

APPENDIX A LITHOLOGICAL INVESTIGATIONS AND GROUNDWATER LEVELS



BOREHOLE LOG - BH25-P1

Client: Colliers Project Leaders Ltd
 Project: Southern Links Stage 1 Residential Area
 Site Location: Deanwell, Hamilton
 Project No.: HAM2025-0056
 Date: 09/07/2025



Borehole Location: Refer to Site Plan Logged by: DB Checked by: WD Scale: 1:50 Sheet 1 of 1

Position: 445348.9mE; 694955.0mN Projection: Mt Eden 2000
 Datum: NZVD 2016

Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description		Moisture Condition	Consistency/Relative Density	Recovery	Drilling Method/Support	Dynamic Cone Penetrometer (Blows/100mm)			Structure & Other Observations
		Depth	Type & Results				Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit)	Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)					5	10	15	
					0		OL: Organic SILT: dark brown. Low plasticity. (Topsoil)									
					1		SP: Fine SAND: with some silt. Light brown. Poorly graded. (Hinuera Formation)		M		77					
					2		SW: Fine to coarse SAND: with trace silt. Light brown. Well graded. (Hinuera Formation)									
					3		SW: Fine to coarse SAND: with trace fine gravel. Grey. Well graded. Gravel; subrounded, pumiceous. (Hinuera Formation)									
					4		OL: Organic SILT: black. Low plasticity. (Hinuera Formation)									
					5		ML: SILT: with some fine sand. Grey. Low plasticity. (Hinuera Formation)		S							
					6		SW: Fine to coarse SAND: with trace fine gravel. Grey. Well graded. Gravel; subrounded, pumiceous. (Hinuera Formation)									
					7											
					8											
					9											
					10											

Termination Reason: Target Depth Reached.

Shear Vane No: DCP No:

Remarks: Groundwater encountered at 2.42m. Piezometer screened from 4.5 to 6.0m.

BOREHOLE LOG - BH25-P2

Client: Colliers Project Leaders Ltd
Project: Southern Links Stage 1 Residential Area
Site Location: Deanwell, Hamilton
Project No.: HAM2025-0056
Date: 08/07/2025



Borehole Location: Refer to Site Plan Logged by: DB Checked by: WD Scale: 1:60 Sheet 1 of 1

Position: 445423.8mE; 694892.5mN Projection: Mt Eden 2000
Datum: NZVD 2016

Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Weathering						Recovery	RQD	Estimated Strength						Defect Spacing (mm)						Drilling Method/Support	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
		Depth	Type & Results							RS	CW	HW	MW	SW	UW			EW	W	MS	S	VS	ES	<20	20-60	60-200	200-600	600-2000	>2000		
							OL: Organic SILT: dark brown. Low plasticity. (Topsoil) GW: Silty Sandy fine GRAVEL: dark orange. Well graded. Gravel; angular. Iron pan. (Hinuera Formation) SW: Fine to coarse SAND: with trace silt. Light brown. Well graded. (Hinuera Formation) ... at 0.54m, silt becoming absent. ... at 1.12m, becoming grey. ... at 2.00m, containing trace fine pumiceous gravel. ... at 2.50m, becoming slightly iron stained.	M	TP								75														
					1																										
					2																										
					3																										
					4			S																							
					5		OL: Organic SILT: black. Low plasticity. (Hinuera Formation) SW: Fine to coarse SAND: with trace fine gravel. Well graded. Gravel; subrounded. (Hinuera Formation) ... from 6.00m to 6.70m, sand becoming medium to coarse.	M	F to St								85														
					6																										
					7																										
					8		... from 8.00m to 8.70m, sand becoming fine to medium.	S	TP																						
					9																										
					10		SW: Fine Gravelly fine to coarse SAND: grey. Well graded. Gravel; subrounded, some pumiceous gravel. (Hinuera Formation)										43														
					11		Borehole terminated at 10.50 m																								
					12																										

Termination Reason: Target Depth Reached.

Shear Vane No: DCP No:
Remarks: Groundwater measured at 3.7m. Deep piezometer screened from 8.5 to 10m, shallow piezometer screened from 3.5 to 5.0m.

BOREHOLE LOG - BH25-P3

Client: Colliers Project Leaders Ltd
 Project: Southern Links Stage 1 Residential Area
 Site Location: Deanwell, Hamilton
 Project No.: HAM2025-0056
 Date: 08/07/2025



Borehole Location: Refer to Site Plan Logged by: DB Checked by: WD Scale: 1:50 Sheet 1 of 1

Position: 445342.6mE; 694873.7mN

Projection: Mt Eden 2000

Datum: NZVD 2016

Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)			Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks				
		Depth	Type & Results									5	10	15					
	Groundwater				0		OL: Organic SILT: dark brown. Low plasticity. (Topsoil)	M			80	DPP							
					1		SW: Fine to coarse SAND: with trace silt. Brown. Well graded. (Hinuera Formation) ... at 0.65m, becoming light grey, containing trace fine gravel.												
					2														
					3		... at 3.00m, becoming grey.	S					79						
					4		ML: SILT: with some clay. Dark grey. Low plasticity. (Hinuera Formation) ... from 3.65m to 3.75m, lens of organic silt, black, low plasticity.		F	100									
					5		SW: Fine to coarse SAND: with trace fine gravel. Grey. Well graded. Pumiceous. (Hinuera Formation) ... from 4.96m to 5.15m, lens of fine pumiceous gravel.		TP	100									
					6		Borehole terminated at 6.0 m												
					7														
					8														
					9														
					10														

Termination Reason: Target Depth Reached.

Shear Vane No: DCP No:

Remarks: Groundwater encountered at 2.12m. Piezometer screened from 4.5 to 6.0m.

BOREHOLE LOG - BH25-P4

Client: Colliers Project Leaders Ltd
Project: Southern Links Stage 1 Residential Area
Site Location: Deanwell, Hamilton
Project No.: HAM2025-0056
Date: 08/07/2025



Borehole Location: Refer to Site Plan

Logged by: DB

Checked by: WD

Scale: 1:50

Sheet 1 of 1

Position: 445349.9mE; 694563.3mN

Projection: Mt Eden 2000

Datum: NZVD 2016

Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)			Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
		Depth	Type & Results									5	10	15	
08-07-2025					1		OL: Organic SILT: dark brown. Low plasticity. (Topsoil) ML: Fine Sandy SILT: grey streaked orange brown. Low plasticity. (Hinuera Formation)	M	F to St	47					
				2		SP: Silty Fine SAND: grey streaked orange brown. Poorly graded. (Hinuera Formation) ... at 1.77m, containing lens of clayey silt. SW: Gravelly fine to coarse SAND: grey. Well graded. Gravel; fine, subrounded, pumiceous. (Hinuera Formation) SP: Fine SAND: with some silt. Grey. Poorly graded. (Hinuera Formation) ML: SILT: with some clay. Grey. Low plasticity. (Hinuera Formation) OL: Organic SILT: black. Low plasticity. (Hinuera Formation) ML: Clayey SILT: grey. Low plasticity. (Hinuera Formation) SW: Fine to coarse SAND: with trace silt. Grey. Well graded. (Hinuera Formation)	S	TP	83						
				3						DPP					
				4					97						
				5		... at 4.60m, containing minor fine gravel, pumiceous.		TP							
				6		Borehole terminated at 6.0 m			73						
				7											
				8											
				9											
				10											

Termination Reason: Target Depth Reached.

Shear Vane No: DCP No:

Remarks: Groundwater encountered at 1.57m. Piezometer screened from 4.5 to 6.0m.

PHOTOGRAPH SHEET - BH25-P1

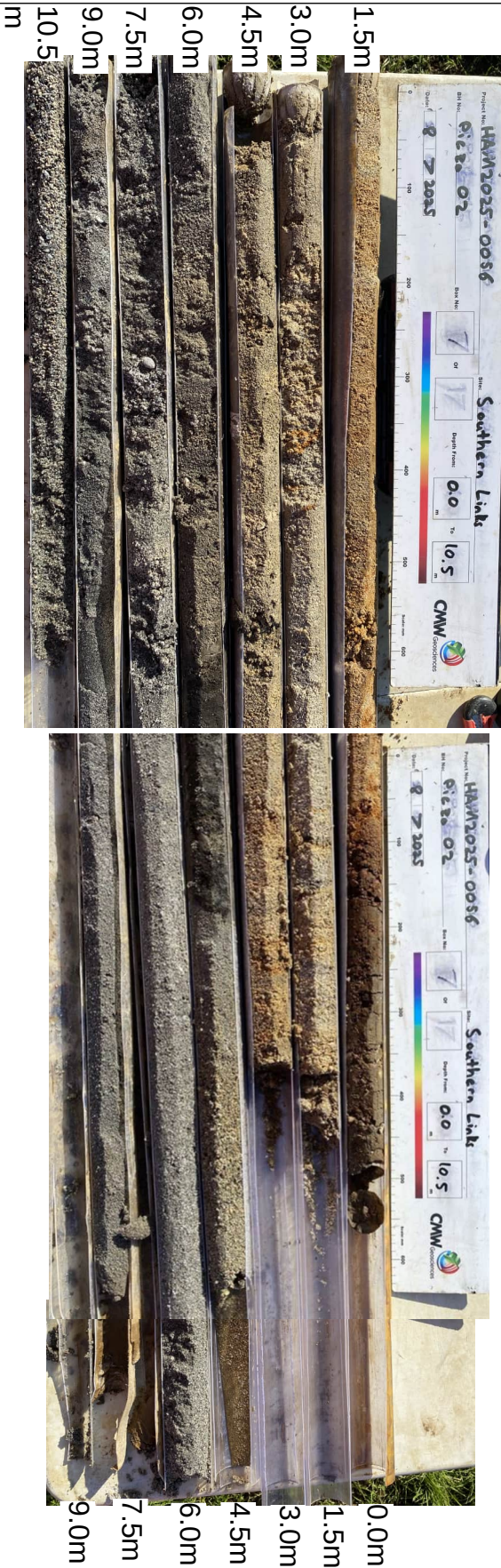
Client: Colliers Project Leaders Ltd
Project: Southern Links Stage 1 Residential Area
Location: Deanwell, Hamilton
Project ID: HAM2025-0056
Date: 9/07/2025



This borehole report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

PHOTOGRAPH SHEET - BH25-P2

Client: Colliers Project Leaders Ltd
Project: Southern Links Stage 1 Residential Area
Location: Deanwell, Hamilton
Project ID: HAM2025-0056
Date: 8/07/2025



This borehole report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

PHOTOGRAPH SHEET - BH25-P3

Client: Colliers Project Leaders Ltd
Project: Southern Links Stage 1 Residential Area
Location: Deanwell, Hamilton
Project ID: HAM2025-0056
Date: 8/07/2025



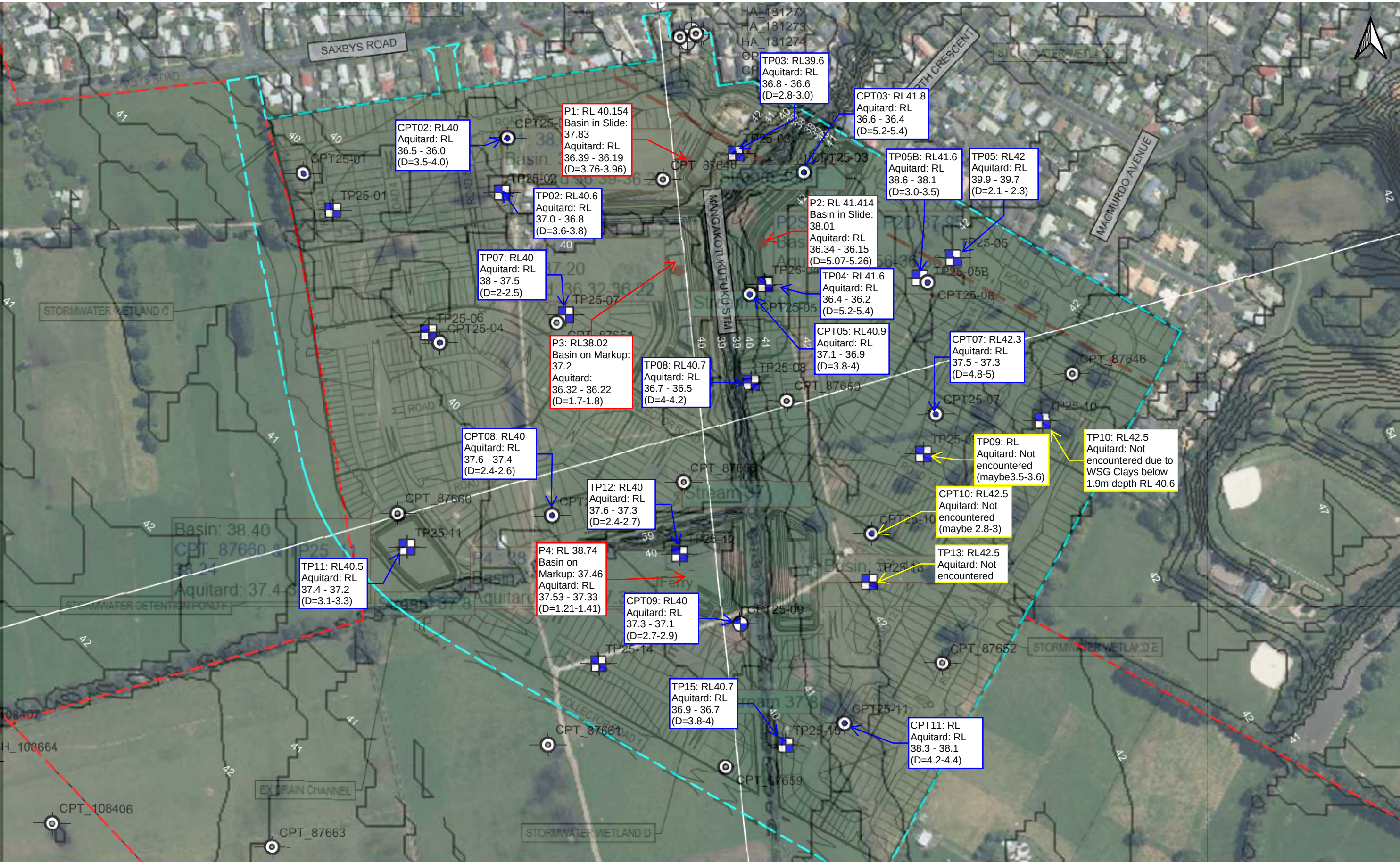
This borehole report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

PHOTOGRAPH SHEET - BH25-P4

Client: Colliers Project Leaders Ltd
Project: Southern Links Stage 1 Residential Area
Location: Deanwell, Hamilton
Project ID: HAM2025-0056
Date: 8/07/2025



This borehole report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.



LEGEND:

Site Investigation Plan_modified

Band 1 (Red)

Band 2 (Green)

Band 3 (Blue)

WGA Markup - Aquitard_modified

Band 1 (Red)

Band 2 (Green)

Band 3 (Blue)

Wetland A

OpenStreetMap

NOTES:

70 0 70 140

CLIENT:	COLLIERS PROJECT LEADERS		DRAWN:	MM	PROJECT:	HAM2025-0056
PROJECT:	SOUTHERN LINKS STAGE 1 RESIDENTIAL		CHECKED:		DRAWING:	XX
TITLE:	TITLE		REVISION:	XX	SCALE:	1:3,500
			DATE:	01/01/2025	SHEET:	A3L

Table A1: Groundwater Levels Recorded in April 2025 by CMW

SITE NUMBER	GROUNDWATER LEVEL (m bgl)	GROUNDWATER LEVEL (m RL)
TP25-01	3.5	36.5
TP25-02	2.8	37.8
TP25-03	2.8	36.8
TP25-04	5	36.6
TP25-05	5.5	36.5
TP25-05 B	2.8	38.8
TP25-06	2.5	37.5
TP25-07	1.7	38.3
TP25-08	3.9	36.8
TP25-09	4.5	38
TP25-10	3.1	39.2
TP25-10	2	38.5
TP25-10	3.2	36.8
TP25-10	3.7	38.8
TP25-10	2	38.4
TP25-10	3.5	37.2
CPT25-01	3.5	36.5
CPT25-02	2.8	37.2
CPT25-03	2.8	39
CPT25-04	2.5	37.5
CPT25-05	5	35.9
CPT25-06	2.8	39.2
CPT25-07	4.5	37.8
CPT25-08	2	38
CPT25-09	3.2	36.8
CPT25-10	3.7	38.8
CPT25-11	3.5	39

Note: Source CMW (2026)

Table A2: Nearby Bores within 1 km of Proposed Residential Development Activities from the WRC Database (March 2026)

BORE ID	TYPE	STATUS	EASTING	NORTHING	EXTERNAL CASING DIAMETER (mm)	DRILLED DEPTH (m)
69_1208	Well/Bore	Existing	1800661	5811970	100	10.3
70_388	Well/Bore	Existing	1799262	5811368	100	26.8
70_363	Well/Bore	Existing	1801264	5810271	100	8.2
70_512	Well/Bore	Existing	1801664	5810371	100	34
70_501	Well/Bore	Existing	1799862	5810869	100	24
70_506	Well/Bore	Existing	1799262	5811268	100	28
70_476	Well/Bore	Existing	1801364	5809871	75	9.09
72_192	Well/Bore	Existing	1801664	5810371	200	76.7
72_1264	Well/Bore	Existing	1799363	5810768		61.5
72_1628	Well/Bore	Existing	1799962	5811269	100	23
72_3943	Well/Bore	Existing	1799461	5810252	104	42
72_3754	Well/Bore	Existing	1801210	5811472	75	2.5
72_3755	Well/Bore	Existing	1801204	5811459	50	2.5
72_3756	Well/Bore	Existing	1801213	5811454	50	2.5
72_3757	Well/Bore	Existing	1801222	5811452	50	2.5
72_3219	Well/Bore	Existing	1801266	5811455	100	3.5
72_3220	Well/Bore	Existing	1801252	5811439	100	2.9
72_3221	Well/Bore	Existing	1801235	5811452	100	2.7
72_3222	Well/Bore	Existing	1801231	5811460	100	2.7
72_3223	Well/Bore	Existing	1801257	5811469	100	4.2
72_3765	Well/Bore	Existing	1801230	5811445	50	2.5
72_3766	Well/Bore	Existing	1801271	5811507	50	5
72_3767	Well/Bore	Existing	1801251	5811473	50	2.2
72_3768	Well/Bore	Existing	1801250	5811481	50	2.1
72_3769	Well/Bore	Existing	1801243	5811477	50	2.15
72_3218	Well/Bore	Existing	1801262	5811440	100	3.5
72_3715	Well/Bore	Existing	1801255	5811489	50	4
72_3469	Well/Bore	Existing	1801219	5811483	50	2.5
72_3716	Well/Bore	Existing	1801272	5811475	50	5
72_3717	Well/Bore	Existing	1801268	5811463	50	4
72_4049	Well/Bore	Existing	1800564	5809970	100	40
70_348	Well/Bore	Existing	1801863	5810572	150	83.82
70_1042	Well/Bore	Existing	1799162	5811268		
72_5293	Well/Bore	Existing	1801014	5809500		6
72_11515	Well/Bore	Existing	1801585	5810417	100	54.7
72_11662	Piezometer	Existing	1800153	5811891	50	15
72_11665	Well/Bore	Existing	1800145	5811864	50	13.95

BORE ID	TYPE	STATUS	EASTING	NORTHING	EXTERNAL CASING DIAMETER (mm)	DRILLED DEPTH (m)
72_11989	Well/Bore	Existing	1800171	5811880		16
72_11990	Piezometer	Existing	1800155	5811876	50	4
72_11992	Piezometer	Existing	1799950	5811960	50	4
72_11661	Piezometer	Existing	1800223	5811911		10.95
72_11663	Well/Bore	Decommissioned	1799658	5812063	32	3.8
72_11664	Well/Bore	Decommissioned	1799950	5811960	32	3.9
72_11666	Well/Bore	Existing	1800155	5811876	32	4
72_11667	Well/Bore	Existing	1800128	5811858		2.7
72_11668	Well/Bore	Decommissioned	1800155	5811876	32	4
72_11669	Well/Bore		1799659	5812056		
72_11670	Well/Bore		1799949	5811951		
72_12408	Well/Bore	Existing	1800157	5811887	101	15.9
72_12409	Well/Bore	Existing	1800130	5811869	101	15.9
72_12410	Well/Bore	Existing	1800120	5811884	200	19
72_12411	Well/Bore	Existing	1800123	5811905	200	20
72_12412	Well/Bore	Existing	1800146	5811903		20.7
72_12413	Well/Bore	Existing	1800146	5811858		18.5
72_12414	Well/Bore	Existing	1800167	5811875		20.1
72_12527	Well/Bore	Existing	1800153	5811891		4
72_12835	Well/Bore	Existing	1800172	5811878	200	18
72_12836	Well/Bore	Existing	1800168	5811886		18
72_12837	Well/Bore	Existing	1800114	5811922	150	18
72_12838	Well/Bore	Existing	1800133	5811916	150	17
72_12839	Well/Bore	Existing	1800152	5811913		18
72_12840	Well/Bore	Existing	1800167	5811904		18
72_12841	Well/Bore	Existing	1800182	5811902	150	18
72_12842	Well/Bore	Existing	1800136	5811864		16
72_12843	Well/Bore	Existing	1800136	5811906		16
72_12844	Well/Bore	Existing	1800162	5811877		16
72_12845	Well/Bore	Existing	1800165	5811859	32	14.5
72_12846	Well/Bore	Existing	1800168	5811901	32	15
72_12847	Well/Bore	Existing	1800101	5811877	32	15
72_12848	Well/Bore	Existing	1800130	5811915	32	15
72_12977	Piezometer	Existing	1800593	5811145		6
72_12978	Piezometer	Existing	1800673	5811072		10.5
72_12979	Piezometer	Existing	1800670	5811073		10.5
72_12980	Piezometer	Existing	1800589	5811047		6
72_12981	Piezometer	Existing	1800595	5810750		6
72_13299	Well/Bore	Proposed				

BORE ID	TYPE	STATUS	EASTING	NORTHING	EXTERNAL CASING DIAMETER (mm)	DRILLED DEPTH (m)
72_13300	Well/Bore	Proposed				
72_13301	Well/Bore	Proposed				
72_13302	Well/Bore	Proposed				
72_13303	Well/Bore	Proposed				
72_13320	Well/Bore	Proposed				
72_13321	Well/Bore	Proposed				
72_13322	Well/Bore	Proposed				
72_13327	Well/Bore	Proposed				
72_13328	Well/Bore	Proposed				

APPENDIX B

HYDRAULIC TESTING



Introduction

The hydraulic conductivity of the geological layers found at the Residential Development site has been determined by WGA. Hydraulic conductivities were determined by the use of slug tests; the results of each test are presented in this Appendix.

