year)	Depth to GW (m)	Drawdown at drain (m)	Depth to aquifer base (m)	Drain separation (m)	L_0 (m)	Midpoint drawdown (m)
Sensitivity analysis - Aquifer thickness								
Base Case Aquifer Thickness 9.15 m	1.37E-06	250	0.1	0.9	9.15	75	51.6	0.41
Aquifer Thickness 4 m	1.37E-06	250	0.1	0.4	4	75	32.7	0
Aquifer Thickness 6 m	1.37E-06	250	0.1	0.4	6	75	41.1	0.11
Aquifer Thickness 8 m	1.37E-06	250	0.1	0.4	8	75	48.1	0.32
Aquifer Thickness 12 m	1.37E-06	250	0.1	0.4	12	75	59.6	0.53
Sensitivity analysis -K Hydraulic Conductivity								
Base Case 1.37×10^{-6}	1.37E-06	250	0.1	0.9	9.15	75	51.6	0.41
Low K Case 1.5×10^{-7}	1.50E-07	250	0.1	0.9	9.15	75	17.1	0
High K Case 1.5×10^{-5}	1.50E-05	250	0.1	0.9	9.15	75	171.1	0.85
Sensitivity analysis - Recharge								
Base case 250 mm	1.37E-06	250	0.1	0.9	9.15	75	51.6	0.41
High Recharge 500 mm	1.37E-06	500	0.1	0.9	9.15	75	36.5	0

Aquifer Thickness

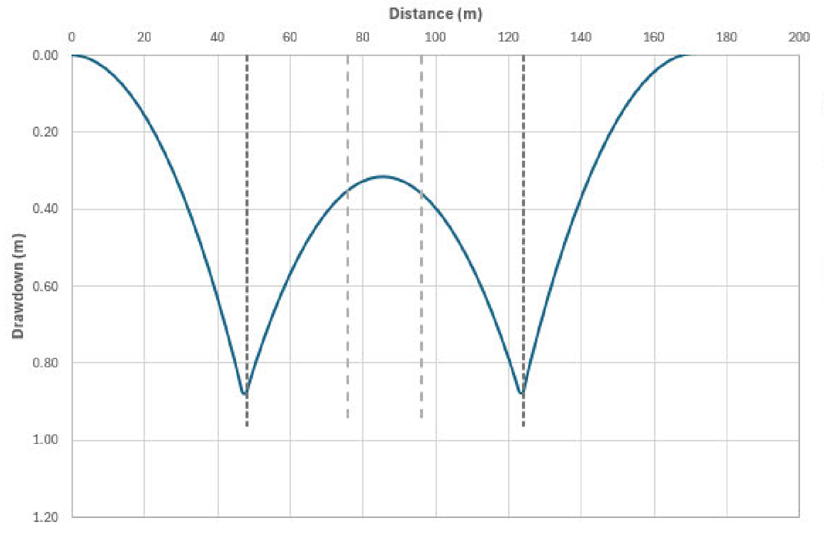
Thickness 9.15 m

Recharge		250	mm/year	
		0.0007	m/day	
K		1.37E-06	m/s	
		1.18E-01	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		9.15	m	
Aquifer saturated thickness (H)		9.05	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		8.15	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**51.6**	m	
Total simulated distance		178		
Distance from Section start	Recharge Distance	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
(m)	(m)			
0	0	0	0	9.05
1	1	0.000685	6.42E-04	9.05
2	2	0.001370	1.28E-03	9.05