Slug Testing

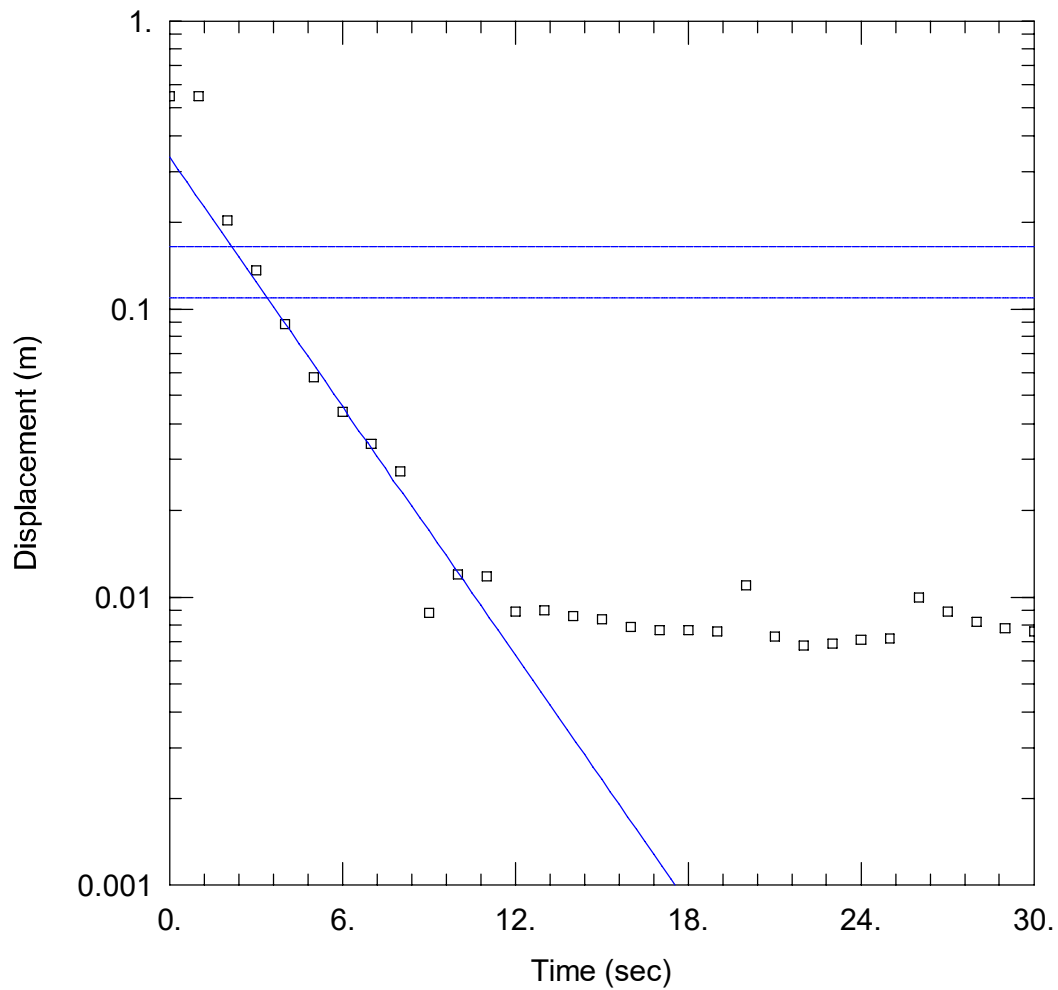
WGA conducted slug testing on the five piezometers within the site area, targeting the sands of the Hinuera Formation. Slug test results were analysed using the Bouwer and Rice (1974). Both falling head and rising head tests were analysed where data was available. AQTESOLV Pro v4.5 software package from HydroSolve Inc was used to analyse the datasets.

Slug tests across the site reacted very rapidly, typically recovering within the first two seconds of each test. Resulting hydraulic conductivities were on average **4×10^{-4} m/sec**, which is considered a representative value for the site.

WGA notes that due to the rapid recovery of the slug tests, resulting hydraulic conductivities should be treated as minimum values as they may be representing the screen and filter pack rather than the target aquifer.

Table B1: Results of Slug Testing

BORE	TEST TYPE	HYDRAULIC CONDUCTIVITY (m/sec)
BH25-P1	RHT 1	1.23×10^{-4}
	FHT 3	3.35×10^{-4}
	RHT 3	8.75×10^{-5}
BH25-P2D	FHT 1	1.03×10^{-3}
	FHT 2	3.50×10^{-4}
BH25-P2S	RHT 1	1.25×10^{-4}
	FHT 2	1.83×10^{-4}
BH25-P3	RHT 2	5.53×10^{-4}
	RHT 4	4.34×10^{-4}
BH25-P4	RHT 2	4.72×10^{-4}
	RHT 3	7.51×10^{-4}



WELL TEST ANALYSIS

Data Set: V:\...\P1 - Test 1 - Rising Head.aqt

Date: 03/03/26

Time: 08:23:00

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 8.104 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P1)

Initial Displacement: 0.5478 m

Static Water Column Height: 3.77 m

Total Well Penetration Depth: 3.77 m

Screen Length: 1.5 m

Casing Radius: 0.02 m

Well Radius: 0.0375 m

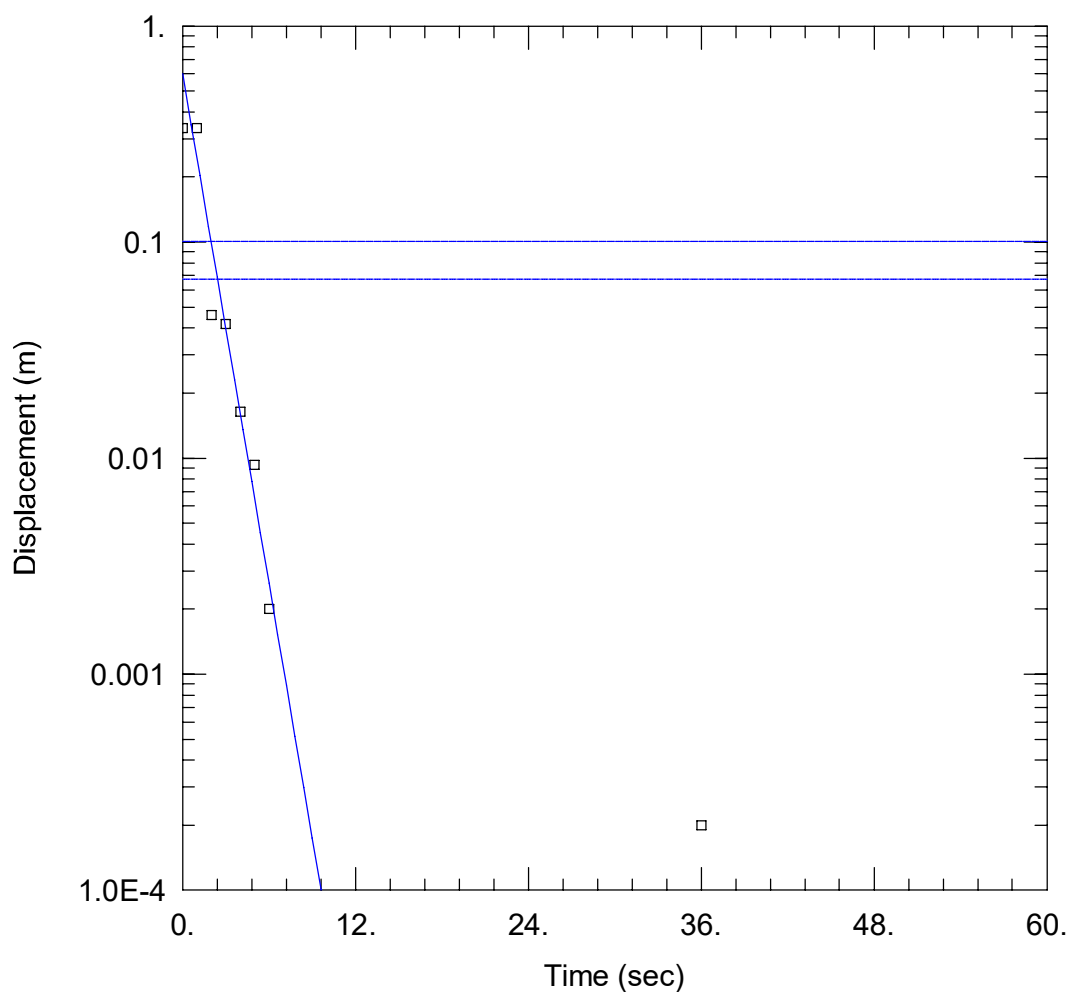
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 10.59$ m/day

$y_0 = 0.3367$ m



WELL TEST ANALYSIS

Data Set: V:\...\P1 - Test 3 - Falling Head.aqt

Date: 03/03/26

Time: 08:28:33

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 8.104 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P1)

Initial Displacement: 0.3361 m

Total Well Penetration Depth: 3.77 m

Casing Radius: 0.02 m

Static Water Column Height: 3.77 m

Screen Length: 1.5 m

Well Radius: 0.0375 m

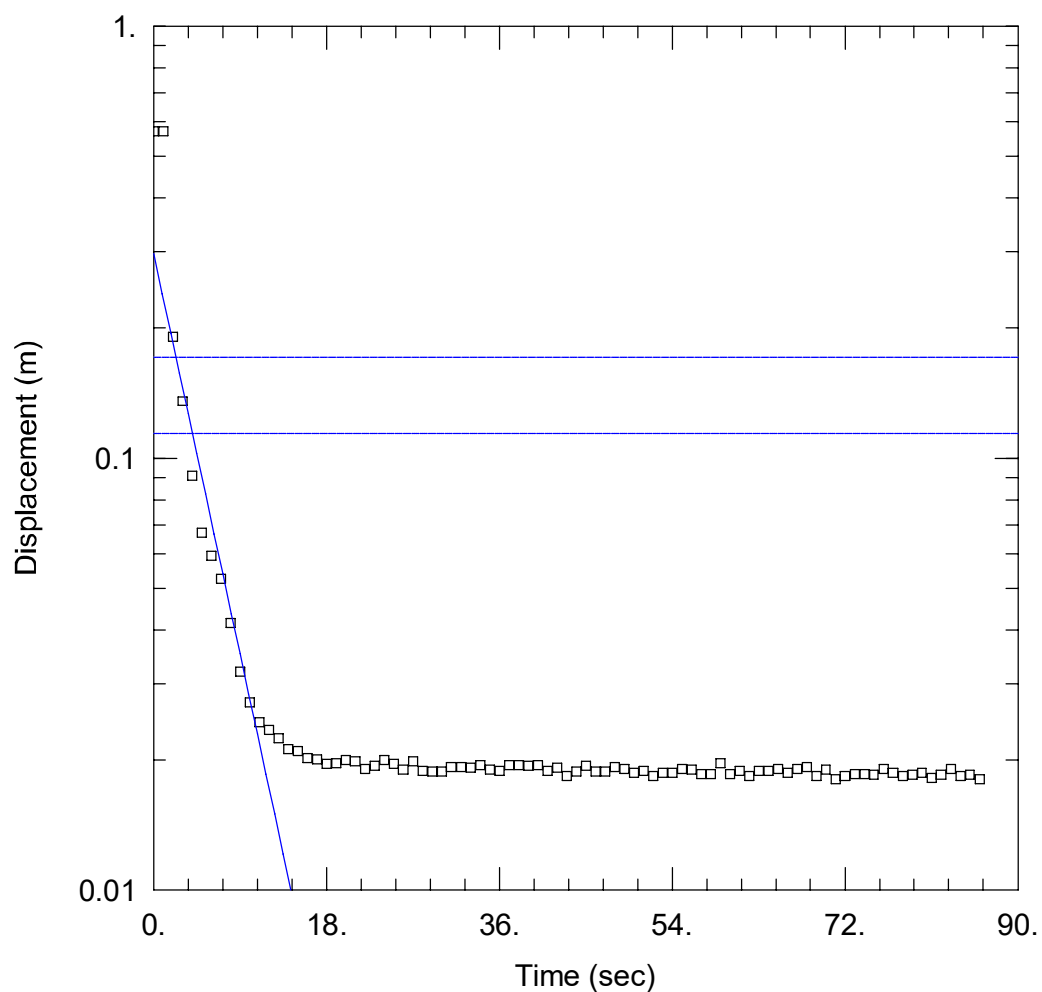
SOLUTION

Aquifer Model: Unconfined

K = 28.91 m/day

Solution Method: Bouwer-Rice

y0 = 0.6019 m



WELL TEST ANALYSIS

Data Set: V:\...\P1 - Test 3 - Rising Head.aqt

Date: 03/03/26

Time: 08:31:56

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 8.104 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P1)

Initial Displacement: 0.5698 m

Total Well Penetration Depth: 3.77 m

Casing Radius: 0.02 m

Static Water Column Height: 3.77 m

Screen Length: 1.5 m

Well Radius: 0.0375 m

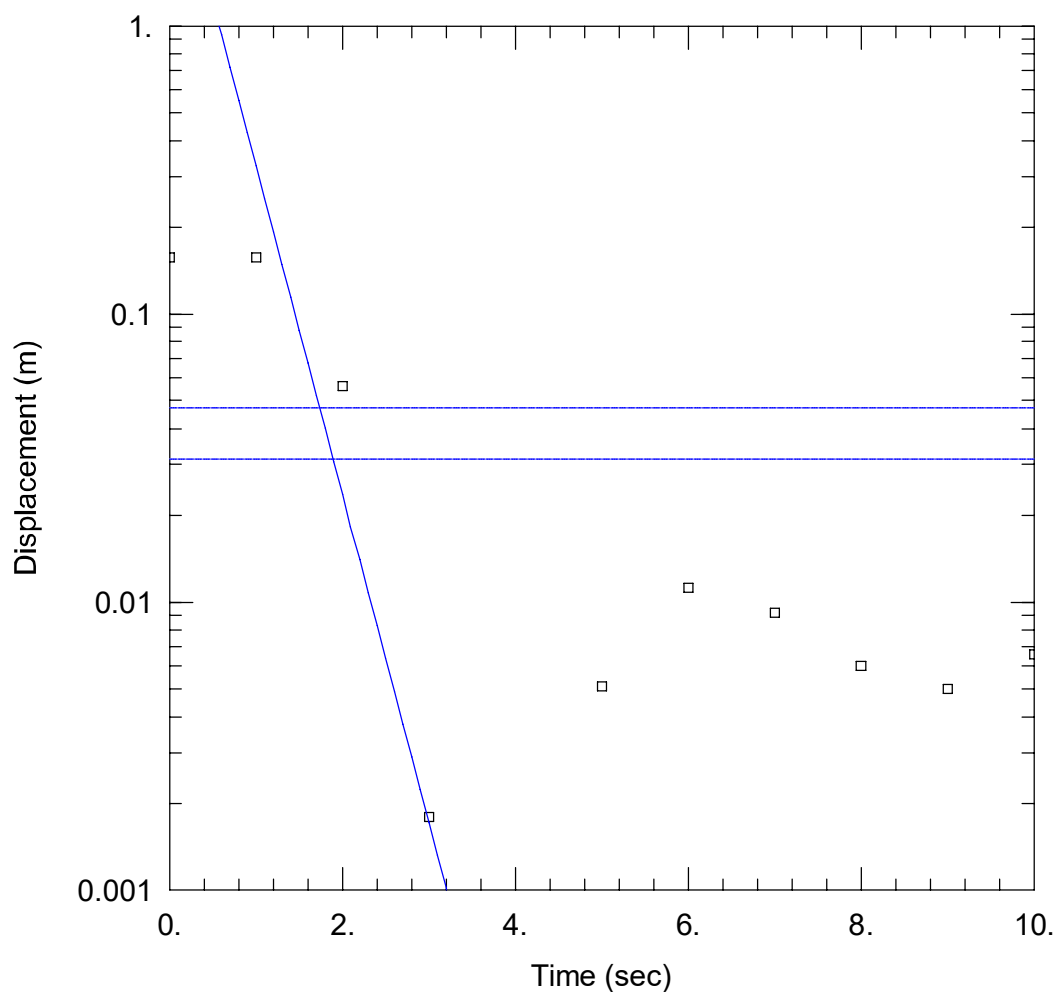
SOLUTION

Aquifer Model: Unconfined

$K = 7.562$ m/day

Solution Method: Bouwer-Rice

$y_0 = 0.297$ m



WELL TEST ANALYSIS

Data Set: V:\...\P2D - Test 1 - Falling Head.aqt

Date: 03/03/26

Time: 08:34:11

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 10.71 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P2D)

Initial Displacement: 0.1572 m

Total Well Penetration Depth: 6.18 m

Casing Radius: 0.02 m

Static Water Column Height: 6.18 m

Screen Length: 1.5 m

Well Radius: 0.0375 m

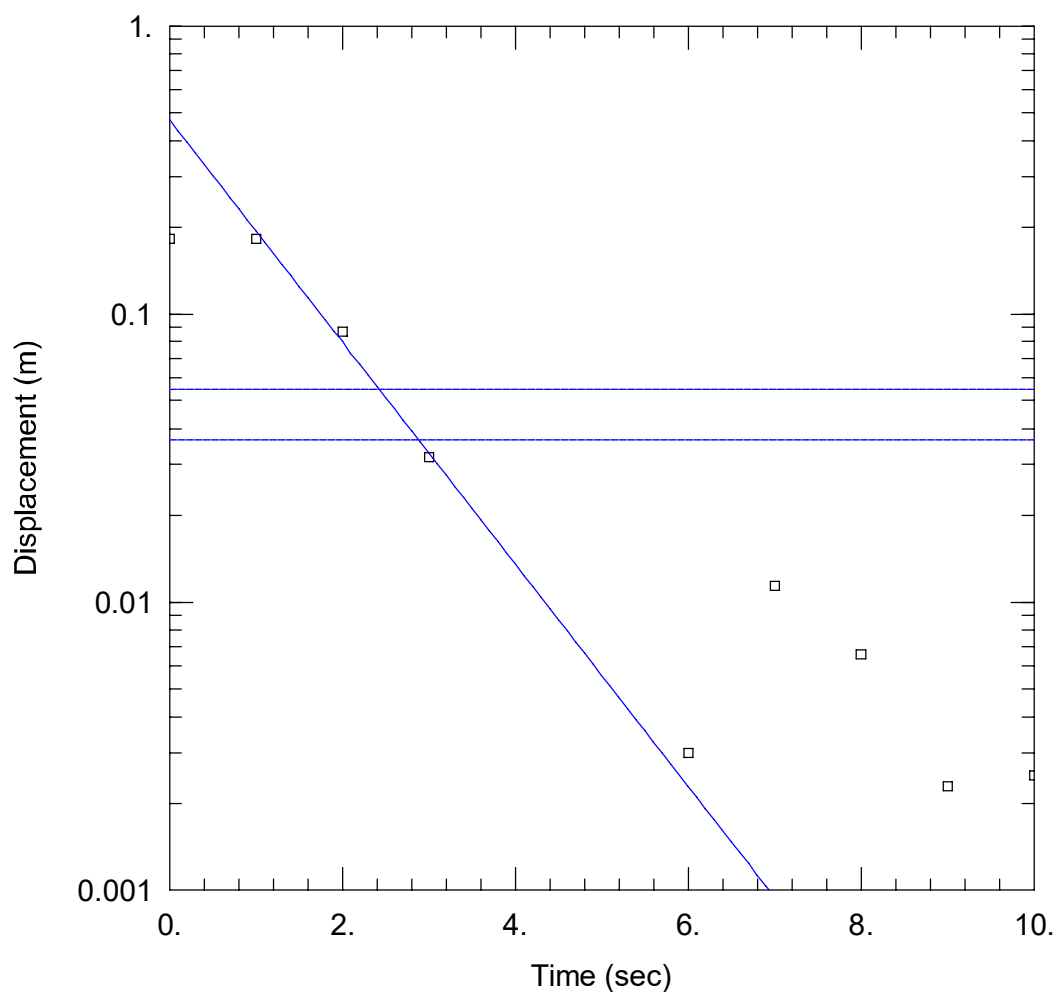
SOLUTION

Aquifer Model: Unconfined

$K = 89.4$ m/day

Solution Method: Bouwer-Rice

$y_0 = 4.507$ m



WELL TEST ANALYSIS

Data Set: V:\...\P2D - Test 2 - Falling Head.aqt

Date: 03/03/26

Time: 08:34:58

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 10.71 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P2D)

Initial Displacement: 0.1826 m

Static Water Column Height: 6.18 m

Total Well Penetration Depth: 6.18 m

Screen Length: 1.5 m

Casing Radius: 0.02 m

Well Radius: 0.0375 m

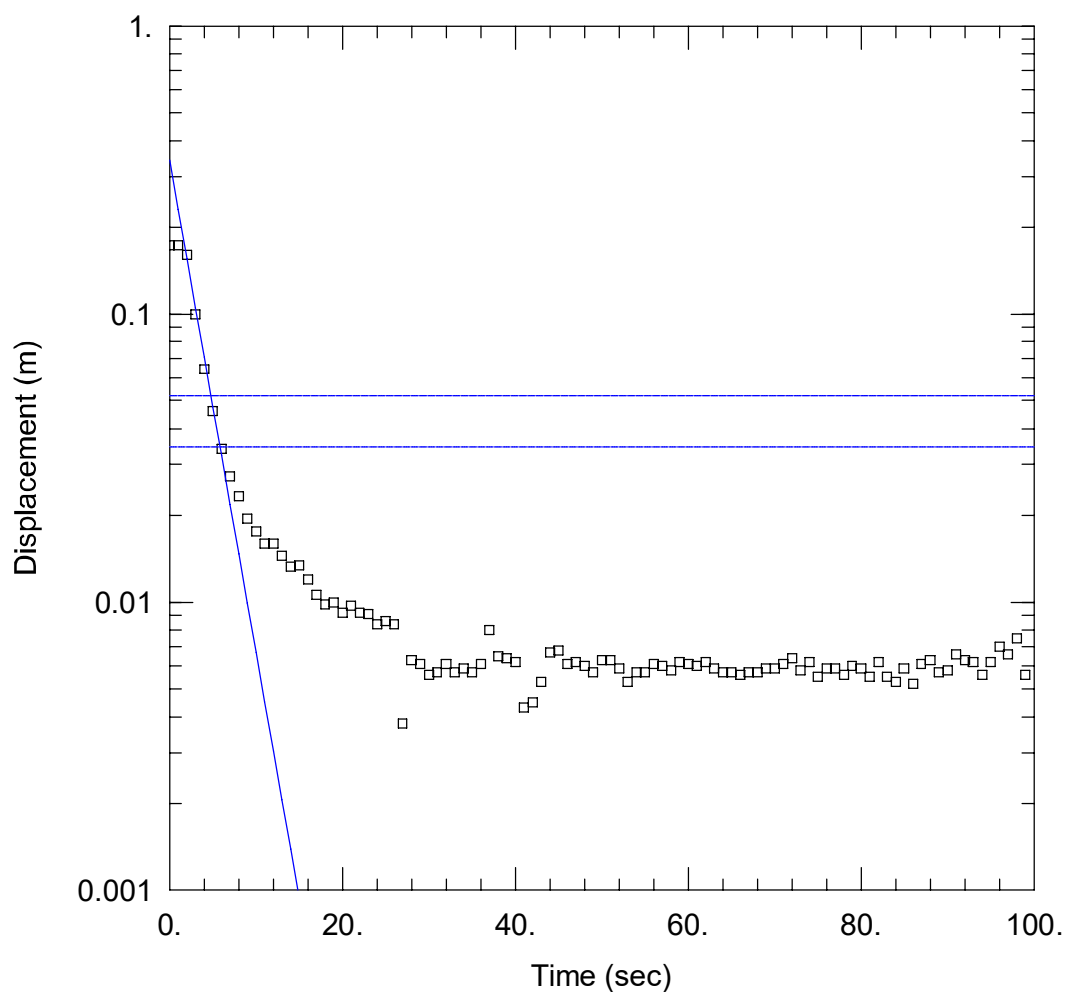
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 30.23$ m/day

$y_0 = 0.4716$ m



WELL TEST ANALYSIS

Data Set: V:\...\P2S - Test 1 - Rising Head.aqt

Date: 03/03/26

Time: 08:36:40

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 11.16 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P2S)

Initial Displacement: 0.1733 m

Static Water Column Height: 1.71 m

Total Well Penetration Depth: 1.71 m

Screen Length: 1.5 m

Casing Radius: 0.02 m

Well Radius: 0.0375 m

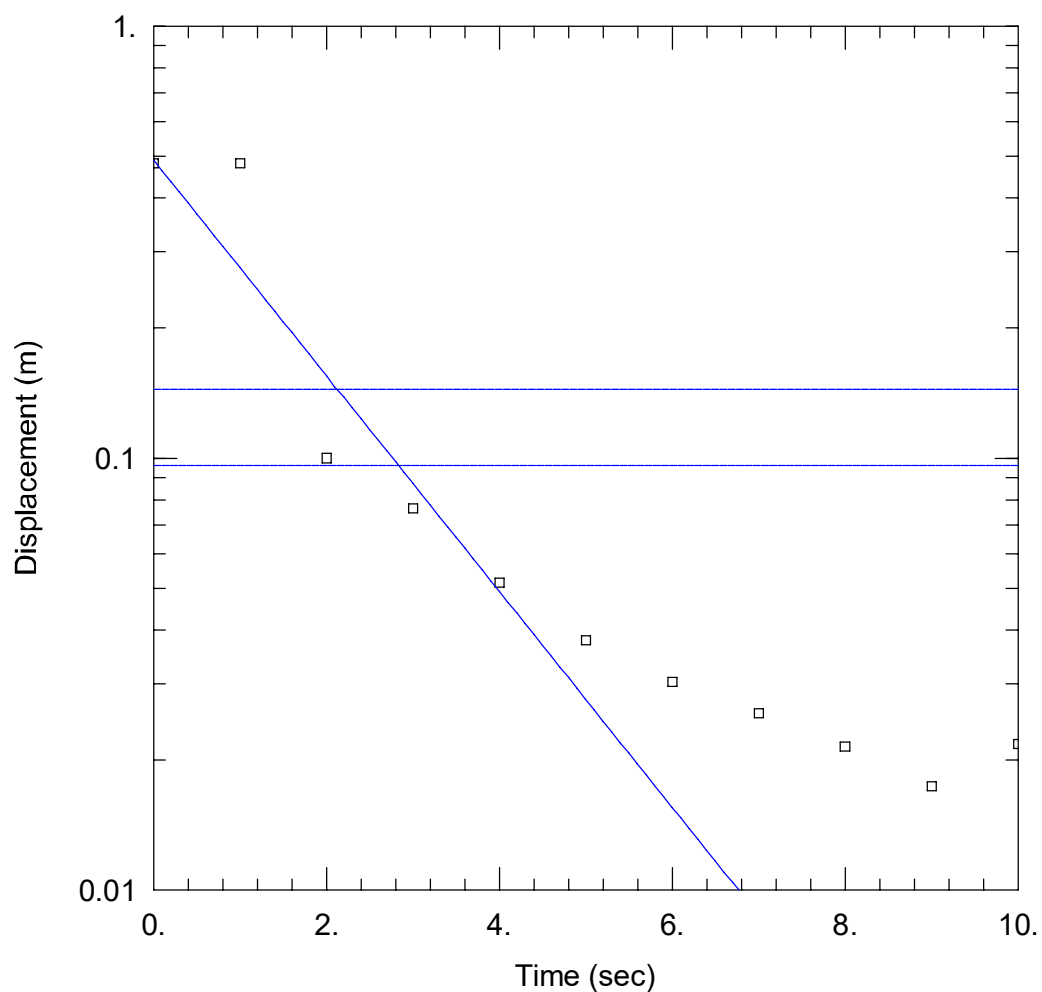
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 10.82$ m/day

$y_0 = 0.3418$ m



WELL TEST ANALYSIS

Data Set: V:\...\P2S - Test 2 - Falling Head.aqt

Date: 03/03/26

Time: 08:37:13

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 11.16 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P2S)

Initial Displacement: 0.4804 m

Total Well Penetration Depth: 1.71 m

Casing Radius: 0.02 m

Static Water Column Height: 1.71 m

Screen Length: 1.5 m

Well Radius: 0.0375 m

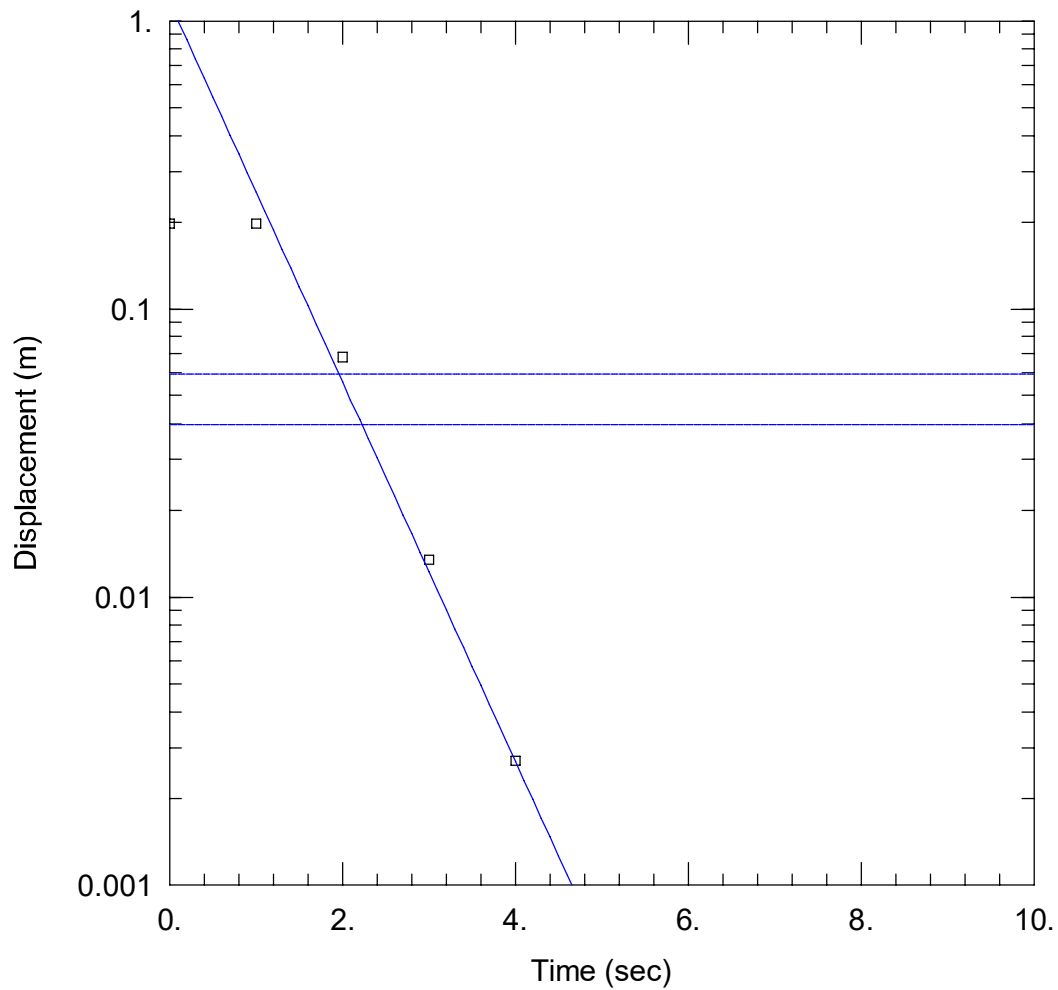
SOLUTION

Aquifer Model: Unconfined

$K = 15.8$ m/day

Solution Method: Bouwer-Rice

$y_0 = 0.4896$ m



WELL TEST ANALYSIS

Data Set: V:\...\P3 - Test 2 - Rising Head.aqt

Date: 03/03/26

Time: 08:35:46

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 12.61 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P3)

Initial Displacement: 0.198 m

Static Water Column Height: 3.955 m

Total Well Penetration Depth: 3.955 m

Screen Length: 1.5 m

Casing Radius: 0.02 m

Well Radius: 0.0375 m

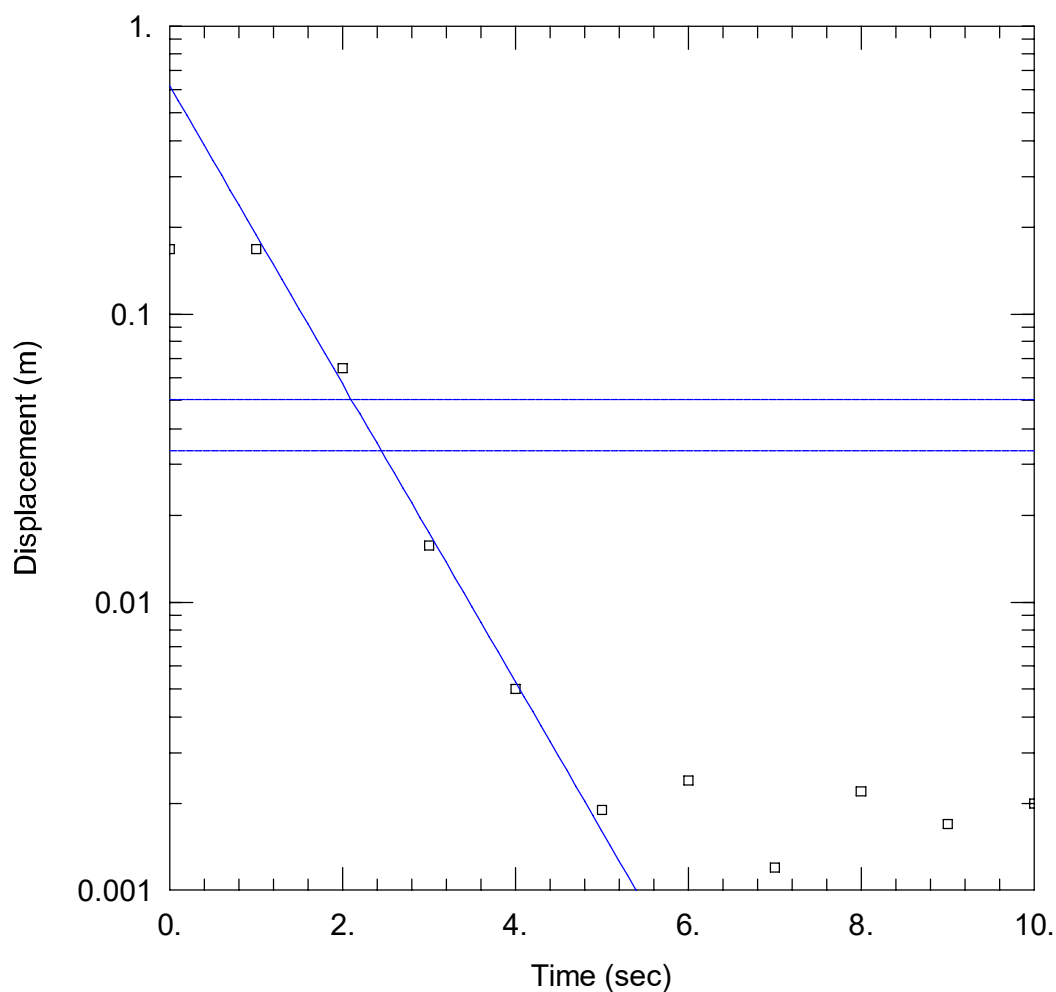
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 47.75$ m/day

$y_0 = 1.162$ m



WELL TEST ANALYSIS

Data Set: V:\...\P3 - Test 4 - Rising Head.aqt

Date: 03/03/26

Time: 08:37:54

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 12.61 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P3)

Initial Displacement: 0.1681 m

Static Water Column Height: 3.955 m

Total Well Penetration Depth: 3.955 m

Screen Length: 1.5 m

Casing Radius: 0.02 m

Well Radius: 0.0375 m

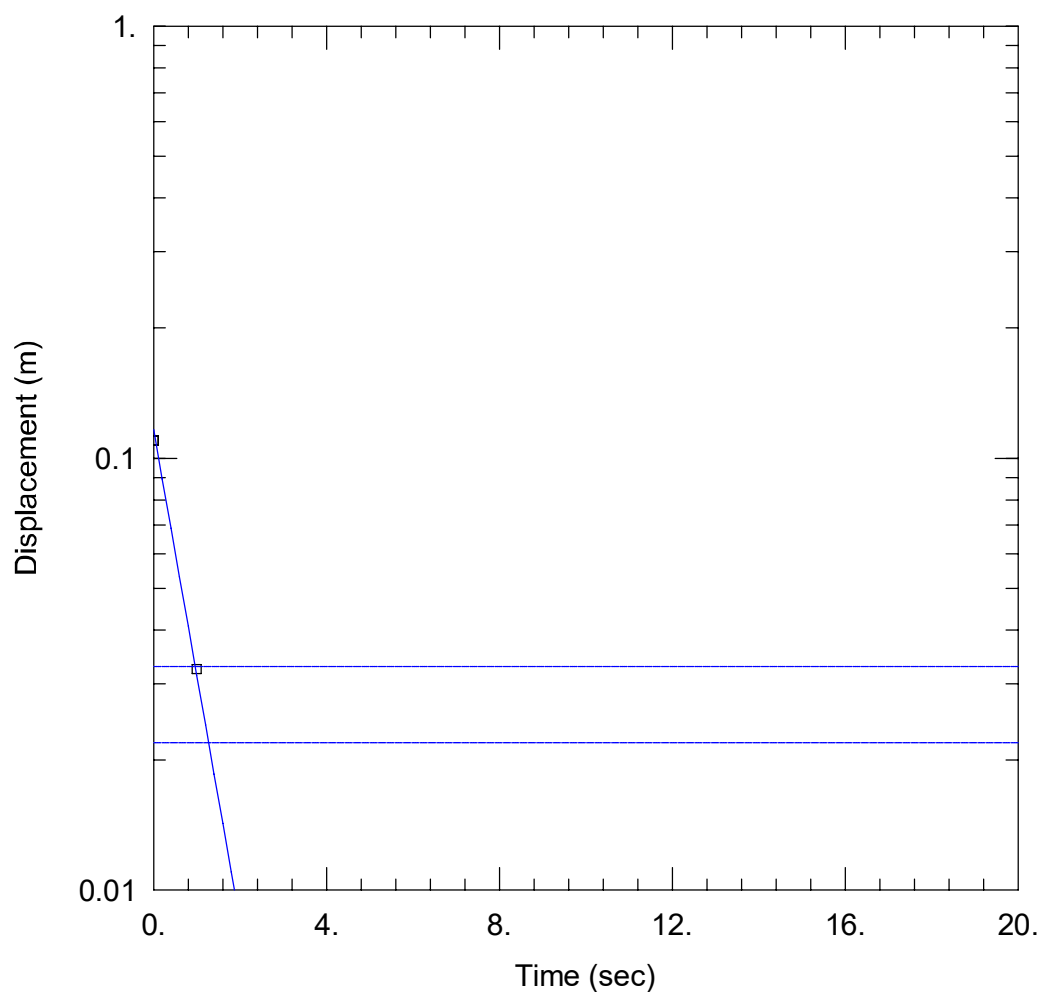
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 37.47$ m/day

$y_0 = 0.6202$ m



WELL TEST ANALYSIS

Data Set: V:\...\P4 - Test 2 - Rising Head.aqt

Date: 03/03/26

Time: 08:41:03

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 10.68 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P4)