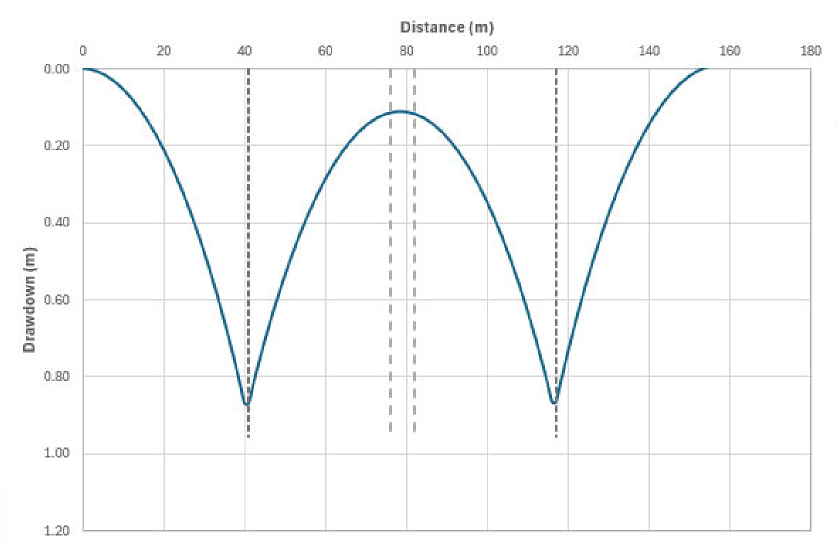


Thickness 8 m

Recharge		250	mm/year	
		0.0007	m/day	
K		1.37E-06	m/s	
		1.18E-01	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		8.00	m	
Aquifer saturated thickness (H)		7.90	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		7.00	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**48.1**	m	
Total simulated distance		171		
Distance from Section start	Recharge Distance	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
(m)	(m)			
0	0	0	0	7.90
1	1	0.000685	7.35E-04	7.90
2	2	0.001370	1.47E-03	7.90

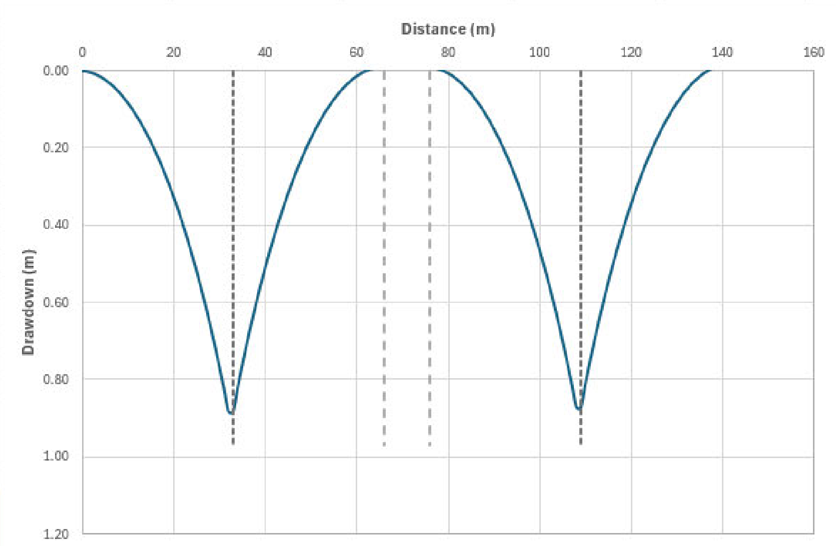


Recharge		250	mm/year	
		0.0007	m/day	
K		1.37E-06	m/s	
		1.18E-01	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		6.00	m	
Aquifer saturated thickness (H)		5.90	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		5.00	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**41.1**	m	
Total simulated distance		157		
Distance from Section start	Recharge Distance	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
(m)	(m)			
0	0	0	0	5.90
1	1	0.000685	9.84E-04	5.90
2	2	0.001370	1.97E-03	5.90



Thickness 6 m

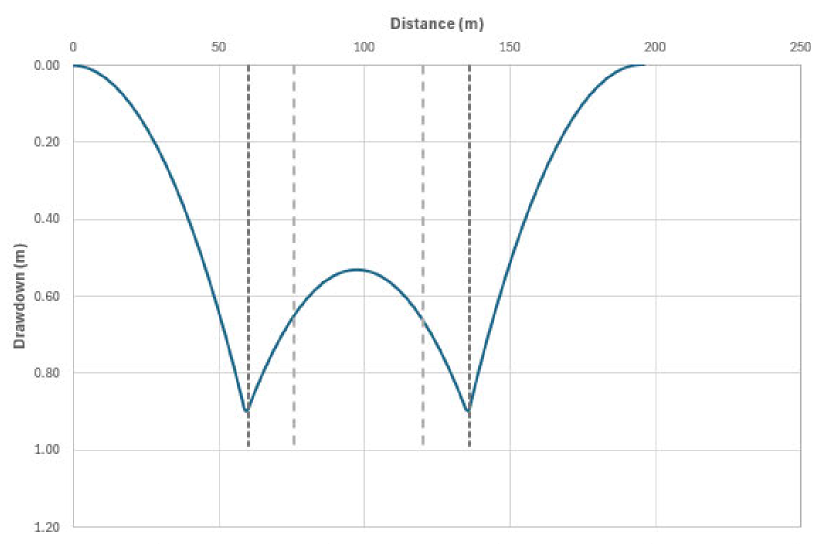
Recharge		250	mm/year	
		0.0007	m/day	
K		1.37E-06	m/s	
		1.18E-01	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		4.00	m	
Aquifer saturated thickness (H)		3.90	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		3.00	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**32.7**	m	
Total simulated distance		140		
Distance from Section start	Recharge Distance	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
(m)	(m)			
0	0	0	0	3.90
1	1	0.000685	1.49E-03	3.90
2	2	0.001370	2.98E-03	3.90



Thickness 4 m

Thickness 12 m

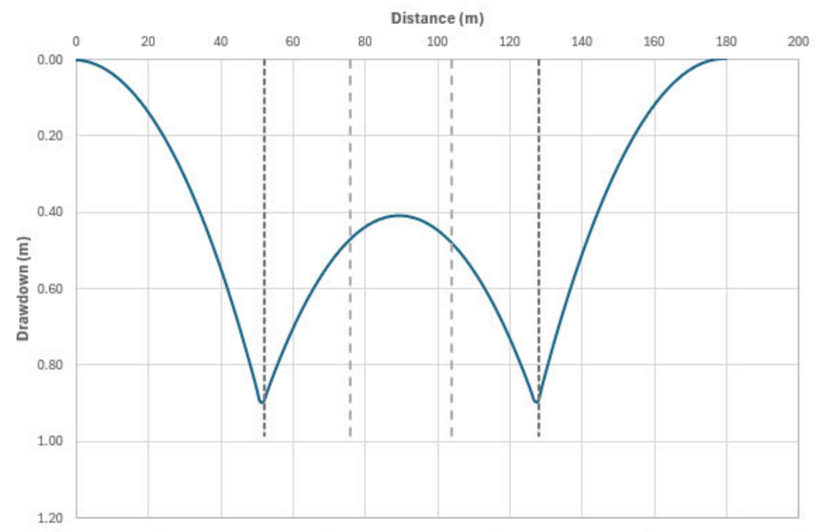
Recharge		250	mm/year	
		0.0007	m/day	
K		1.37E-06	m/s	
		1.18E-01	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		12.00	m	
Aquifer saturated thickness (H)		11.90	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		11.00	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**59.6**	m	
Total simulated distance		194		
Distance from Section start (m)	Recharge Distance (m)	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
0	0	0	0	11.90
1	1	0.000685	4.88E-04	11.90
2	2	0.001370	9.76E-04	11.90



Aquifer Hydraulic Conductivity (K)

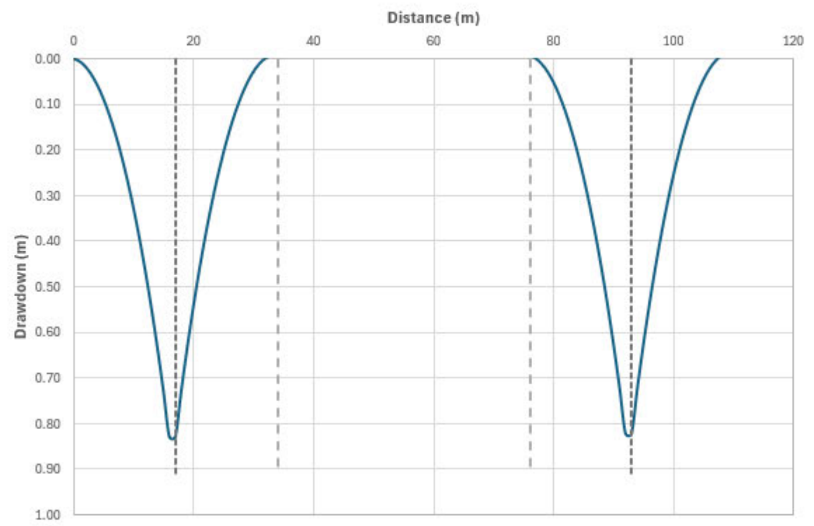
Base case K

Recharge		250	mm/year	
		0.0007	m/day	
K		1.37E-06	m/s	
		1.18E-01	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		9.15	m	
Aquifer saturated thickness (H)		9.05	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		8.15	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**51.6**	m	
Total simulated distance		178		
Distance from Section start (m)	Recharge Distance (m)	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
0	0	0	0	9.05
1	1	0.000685	6.42E-04	9.05
2	2	0.001370	1.28E-03	9.05