Initial Displacement: 0.1097 m

Total Well Penetration Depth: 4.5 m

Casing Radius: 0.02 m

Static Water Column Height: 4.5 m

Screen Length: 1.5 m

Well Radius: 0.0375 m

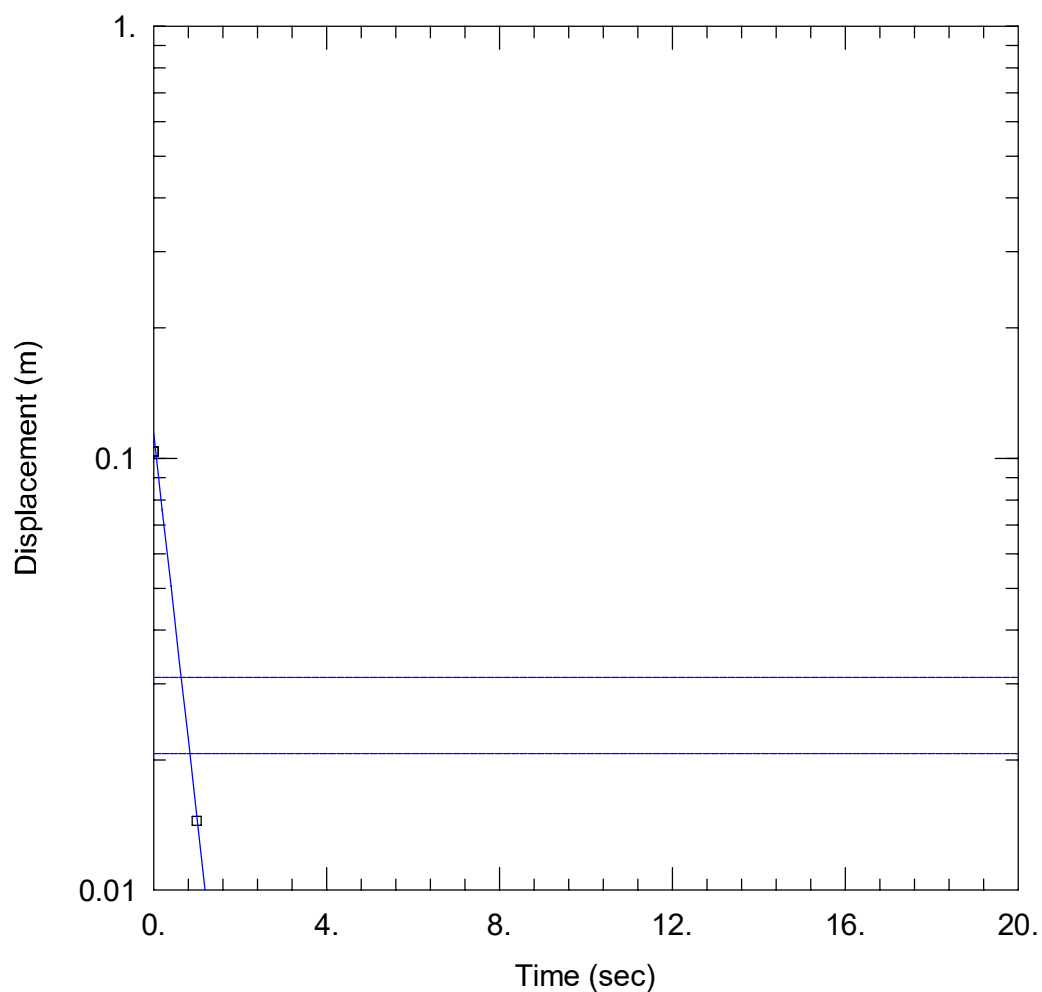
SOLUTION

Aquifer Model: Unconfined

$K = 42.41$ m/day

Solution Method: Bouwer-Rice

$y_0 = 0.1164$ m



WELL TEST ANALYSIS

Data Set: V:\...\P4 - Test 3 - Rising Head.aqt

Date: 03/03/26

Time: 08:41:41

PROJECT INFORMATION

Company: WGA

Client: SL - Southern Block

Project: 242463

Location: Hamilton

Test Well: P1

Test Date: 18/07/2025

AQUIFER DATA

Saturated Thickness: 10.68 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (P4)

Initial Displacement: 0.1035 m

Total Well Penetration Depth: 4.5 m

Casing Radius: 0.02 m

Static Water Column Height: 4.5 m

Screen Length: 1.5 m

Well Radius: 0.0375 m

SOLUTION

Aquifer Model: Unconfined

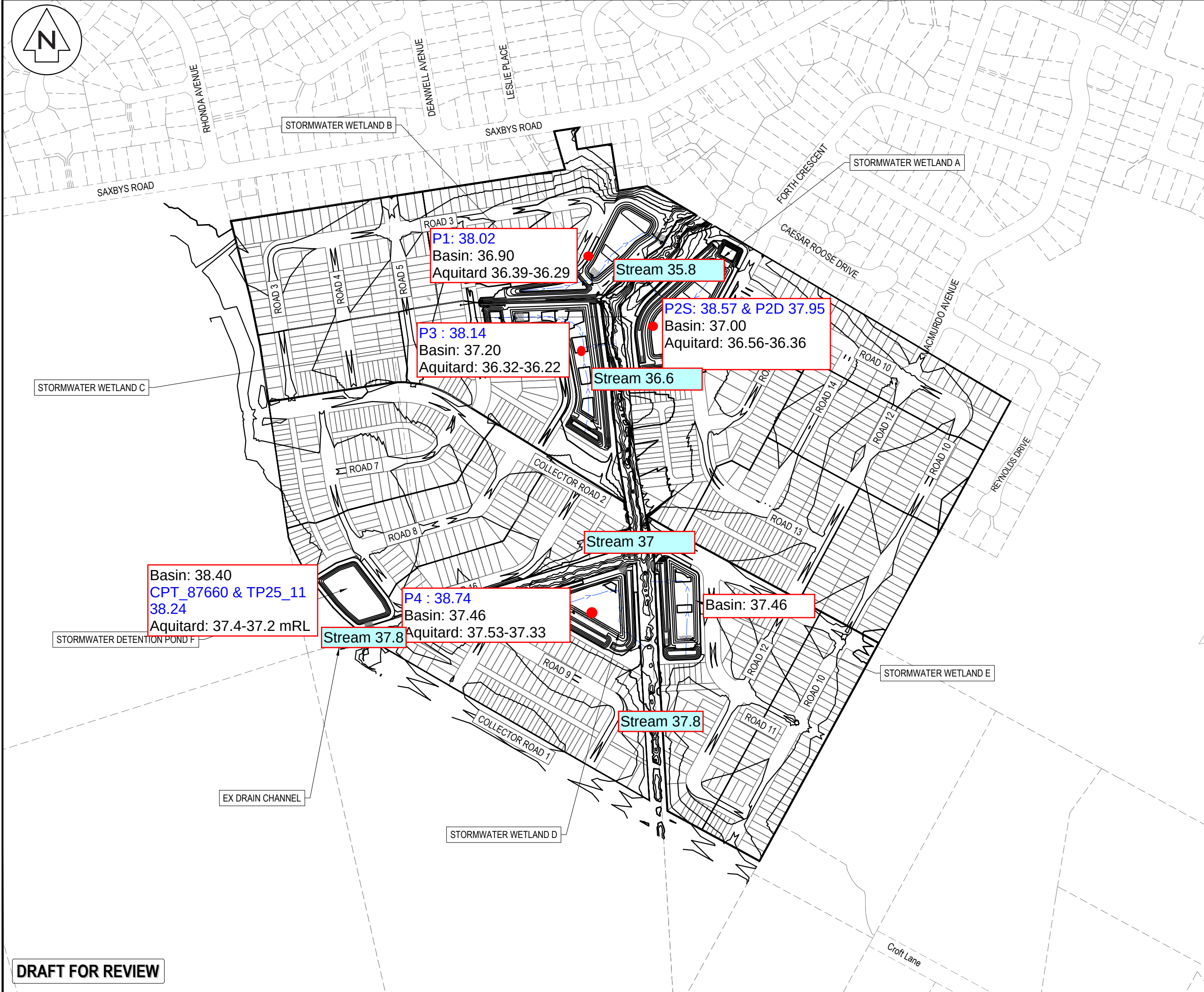
$K = 65.88$ m/day

Solution Method: Bouwer-Rice

$y_0 = 0.1142$ m

APPENDIX C
WGA MARKUP ON MAVEN DESIGN
DRAWING NO. R1-C440 REV C





- NOTES
1. ALL WORKS TO BE IN ACCORDANCE WITH WAIKATO REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATIONS.
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LEGEND

--- EX BOUNDARY
--- PROP BOUNDARY

● Piezo est. location

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
		By	Date
Survey	MAVEN		06/2025
Design	MKS		07/2025
Drawn	MJRA		11/2025
Checked	DJM		11/2025

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New Zealand

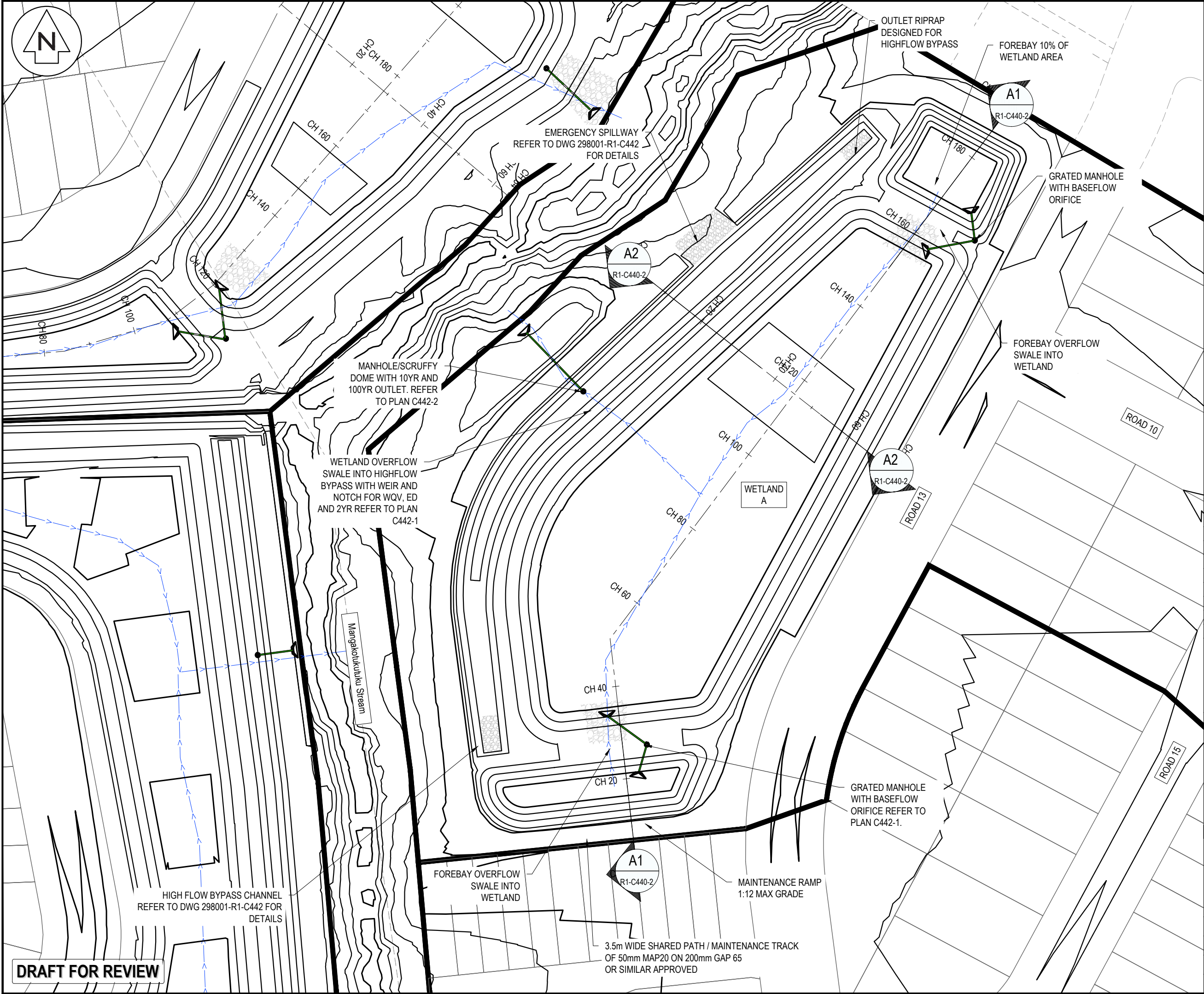
Project
**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title
**PROPOSED STORMWATER
WETLAND + DETENTION
POND - OVERVIEW PLAN**

Project no.	298001-R1 SL1		
Scale	1:4000 @ A3		
Cad file	298001-R1-C440 SW WETLAND.DWG		
Drawing no.	R1-C440	Rev	C

DRAFT FOR REVIEW

DATE: 22/08 FILE PATH: \\MAVEN\MAVEN\CONSULTING\CO_NZ\SHARES\CURRENT\MAVEN_HAMILTON\PROJECTS\298001 - SOUTHERN LINKS 1\STG_R1\DWG\298001-R1-C440 SW WETLAND.DWG



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LEGEND

--- EX BOUNDARY

--- PROP BOUNDARY

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
		By	Date
Survey	MAVEN		06/2025
Design	MKS		07/2025
Drawn	MJRA		11/2025
Checked	DJM		11/2025



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Project

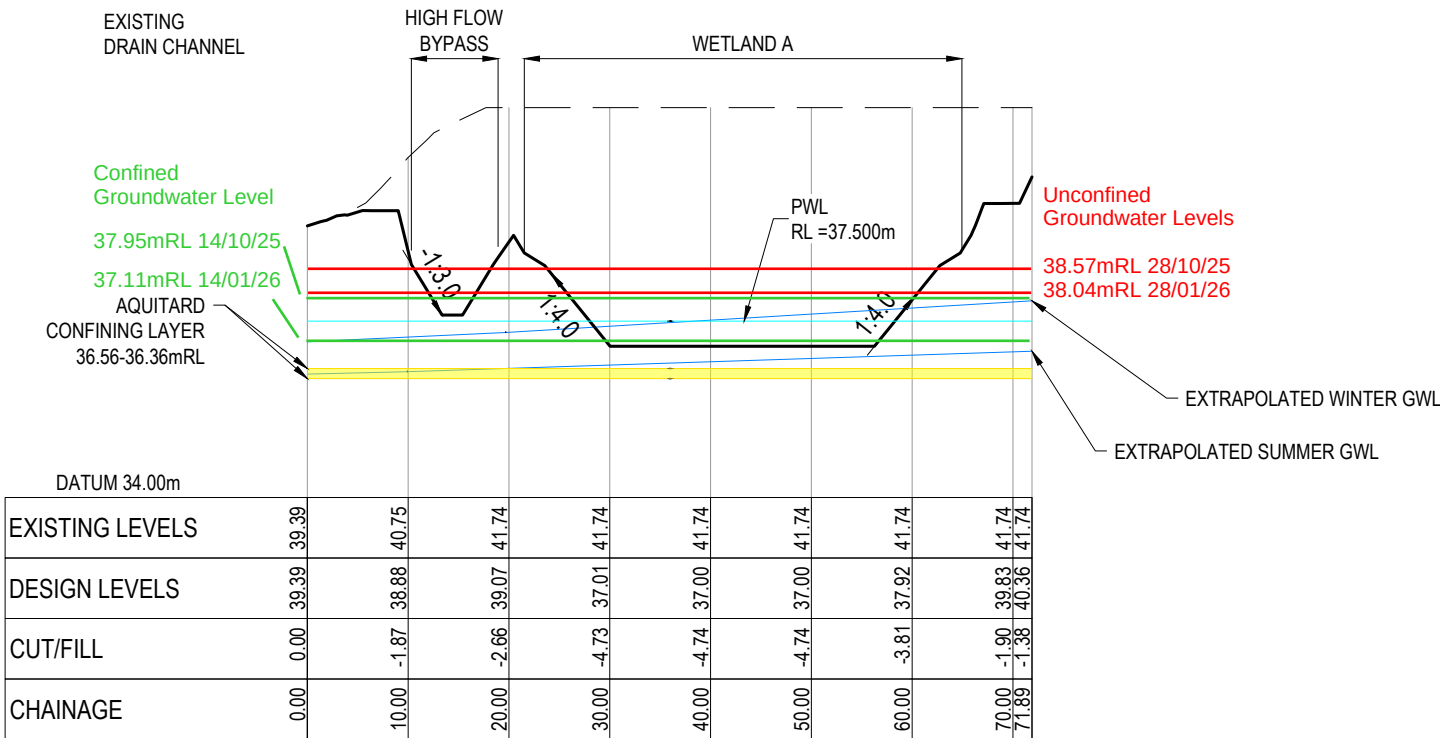
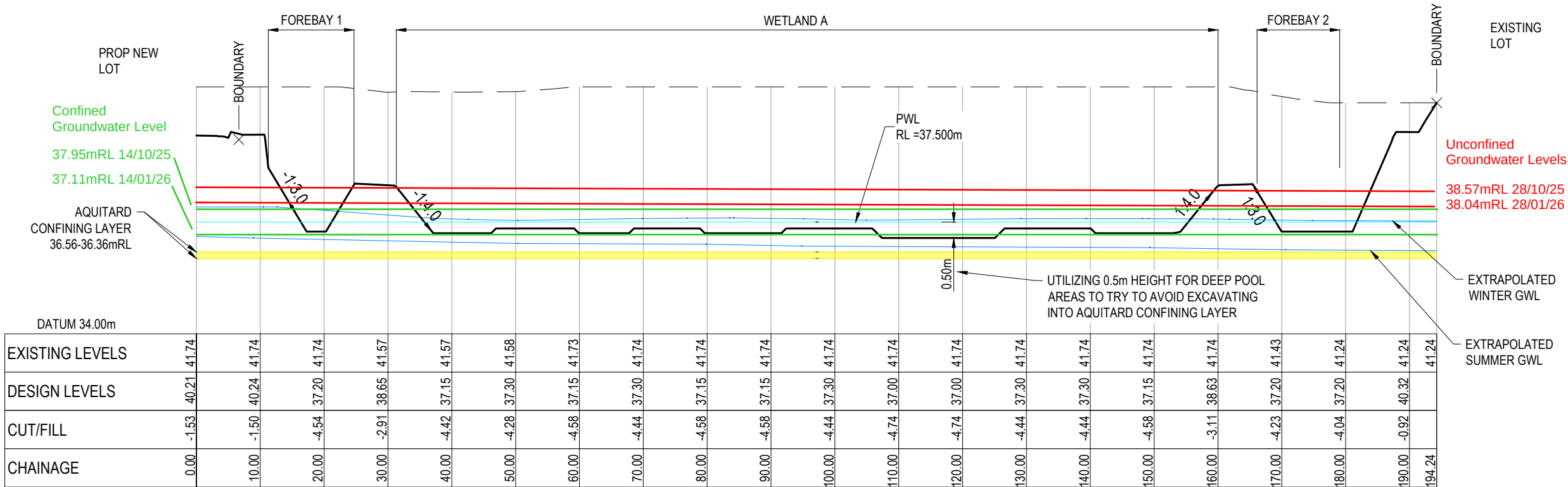
**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title

**PROPOSED STORMWATER
WETLAND A
PLAN**

Project no.	298001-R1 SL1		
Scale	1:750 @ A3		
Cad file	298001-R1-C440 SW WETLAND.DWG		
Drawing no.	R1-C440-1	Rev	C

DATE: 22/08 FILE PATH: \\MAVEN\MAVEN\CONSULTING\CO NZ\SHARE\CURRENT\WAIKEN - HAMILTON - PROJECTS\298001 - SOUTHERN LINKS 1\STG R1\DWG\298001-R1-C440 SW WETLAND.DWG



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Legend

---	EX GROUND LEVEL
---	PROP GROUND LEVEL
---	100YR - 10 YR LEVEL
---	GROUNDWATER LEVEL

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
	By	Date	
Survey	MAVEN	06/2025	
Design	MKS	07/2025	
Drawn	MJRA	11/2025	
Checked	DJM	11/2025	



Project
**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title
**PROPOSED STORMWATER
WETLAND A
SECTIONS**

Project no.	298001-R1 SL1
Scale	AS SHOWN
Cad file	298001-R1-C440 SW WETLAND.DWG
Drawing no.	R1-C440-2
Rev	C

DRAFT FOR REVIEW



NOTES

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LEGEND

EX BOUNDARY

PROP BOUNDARY

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
Survey	MAVEN		06/2025
Design	MKS		07/2025
Drawn	MJRA		11/2025
Checked	DJM		11/2025

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New Zealand

Project

**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

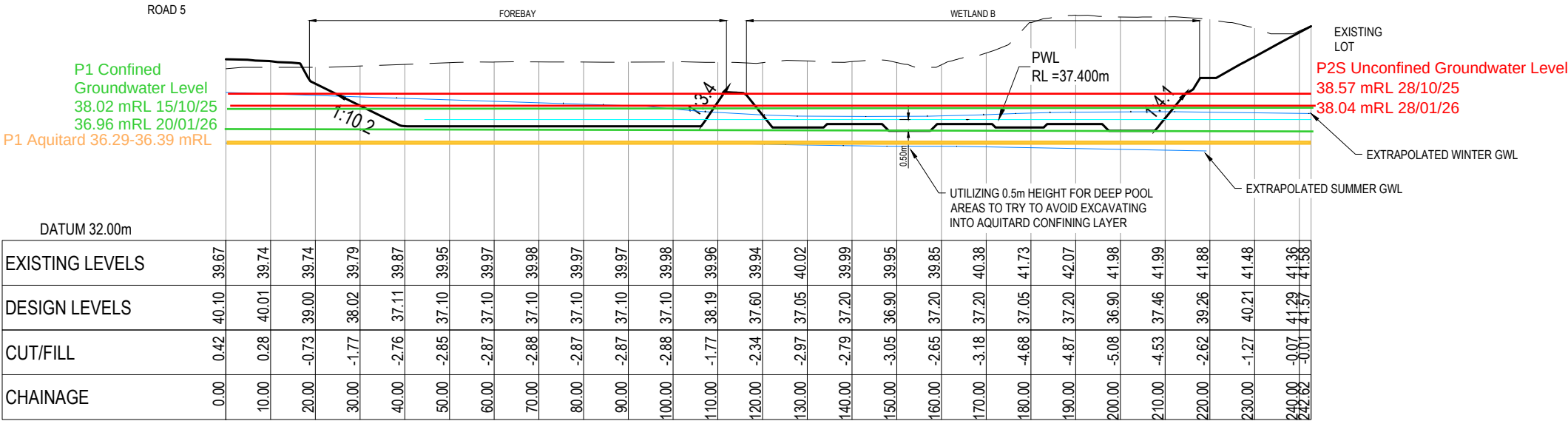
Title

**PROPOSED STORMWATER
WETLAND B
PLAN**

Project no.	298001-R1 SL1
Scale	1:750 @ A3
Cad file	298001-R1-C440 SW WETLAND.DWG
Drawing no.	R1-C440-3
Rev	C

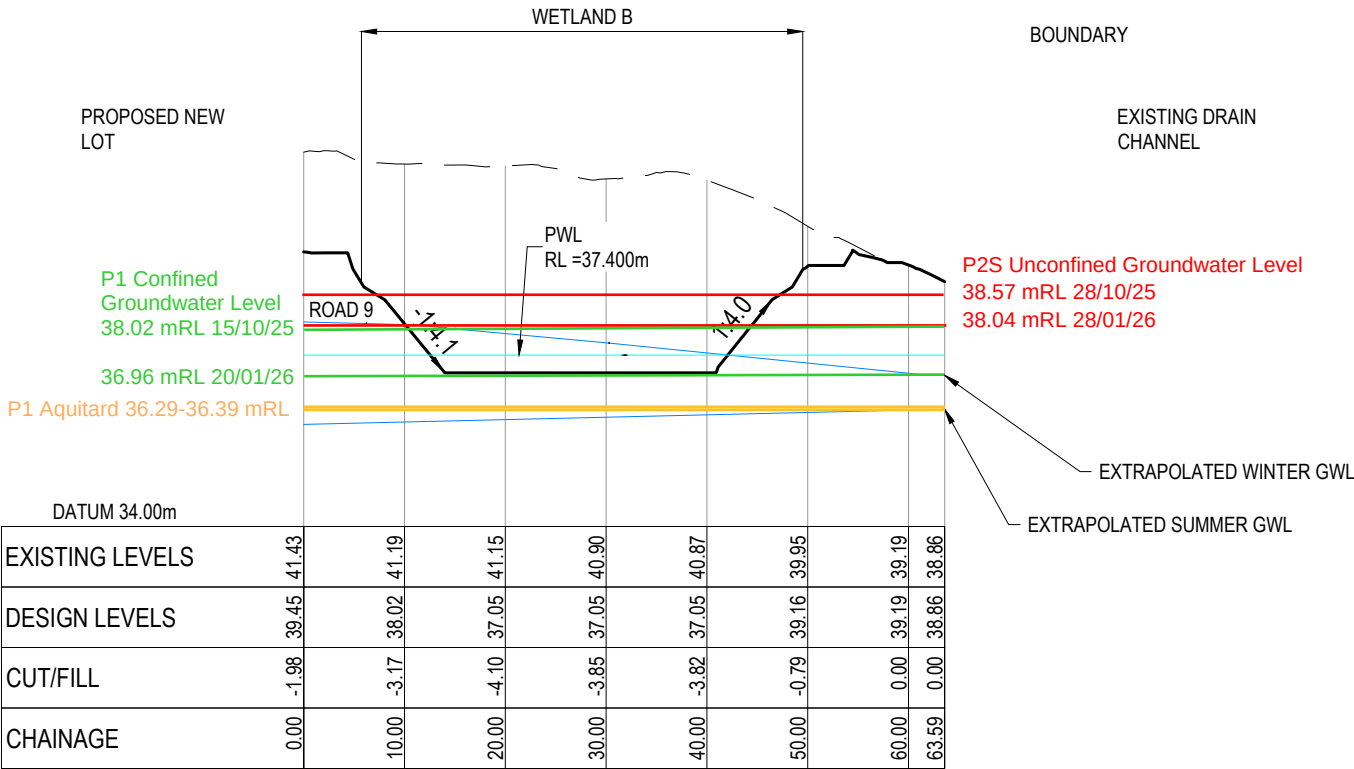
DRAFT FOR REVIEW

DATE: 22/08 FILE PATH: \\MAVEN\MAVENCONSULTING\CO NZ\SHARE\CURRENT\MAVEN - HAMILTON - PROJECTS\298001 - SOUTHERN LINKS R1\298001-R1-C440 SW WETLAND.DWG



PROPOSED - Section - B1 CH 0+00.00 TO CH 2+42.62
SCALE: 1:750 H / 1:150 V

SCALE: 1:1250 H / 1:250 V (pers. comm. M.Shon 25/02/26)



PROPOSED - Section - B2 CH 0+00.00 TO CH 0+63.59
SCALE: 1:750 H / 1:150 V

DRAFT FOR REVIEW

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LEGEND

EX BDY

PROP BDY

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
	Survey	MAVEN	06/2025
	Design	MKS	07/2025
	Drawn	MJRA	11/2025
	Checked	DJM	11/2025



Project

SOUTHERN LINKS 1

RESIDENTIAL STAGE 1

HAMILTON, WAIKATO

FOR

SL1 CONSORTIUM GROUP

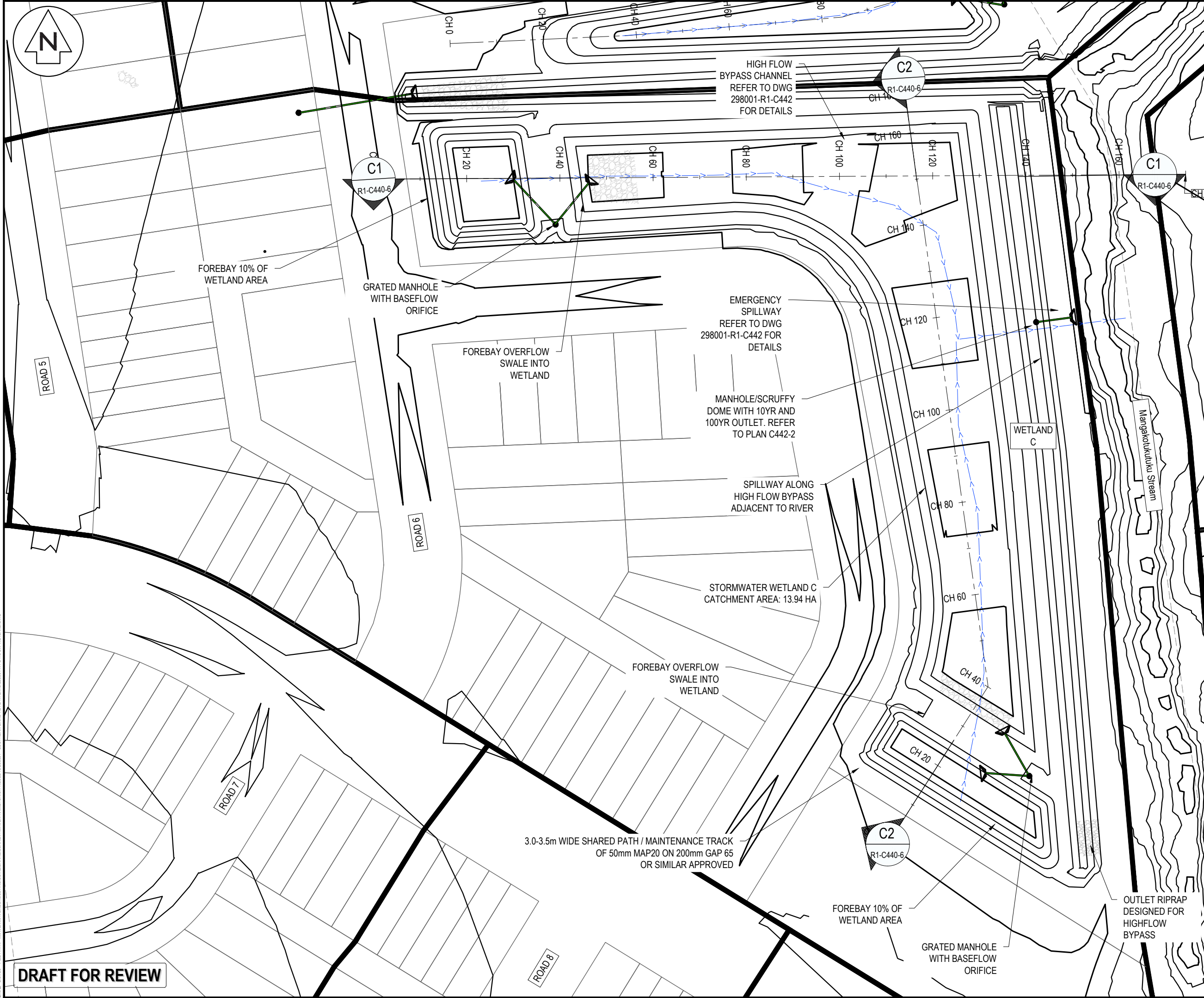
Title

PROPOSED STORMWATER

WETLAND B

SECTIONS

Project no.	298001-R1 SL1		
Scale	AS SHOWN		
Cad file	298001-R1-C440 SW WETLAND.DWG		
Drawing no.	R1-C440-4	Rev	C



- NOTES
1. ALL WORKS TO BE IN ACCORDANCE WITH WAIKATO REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATIONS.
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LEGEND

--- EX BOUNDARY

--- PROP BOUNDARY

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
Survey	MAVEN		06/2025
Design	MKS		07/2025
Drawn	MJRA		11/2025
Checked	DJM		11/2025

M Maven Waikato
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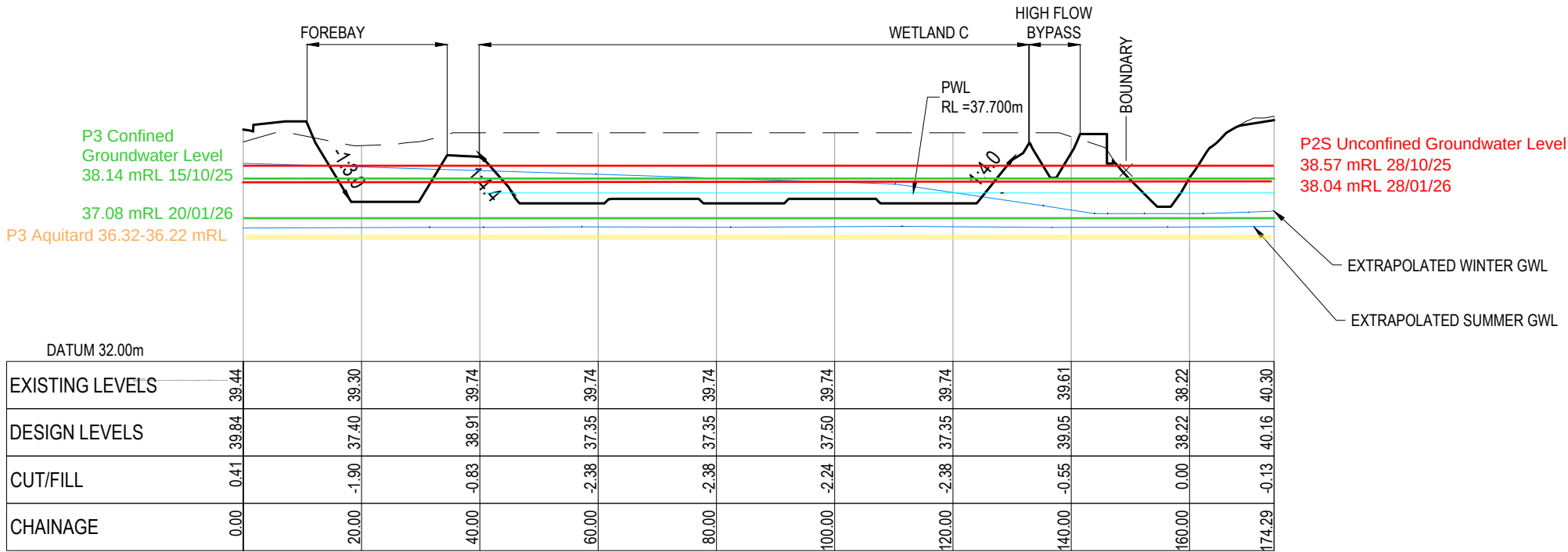
Project
**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title
**PROPOSED STORMWATER
WETLAND C
PLAN**

Project no.	298001-R1 SL1
Scale	1:750 @ A3
Cad file	298001-R1-C440 SW WETLAND.DWG
Drawing no.	R1-C440-5
Rev	C

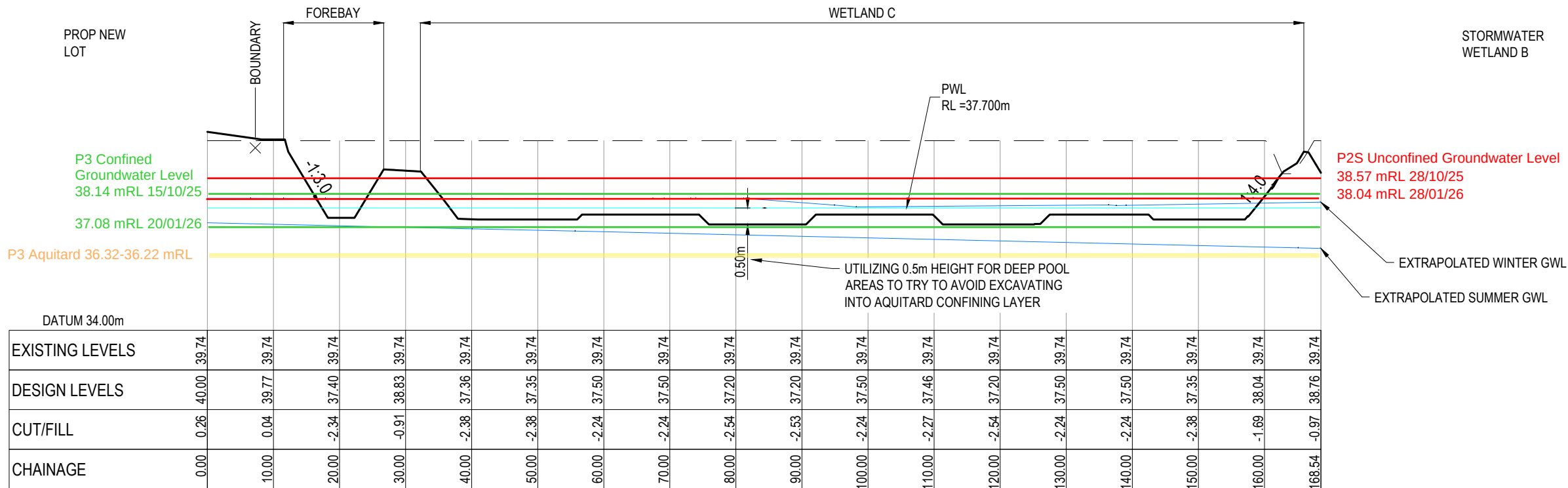
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DATE: 22/08 FILE PATH: \\MAVEN\MAVEN\CONSULTING\CO NZ\SHARE\CURRENT\HAMILTON\ PROJECT\298001-R1-C440 SW WETLAND.DWG



PV - Section - C1
SCALE: HORI 1:750 VERT 1:150

SCALE: HORI 1:1000 VERT 1:200 (pers. comm. M.Shon 25/02/26)



PROPOSED - Section - C2 CH 0+00.00 TO CH 1+68.54
SCALE: 1:750 H / 1:150 V

DRAFT FOR REVIEW

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 9. ALL LINES TO BE ABANDONED SHALL BE SEALED AT EACH END. TIMING OF ALL SEALING TO BE COORDINATED WITH COUNCIL STAFF.

LEGEND

EX BDY

PROP BDY

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
	Survey	MAVEN	06/2025
	Design	MKS	07/2025
	Drawn	MJRA	11/2025
	Checked	DJM	11/2025



Project

SOUTHERN LINKS 1

RESIDENTIAL STAGE 1

HAMILTON, WAIKATO

FOR

SL1 CONSORTIUM GROUP

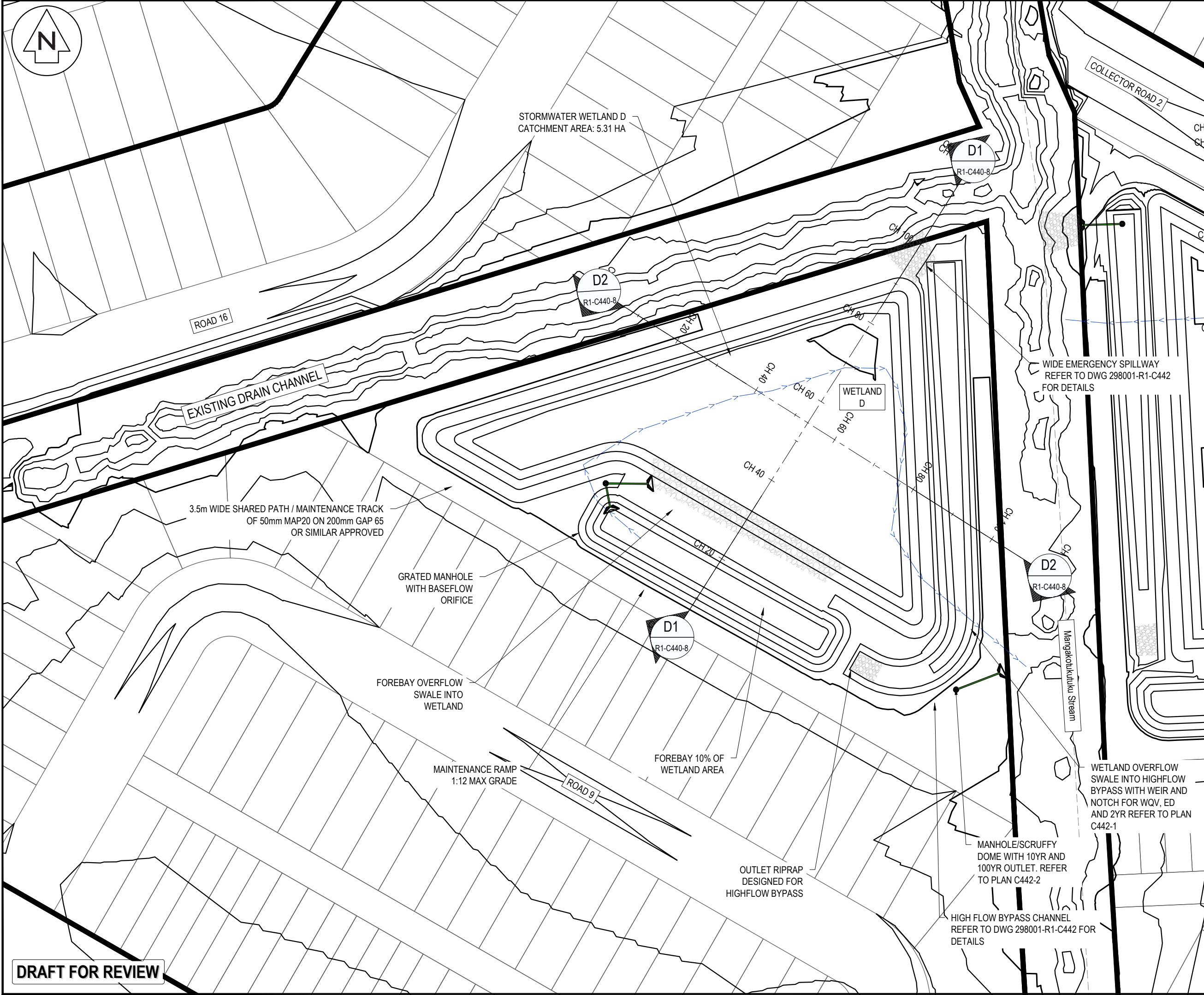
Title

PROPOSED STORMWATER

WETLAND C

SECTIONS

Project no.	298001-R1 SL1
Scale	AS SHOWN
Cad file	298001-R1-C440 SW WETLAND.DWG
Drawing no.	R1-C440-6
Rev	C