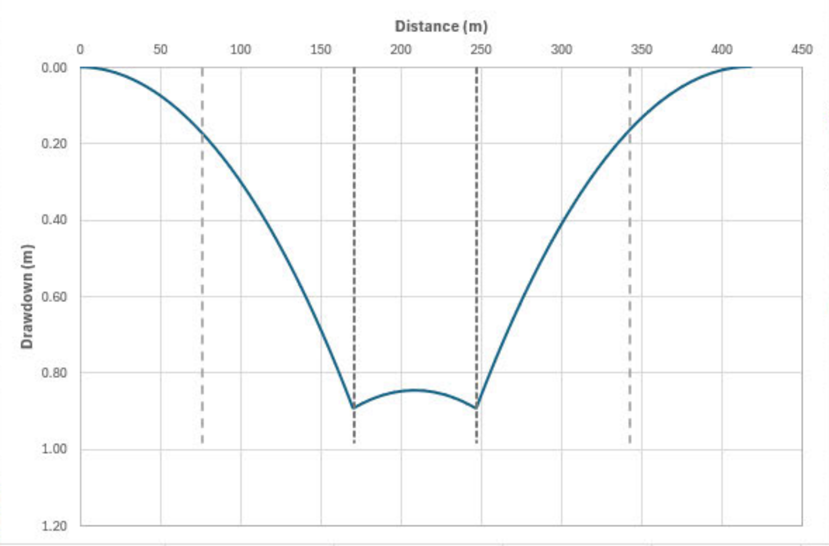
Low K

Recharge		250	mm/year	
		0.0007	m/day	
K		1.50E-07	m/s	
		1.30E-02	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		9.15	m	
Aquifer saturated thickness (H)		9.05	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		8.15	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**17.1**	m	
Total simulated distance		109		
Distance from Section start (m)	Recharge Distance (m)	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
0	0	0	0	9.05
1	1	0.000685	5.84E-03	9.04
2	2	0.001370	1.17E-02	9.03



High K

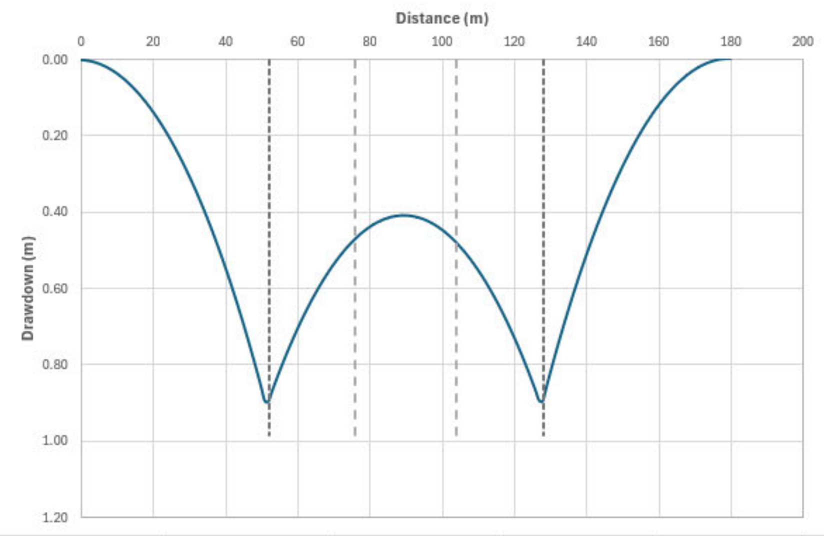
Recharge		250	mm/year	
		0.0007	m/day	
K		1.50E-05	m/s	
		1.30E+00	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		9.15	m	
Aquifer saturated thickness (H)		9.05	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		8.15	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**171.1**	m	
Total simulated distance		417		
Distance from Section start	Recharge Distance	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
(m)	(m)			
0	0	0	0	9.05
1	1	0.000685	5.84E-05	9.05
2	2	0.001370	1.17E-04	9.05



Aquifer Recharge

Base case

Recharge		250	mm/year	
		0.0007	m/day	
K		1.37E-06	m/s	
		1.18E-01	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		9.15	m	
Aquifer saturated thickness (H)		9.05	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		8.15	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**51.6**	m	
Total simulated distance		178		
Distance from Section start (m)	Recharge Distance (m)	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
0	0	0	0	9.05
1	1	0.000685	6.42E-04	9.05
2	2	0.001370	1.28E-03	9.05



High Recharge

Recharge		500	mm/year	
		0.0014	m/day	
K		1.37E-06	m/s	
		1.18E-01	m/day	
Ground elevation		67.6	mRL	
Depth to groundwater		0.1	m	
Depth to base of aquifer		9.15	m	
Aquifer saturated thickness (H)		9.05	m	
Separation distance between trenches (L)		75.00	m	
Height of drain floor above aquifer base		8.15	m	
Drawdown at drains		0.90	m	
Length of drains		1	m	
External distance to 0 drawdown (L_0)		**36.5**	m	
Total simulated distance		148		
Distance from Section start (m)	Recharge Distance (m)	Cumulative recharge (m3/day)	Hydraulic gradient (m/m)	Aquifer saturated thickness (m)
0	0	0	0	9.05
1	1	0.001370	1.28E-03	9.05
2	2	0.002740	2.57E-03	9.05