- NOTES
1. ALL WORKS TO BE IN ACCORDANCE WITH WAIKATO REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATIONS.
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LEGEND

--- EX BOUNDARY

--- PROP BOUNDARY

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
Survey	MAVEN	06/2025	
Design	MKS	07/2025	
Drawn	MJRA	11/2025	
Checked	DJM	11/2025	

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07 242 0601
info@maven.co.nz
www.maven.co.nz
Level 1 286 Victoria Street, Hamilton
New Zealand

Project

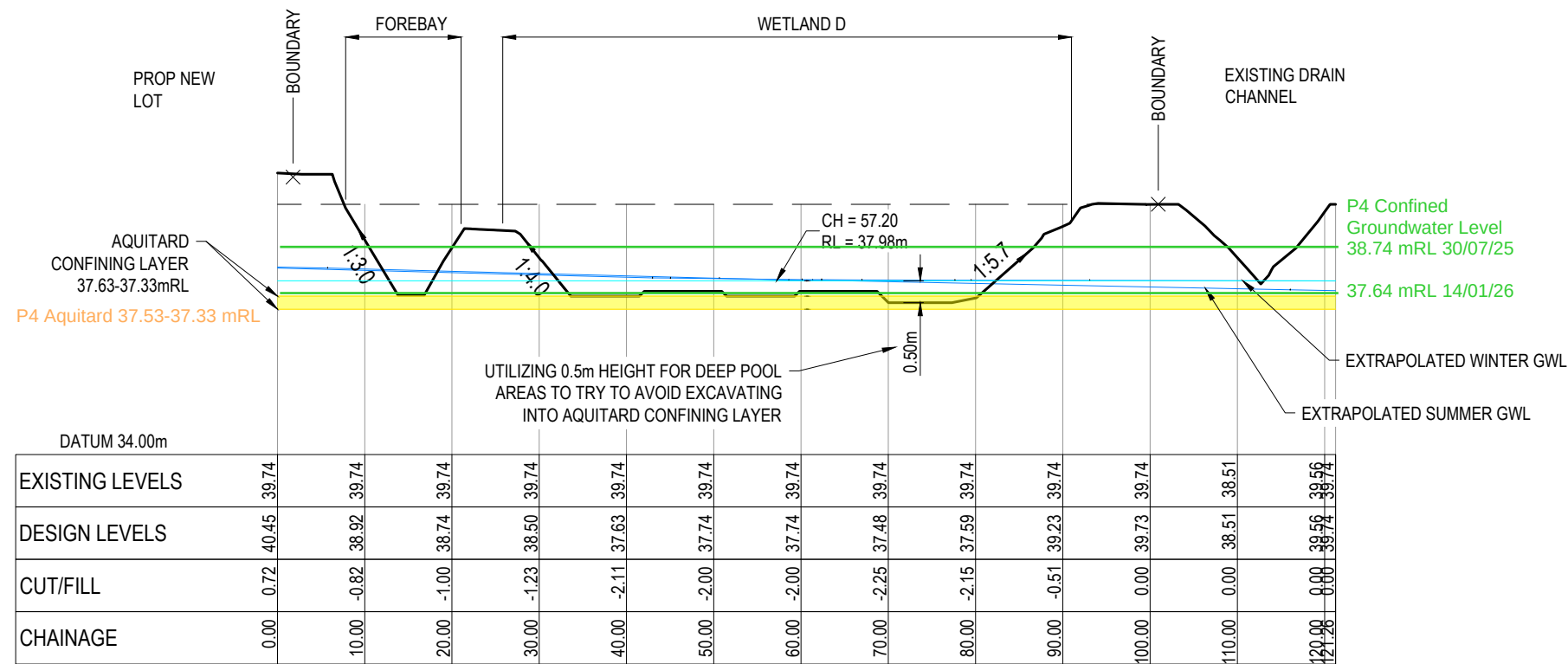
**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title

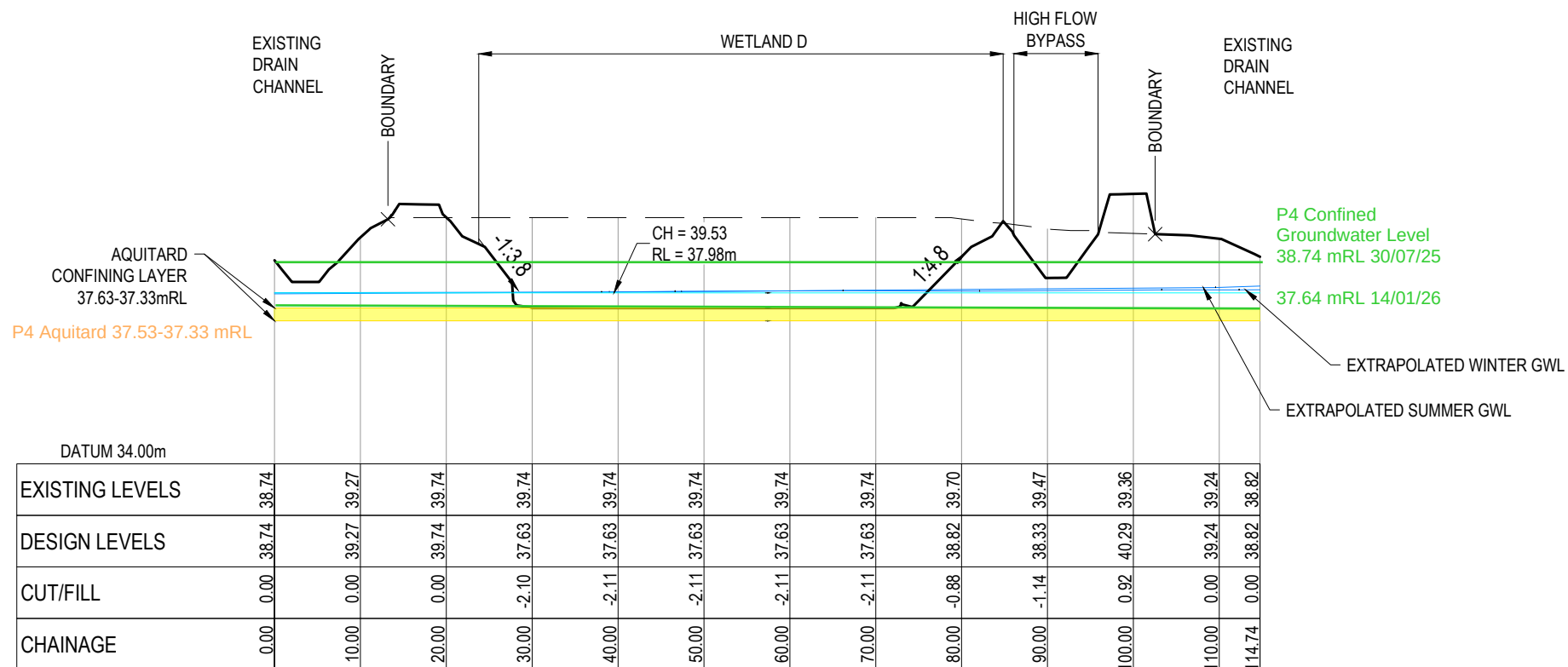
**PROPOSED STORMWATER
WETLAND D
PLAN**

Project no.	298001-R1 SL1
Scale	1:750 @ A3
Cad file	298001-R1-C440 SW WETLAND.DWG
Drawing no.	R1-C440-7
Rev	C

DATE: 22/08 FILE PATH: \\MAVEN\MAVENCONSULTING\CO NZ\SHARE\CURRENT\MAVEN HAMILTON\ PROJECTS\298001-R1-C440 SW WETLAND.DWG



PROPOSED - Section - D1 CH 0+00.00 TO CH 1+21.26
SCALE: 1:750 H / 1:150 V



PROPOSED - Section - D2 CH 0+00.00 TO CH 1+14.74
SCALE: 1:750 H / 1:150 V

DRAFT FOR REVIEW

- NOTES
1. ALL WORKS TO BE IN ACCORDANCE WITH WAIKATO REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATIONS.
 2. CO-ORDINATES IN TERMS OF NZ GEODETIC DATUM MT EDEN 2000. LEVELS IN TERMS OF THE NEW ZEALAND VERTICAL DATUM 2016. CONVERSION TO MOTURIKI 1953 CAN BE ACHIEVED BY ADDING ???m.
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LEGEND

EX BDY
PROP BDY

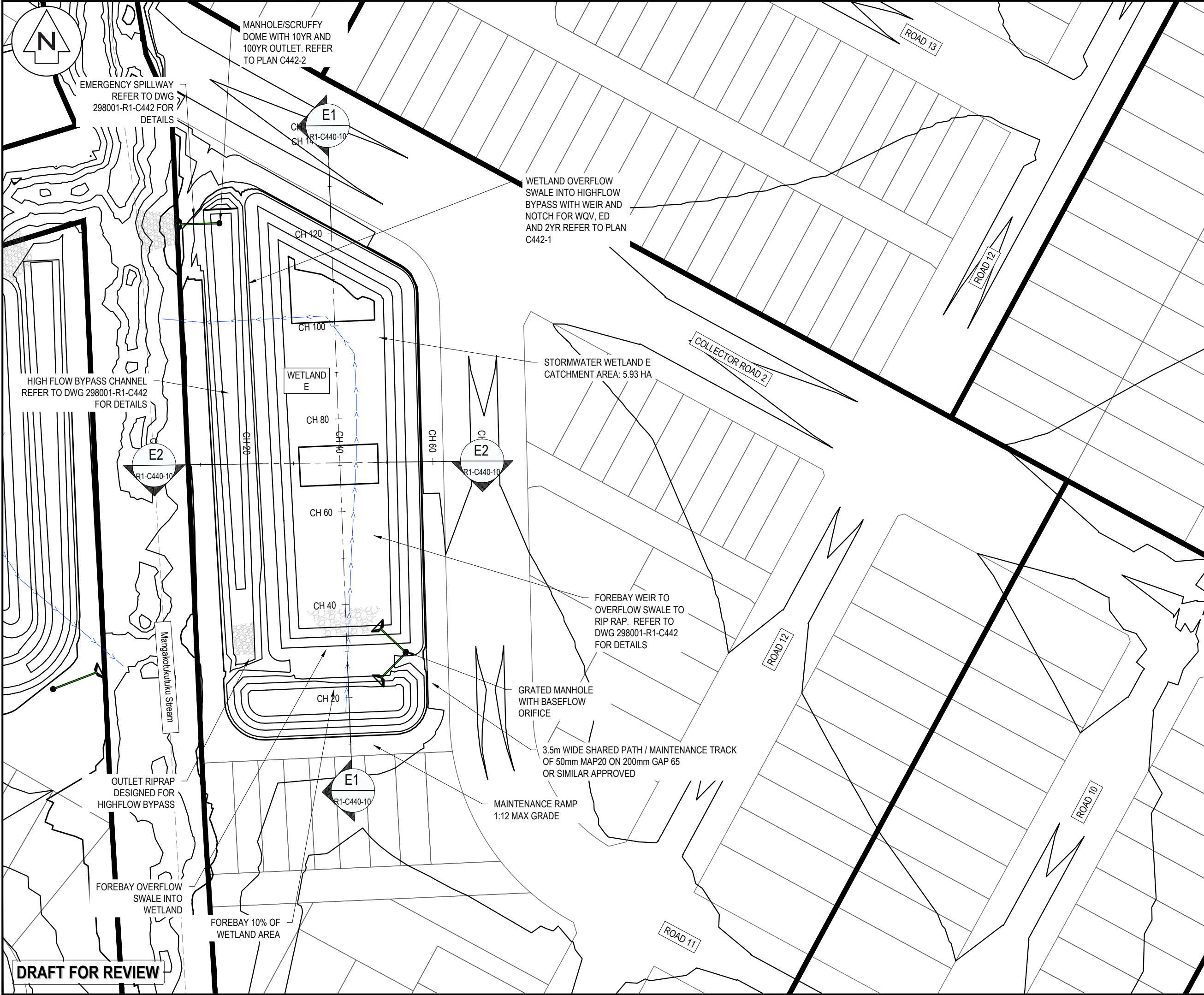
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A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
	Survey	MAVEN	06/2025
	Design	MKS	07/2025
	Drawn	MJRA	11/2025
	Checked	DJM	11/2025



Project
**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title
**PROPOSED STORMWATER
WETLAND D
SECTIONS**

Project no.	298001-R1 SL1
Scale	AS SHOWN
Cad file	298001-R1-C440 SW WETLAND.DWG
Drawing no.	R1-C440-8
Rev	C



NOTES

1. ALL WORKS TO BE IN ACCORDANCE WITH WAIKATO REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATIONS.
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LEGEND

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----- PROP BOUNDARY

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
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Rev	Description	By	Date
Survey	MAVEN		06/2025
Design	MKS		07/2025
Drawn	MJRA		11/2025
Checked	DJM		11/2025

Maven Waikato
07 242 0601
info@maven.co.nz
www.maven.co.nz
Level 1 286 Victoria Street, Hamilton
New Zealand

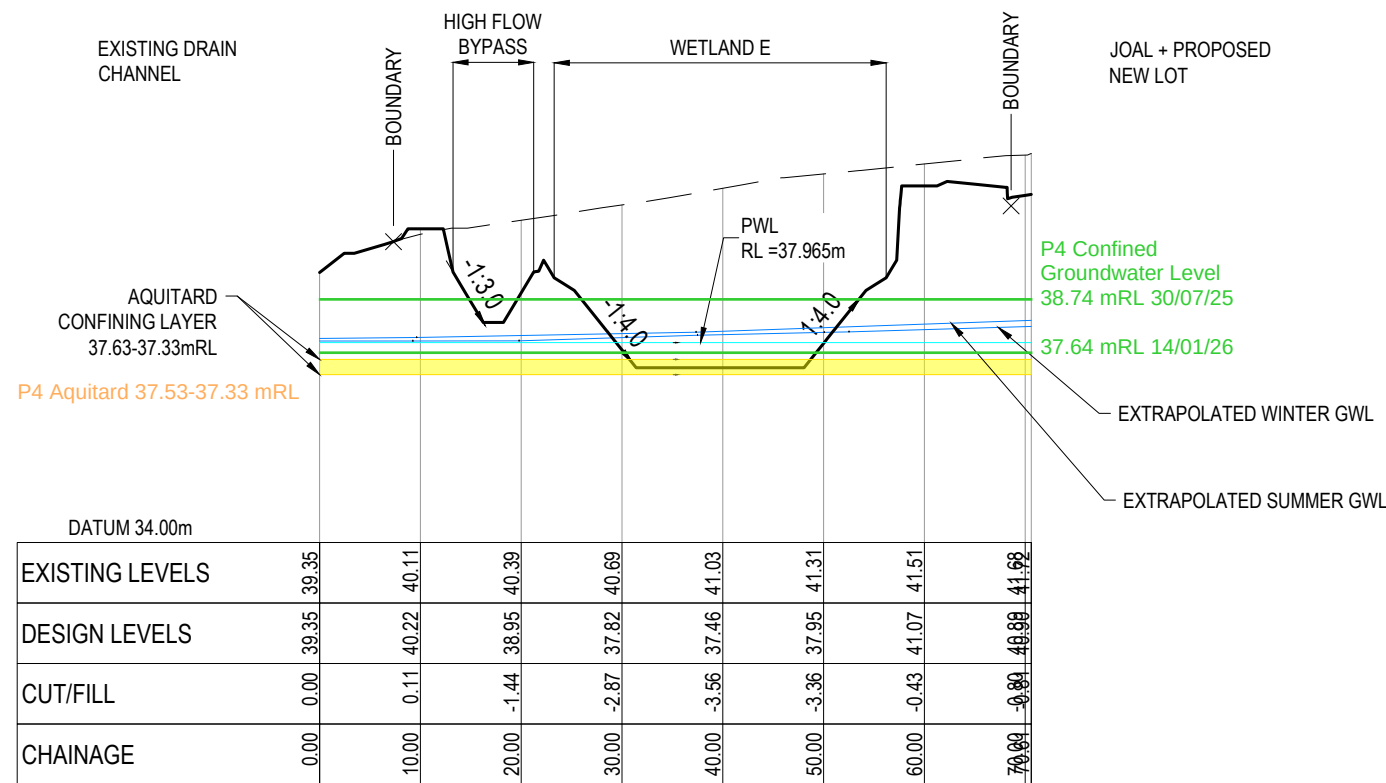
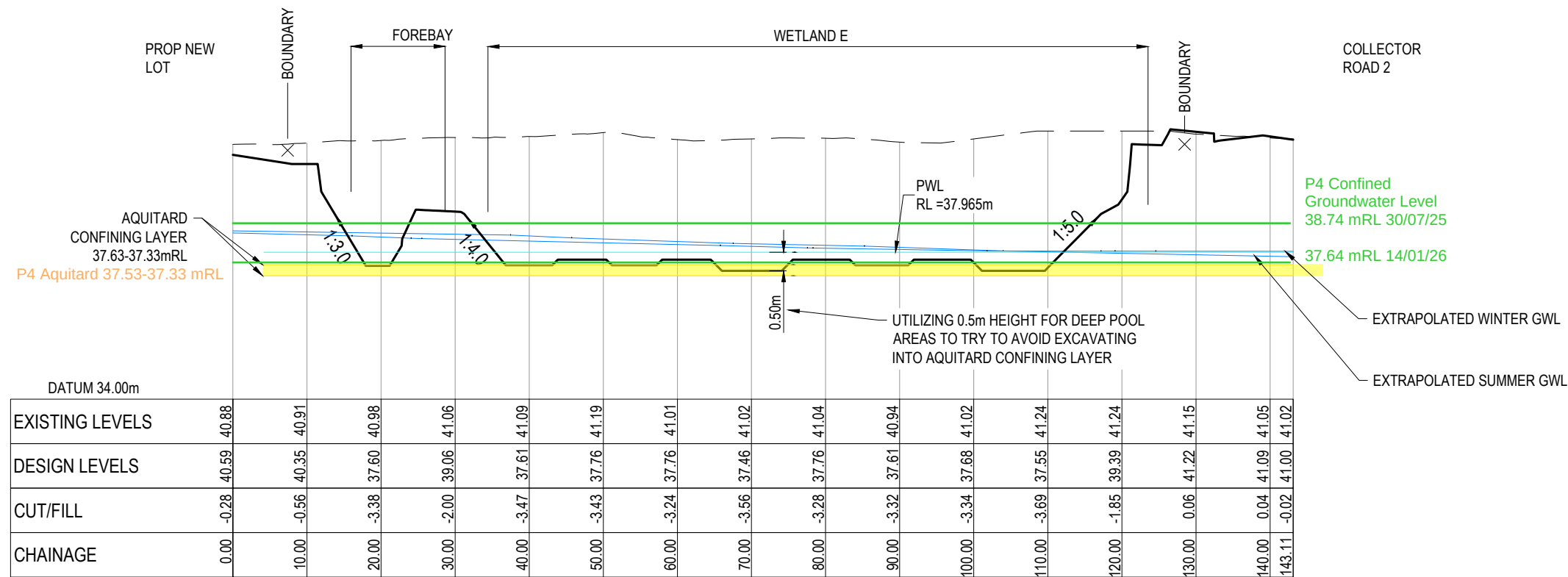
Project

**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title

**PROPOSED STORMWATER
WETLAND E
PLAN**

Project no.	298001-R1 SL1		
Scale	1:750 @ A3		
Cad file	298001-R1-C440 SW WETLAND.DWG		
Drawing no.	R1-C440-9	Rev	C



- NOTES
- ALL WORKS TO BE IN ACCORDANCE WITH WAIKATO REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATIONS.
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LEGEND

EX BDY
PROP BDY

C	DRAFT	MJRA	02/2026
B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
	By	Date	
Survey	MAVEN	06/2025	
Design	MKS	07/2025	
Drawn	MJRA	11/2025	
Checked	DJM	11/2025	



Project
**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title
**PROPOSED STORMWATER
WETLAND E
SECTIONS**

Project no.	298001-R1 SL1
Scale	AS SHOWN
Cad file	298001-R1-C440 SW WETLAND.DWG
Drawing no.	R1-C440-10
Rev	C

DRAFT FOR REVIEW



STORMWATER DETENTION D
CATCHMENT AREA: 4.20 HA

DETENTION
POND F

F1

R1-C440-12

F2

R1-C440-12

F2

R1-C440-12

Mangakotukutuku Stream

F1

R1-C440-12

WIDE EMERGENCY SPILLWAY
REFER TO DWG 298001-R1-C442
FOR DETAILS

ROAD 8

ROAD 16

ROAD 9

- NOTES
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Design	MKS	07/2025	
Drawn	MJRA	11/2025	
Checked	DJM	11/2025	



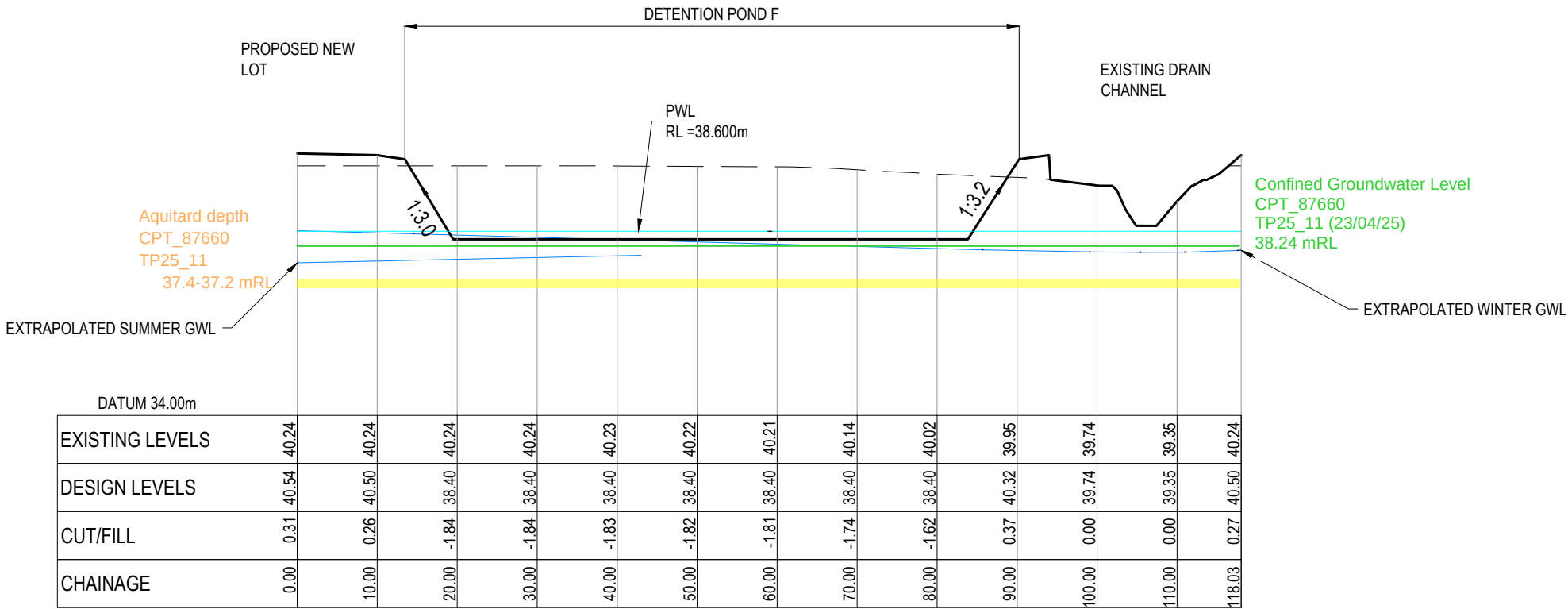
Project
**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title
**PROPOSED STORMWATER
DETENTION POND F
PLAN**

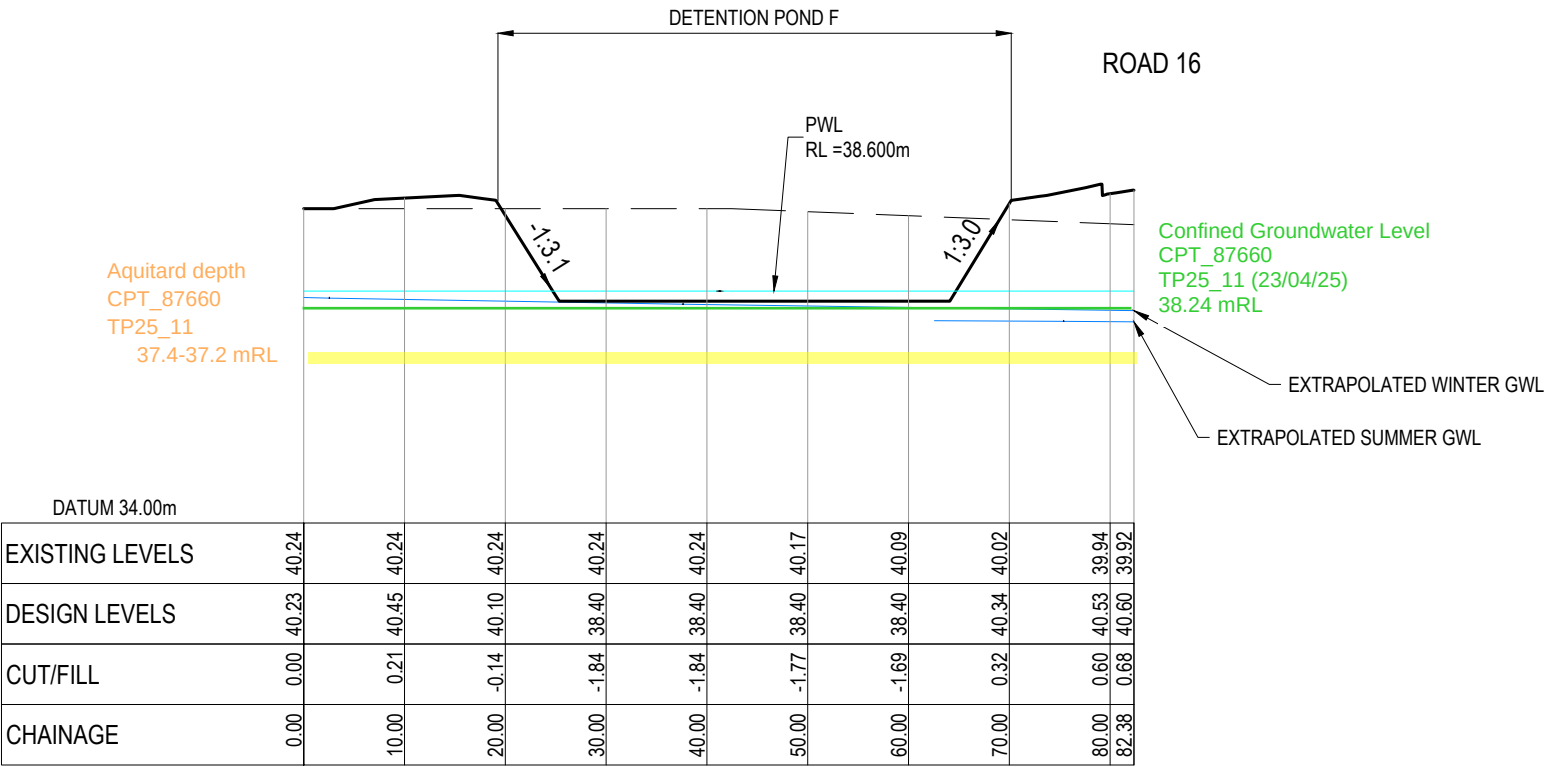
Project no.	298001-R1 SL1		
Scale	1:750 @ A3		
Cad file	298001-R1-C440 SW WETLAND.DWG		
Drawing no.	R1-C440-11	Rev	C

DRAFT FOR REVIEW

DATE: 22/08 FILE PATH: \\MAVEN\MAVEN\CONSULTING\CO NZ\SHARE\CURRENT\MAVEN - HAMILTON - SOUTHERN LINKS 1\STG R1\DWG\298001-R1-C440 SW WETLAND.DWG



PROPOSED - Section - F1 CH 0+00.00 TO CH 1+18.03
SCALE: 1:750 H / 1:150 V



PROPOSED - Section - F2 CH 0+00.00 TO CH 0+82.38
SCALE: 1:750 H / 1:150 V

DRAFT FOR REVIEW

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LEGEND

EX BDY

PROP BDY

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B	DRAFT	MJRA	02/2026
A	DRAFT	MJRA	11/2025
Rev	Description	By	Date
	Survey	MAVEN	06/2025
	Design	MKS	07/2025
	Drawn	MJRA	11/2025
	Checked	DJM	11/2025

M

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Level 1 286 Victoria Street, Hamilton
New Zealand

Project

**SOUTHERN LINKS 1
RESIDENTIAL STAGE 1
HAMILTON, WAIKATO
FOR
SL1 CONSORTIUM GROUP**

Title

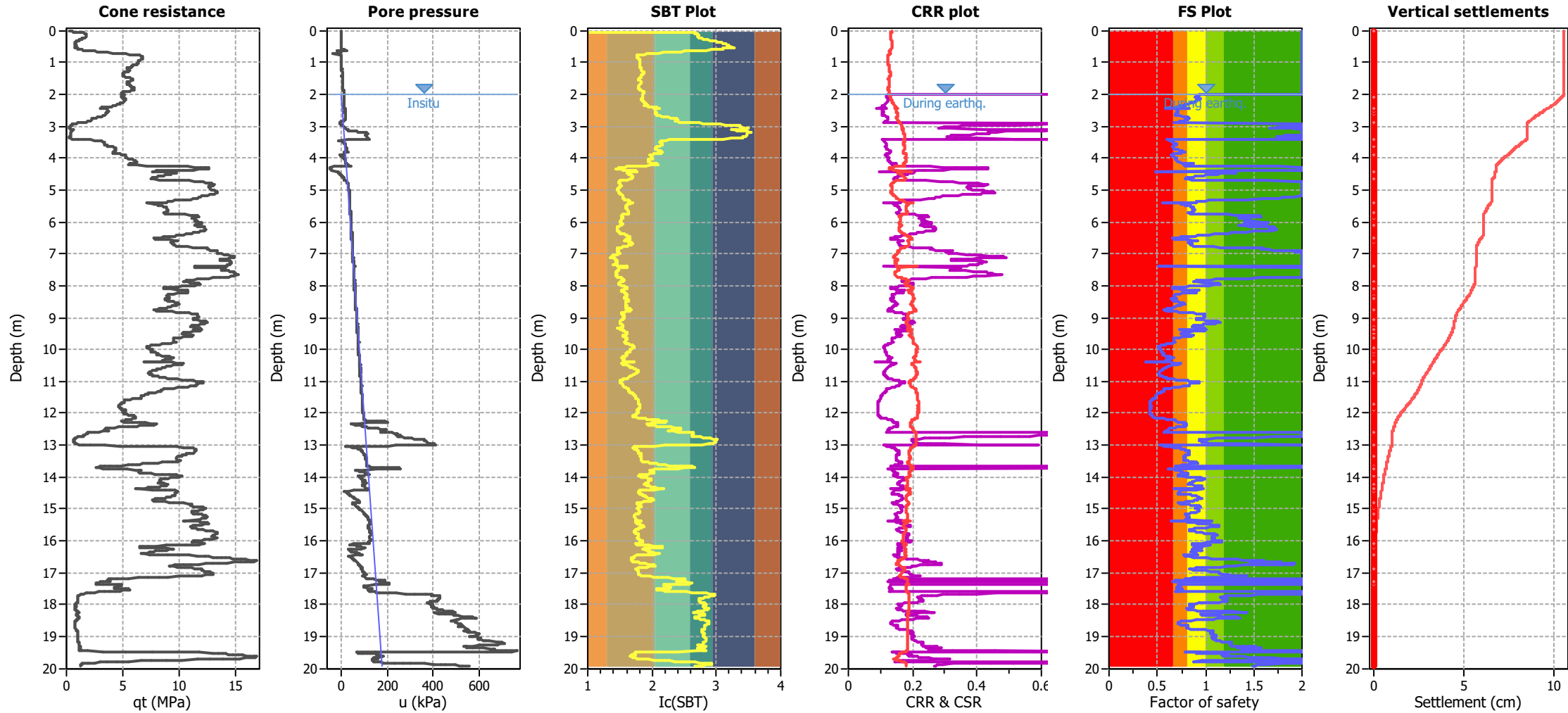
**PROPOSED STORMWATER
DETENTION POND F
SECTIONS**

Project no.	298001-R1 SL1		
Scale	AS SHOWN		
Cad file	298001-R1-C440 SW WETLAND.DWG		
Drawing no.	R1-C440-12	Rev	C

Project: Southern Links - Stage 1 Residential Area
Location: Saxbys Road, Deanwell, Hamilton

CPT: CPT_87660

Total depth: 19.93 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	applied:	.
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based

Client: Colliers Project Leaders Ltd
Project: Southern Links Stage 1 Residential Area
Site Location: Deanwell, Hamilton
Project No.: HAM2024-0017
Date: 23/04/2025



Position: 445066.9mE; 694588.0mN	Projection: Mt Eden 2000	Pit Dimensions: 4.0m by 1.0m
Elevation: 40.50m	Datum: NZVD 2016	Survey Source: Hand-held GPS

[illegible]

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

PHOTOGRAPH SHEET - TP25-11

Client:
Project: Southern Links
Location: Hamilton
Project ID: HAM2024-0017
Date: 23/04/2025



TP25-11:



TP25-11:

This borehole report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

APPENDIX D

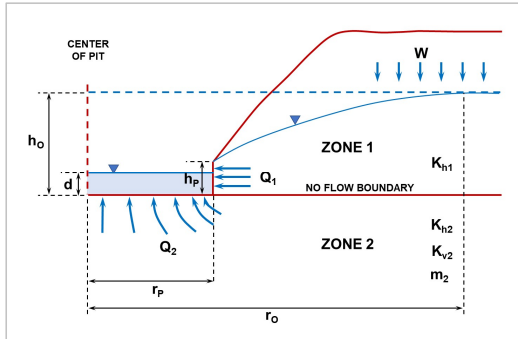
ARTIFICIAL WETLAND DRAWDOWN PIT MODELLING



INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland A - Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$\begin{aligned}
 \text{A } h_o &= \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}, \\
 \text{B } Q_1 &= W \pi (r_o^2 - r_p^2), \\
 \text{C } Q_2 &= 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d), \\
 \text{D } m_2 &= \sqrt{\frac{K_{h2}}{K_{v2}}}
 \end{aligned}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.57	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	52.6241	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 312 m

Known h_o 1.57 m
 h_o calculated using Equation A 1.57 m

Q₁ 2.4E-03 m³/s
2.0E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 6.0E-02 m³/s
5.2E+03 m³/day

Total Pit Inflow

Q_{TOT} 6.2E-02 m³/s
5361.39 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

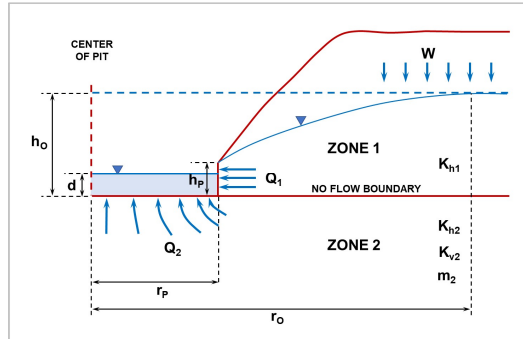
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
 PROJECT: Southern Links - Southern Block
 Project #: WGA242463
 Location: Wetland A - Winter Dry Pit
 Date: Friday, 13 March 2026
 Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone 1} = h_o - \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

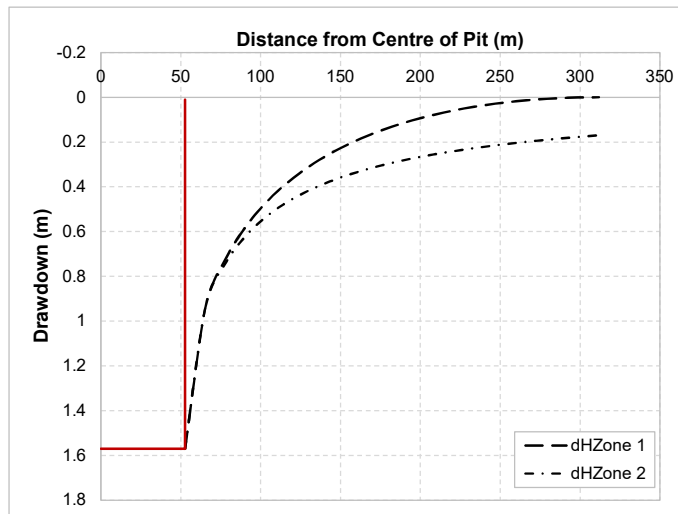
$$dH_{Zone 2} = \frac{2(h_o - d)}{\pi} \sin^{-1} \left(\frac{r_p}{r} \right)$$

$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.57	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	52.6241	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_o calculated by iterating equation A in analysis sheet 1 312 m



Drawdown curves

r	dH _{Zone 1}	dH _{Zone 2}
52.6241	1.57	1.6
65.6	0.9	0.9
78.5	0.7	0.7
91.5	0.6	0.6
104.4	0.5	0.5
117.4	0.4	0.5
130.3	0.3	0.4
143.3	0.3	0.4
156.3	0.2	0.3
169.2	0.2	0.3
182.2	0.1	0.3
195.1	0.1	0.3
208.1	0.1	0.3
221.0	0.06	0.2
234.0	0.04	0.2
246.9	0.03	0.2
259.9	0.02	0.2
272.8	0.01	0.2
285.8	0.00	0.2
298.7	0.00	0.2
311.7	0.00	0.2

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

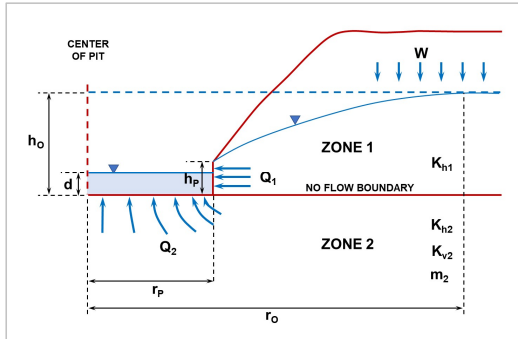
Analysed by: Toby Beisly
 Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland B Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.67	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	36.56366	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 298 m

Known h_o 1.67 m

h_o calculated using Equation A 1.67 m

Q₁ 2.2E-03 m³/s
1.9E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 4.4E-02 m³/s
3.8E+03 m³/day

Total Pit Inflow

Q_{TOT} 4.6E-02 m³/s
4000.06 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

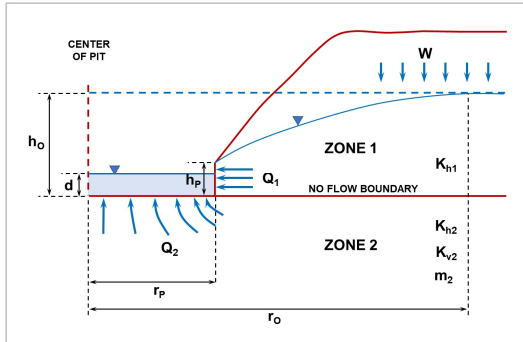
Analysed by: Toby Beisly
Checked by:

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland B Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1} \left(\frac{r_p}{r} \right)$$

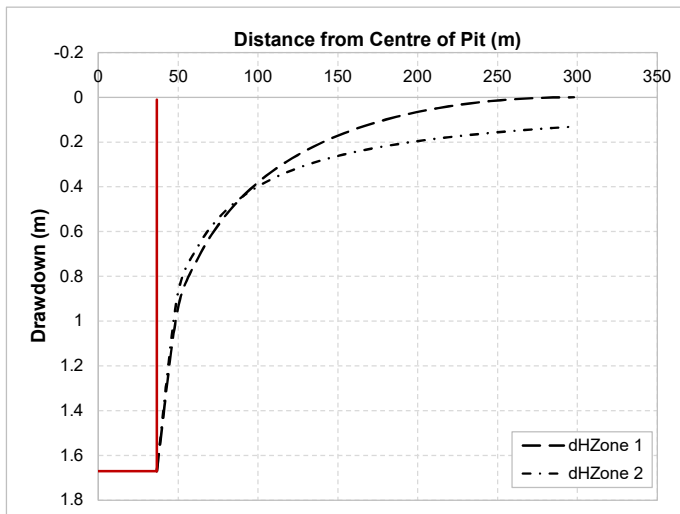
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h₀	1.67	m	initial saturated thickness above the base of Zone 1
h_p	0	m	saturated thickness at the pit wall
r_p	36.56366	m	effective pit radius
d	0	m	depth of the pit lake

r_0 is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_0 calculated by iterating equation A in analysis sheet 1

298 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
36.56366	1.67	1.7
49.6	0.9	0.9
62.7	0.7	0.7
75.7	0.6	0.5
88.8	0.5	0.5
101.8	0.4	0.4
114.9	0.3	0.3
127.9	0.2	0.3
141.0	0.2	0.3
154.1	0.2	0.3
167.1	0.1	0.2
180.2	0.1	0.2
193.2	0.1	0.2
206.3	0.06	0.2
219.3	0.04	0.2
232.4	0.03	0.2
245.4	0.02	0.2
258.5	0.01	0.2
271.5	0.00	0.1
284.6	0.00	0.1
297.6	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

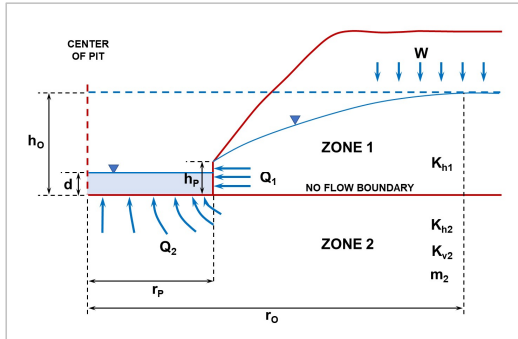
Analysed by: Toby _____
Checked by: _____

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland C Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
Kh1	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
Kh2	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
Kv2	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h0	1.22	m	initial saturated thickness above the base of Zone 1
hp	0	m	saturated thickness at the pit wall
rp	46.18091	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 251 m

Known h_o 1.22 m

h_o calculated using Equation A 1.22 m

Q₁ 1.5E-03 m³/s
1.3E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 4.1E-02 m³/s
3.5E+03 m³/day

Total Pit Inflow

Q_{TOT} 4.2E-02 m³/s
3648.07 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

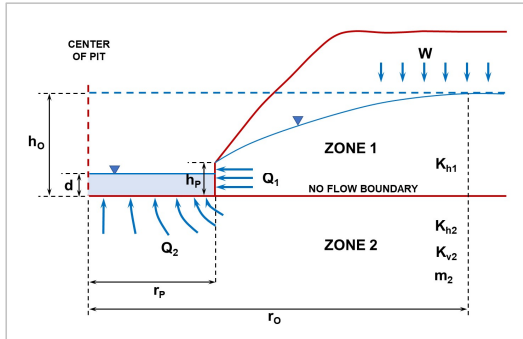
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland C Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone\ 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone\ 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1} \left(\frac{r_p}{r} \right)$$

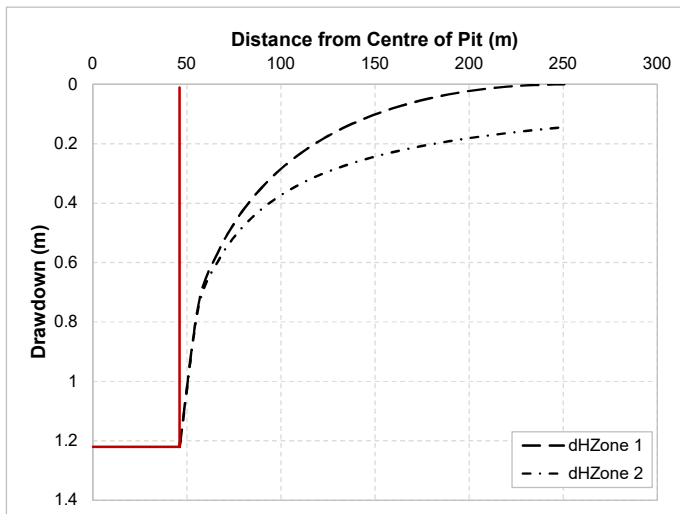
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.22	m	initial saturated thickness above the base of Zone 1
h_p	0	m	saturated thickness at the pit wall
r_p	46.18091	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_o calculated by iterating equation A in analysis sheet 1

251 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
46.18091	1.22	1.2
56.4	0.7	0.7
66.6	0.6	0.6
76.8	0.5	0.5
87.1	0.4	0.4
97.3	0.3	0.4
107.5	0.2	0.3
117.7	0.2	0.3
127.9	0.2	0.3
138.2	0.1	0.3
148.4	0.1	0.2
158.6	0.1	0.2
168.8	0.1	0.2
179.0	0.05	0.2
189.2	0.03	0.2
199.5	0.02	0.2
209.7	0.01	0.2
219.9	0.01	0.2
230.1	0.00	0.2
240.3	0.00	0.2
250.6	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

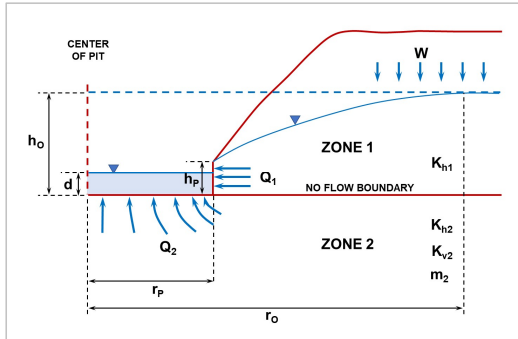
Analysed by: Toby
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland D Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.266998	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	39.89423	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 248 m

Known h_o 1.27 m

h_o calculated using Equation A 1.27 m

Q₁ 1.5E-03 m³/s
1.3E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 3.7E-02 m³/s
3.2E+03 m³/day

Total Pit Inflow

Q_{TOT} 3.8E-02 m³/s
3284.48 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

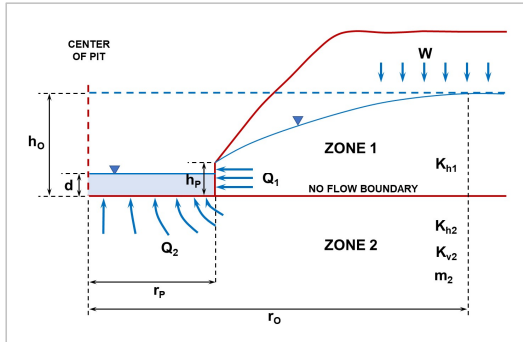
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
 PROJECT: Southern Links - Southern Block
 Project #: WGA242463
 Location: Wetland D Winter Dry Pit
 Date: Friday, 13 March 2026
 Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1}\left(\frac{r_p}{r}\right)$$

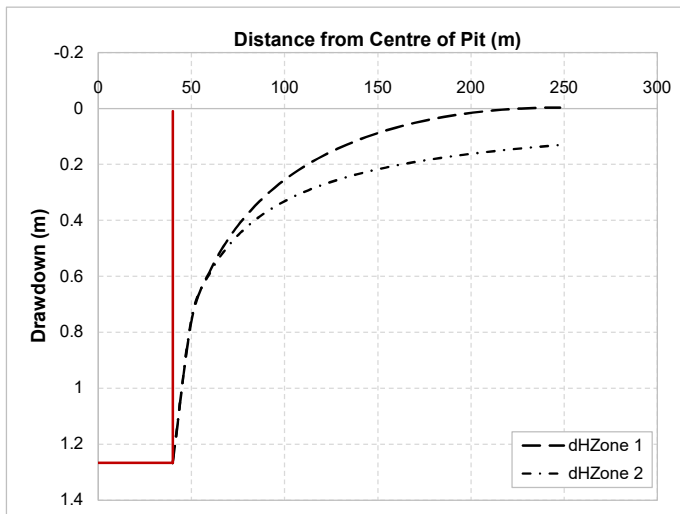
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h ₀	1.266998	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	39.89423	m	effective pit radius
d	0	m	depth of the pit lake

r₀ is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r₀ calculated by iterating equation A in analysis sheet 1

248 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
39.89423	1.266998	1.3
50.3	0.7	0.7
60.7	0.6	0.6
71.1	0.5	0.5
81.5	0.4	0.4
91.9	0.3	0.4
102.3	0.2	0.3
112.7	0.2	0.3
123.1	0.2	0.3
133.4	0.1	0.2
143.8	0.1	0.2
154.2	0.1	0.2
164.6	0.1	0.2
175.0	0.04	0.2
185.4	0.03	0.2
195.8	0.02	0.2
206.2	0.01	0.2
216.6	0.00	0.1
227.0	0.00	0.1
237.4	0.00	0.1
247.8	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

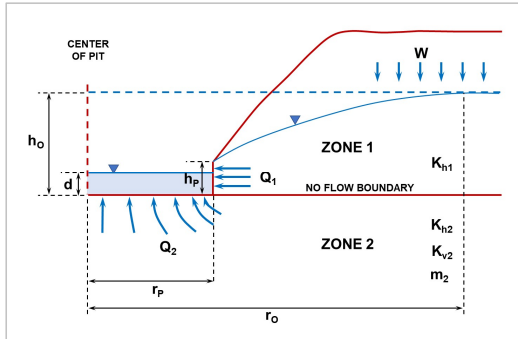
Analysed by: Toby Beisly
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland E Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.246998	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	37.21086	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 240 m

Known h_o 1.25 m

h_o calculated using Equation A 1.25 m

Q₁ 1.4E-03 m³/s
1.2E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 3.4E-02 m³/s
2.9E+03 m³/day

Total Pit Inflow

Q_{TOT} 3.5E-02 m³/s
3018.46 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

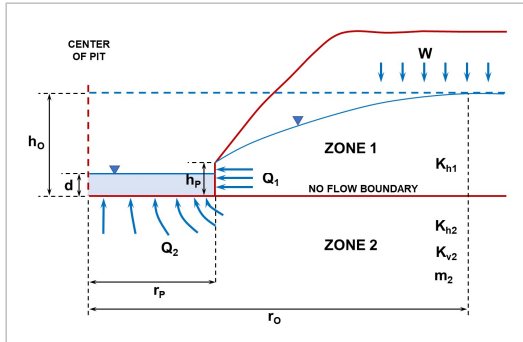
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland E Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone\ 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone\ 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1}\left(\frac{r_p}{r}\right)$$

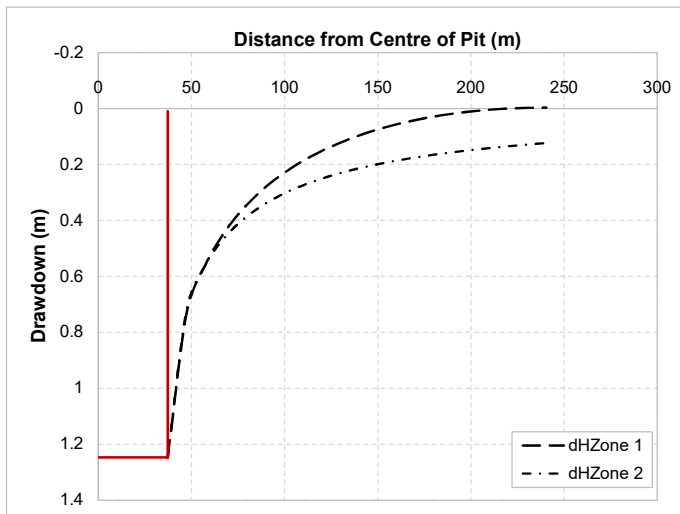
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
Kh1	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
Kh2	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
Kv2	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h0	1.246998	m	initial saturated thickness above the base of Zone 1
hp	0	m	saturated thickness at the pit wall
rp	37.21086	m	effective pit radius
d	0	m	depth of the pit lake

r_0 is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_0 calculated by iterating equation A in analysis sheet 1

240 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
37.21086	1.246998	1.2
47.4	0.7	0.7
57.5	0.6	0.6
67.7	0.4	0.5
77.9	0.4	0.4
88.0	0.3	0.3
98.2	0.2	0.3
108.3	0.2	0.3
118.5	0.2	0.3
128.7	0.1	0.2
138.8	0.1	0.2
149.0	0.1	0.2
159.1	0.1	0.2
169.3	0.04	0.2
179.5	0.03	0.2
189.6	0.02	0.2
199.8	0.01	0.1
209.9	0.00	0.1
220.1	0.00	0.1
230.3	0.00	0.1
240.4	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

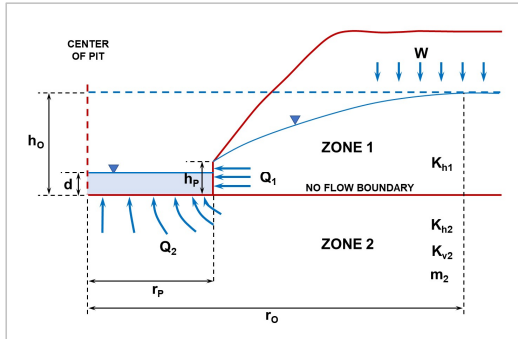
Analysed by: Toby
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland F Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	0.8	m	initial saturated thickness above the base of Zone 1
h_p	0	m	saturated thickness at the pit wall
r_p	32.89762	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 168 m

Known h_o 0.80 m

h_o calculated using Equation A 0.80 m

Q₁ 6.8E-04 m³/s
5.9E+01 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 1.9E-02 m³/s
1.6E+03 m³/day

Total Pit Inflow

Q_{TOT} 2.0E-02 m³/s
1701.87 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

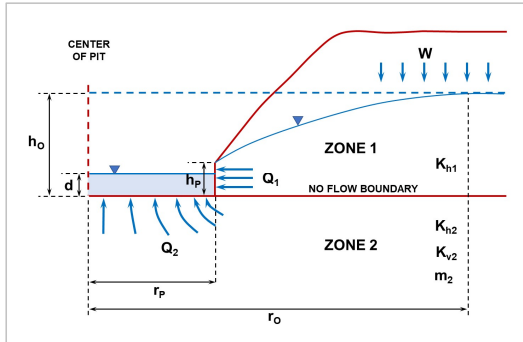
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland F Winter Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone\ 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone\ 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1}\left(\frac{r_p}{r}\right)$$

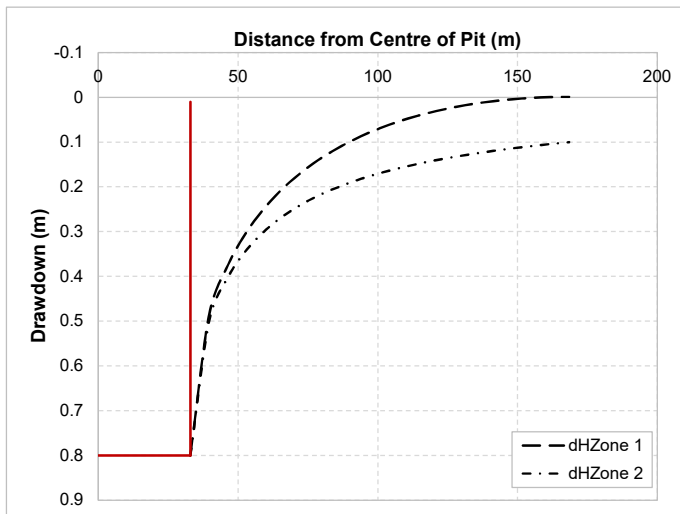
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h₀	0.8	m	initial saturated thickness above the base of Zone 1
h_p	0	m	saturated thickness at the pit wall
r_p	32.89762	m	effective pit radius
d	0	m	depth of the pit lake

r_0 is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_0 calculated by iterating equation A in analysis sheet 1

168 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
32.89762	0.8	0.8
39.7	0.5	0.5
46.5	0.4	0.4
53.2	0.3	0.3
60.0	0.2	0.3
66.8	0.2	0.3
73.6	0.2	0.2
80.3	0.1	0.2
87.1	0.1	0.2
93.9	0.1	0.2
100.7	0.1	0.2
107.4	0.1	0.2
114.2	0.0	0.1
121.0	0.03	0.1
127.8	0.02	0.1
134.6	0.01	0.1
141.3	0.01	0.1
148.1	0.00	0.1
154.9	0.00	0.1
161.7	0.00	0.1
168.4	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

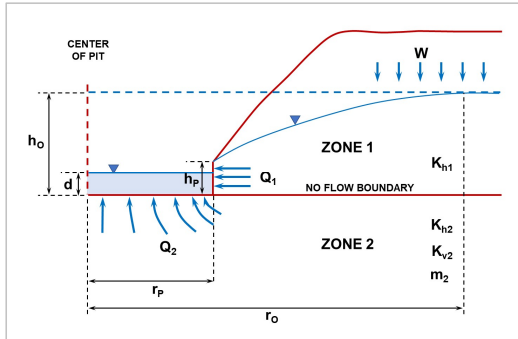
Analysed by: Toby
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland A Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.57	m	initial saturated thickness above the base of Zone 1
h_p	0.5	m	saturated thickness at the pit wall
r_p	52.62	m	effective pit radius
d	0.5	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 300 m

Known h_o 1.57 m
 h_o calculated using Equation A 1.57 m

Q₁ 2.2E-03 m³/s
1.9E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 4.1E-02 m³/s
3.5E+03 m³/day

Total Pit Inflow

Q_{TOT} 4.3E-02 m³/s
3703.05 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

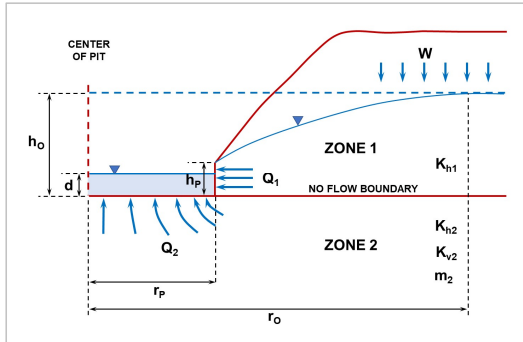
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland A Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone 1} = h_o - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_o^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone 2} = \frac{2(h_o - d)}{\pi} \sin^{-1} \left(\frac{r_p}{r} \right)$$

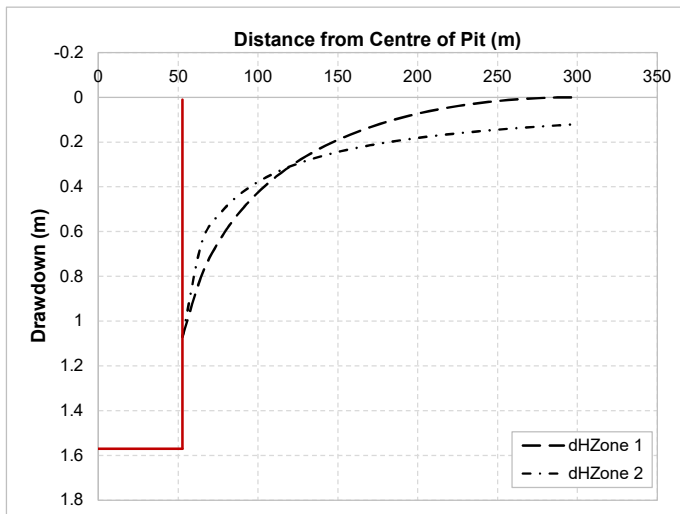
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.57	m	initial saturated thickness above the base of Zone 1
h_p	0.5	m	saturated thickness at the pit wall
r_p	52.6241	m	effective pit radius
d	0.5	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_o calculated by iterating equation A in analysis sheet 1

300 m



Drawdown curves

r	dH _{Zone 1}	dH _{Zone 2}
52.6241	1.07	1.1
65.0	0.8	0.6
77.3	0.6	0.5
89.7	0.5	0.4
102.1	0.4	0.4
114.4	0.3	0.3
126.8	0.3	0.3
139.2	0.2	0.3
151.5	0.2	0.2
163.9	0.1	0.2
176.2	0.1	0.2
188.6	0.1	0.2
201.0	0.1	0.2
213.3	0.05	0.2
225.7	0.04	0.2
238.1	0.03	0.2
250.4	0.02	0.1
262.8	0.01	0.1
275.1	0.00	0.1
287.5	0.00	0.1
299.9	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

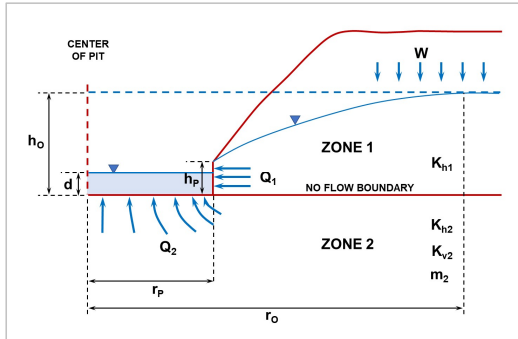
Analysed by: Toby
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The $dH_{Zone 2}$ line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland B Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.67	m	initial saturated thickness above the base of Zone 1
h_p	0.5	m	saturated thickness at the pit wall
r_p	36.56366	m	effective pit radius
d	0.5	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 287 m

Known h_o 1.67 m

h_o calculated using Equation A 1.67 m

Q₁ 2.0E-03 m³/s
1.7E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 3.1E-02 m³/s
2.7E+03 m³/day

Total Pit Inflow

Q_{TOT} 3.3E-02 m³/s
2845.51 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

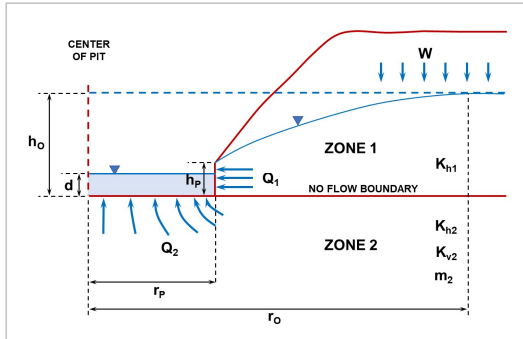
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland B Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

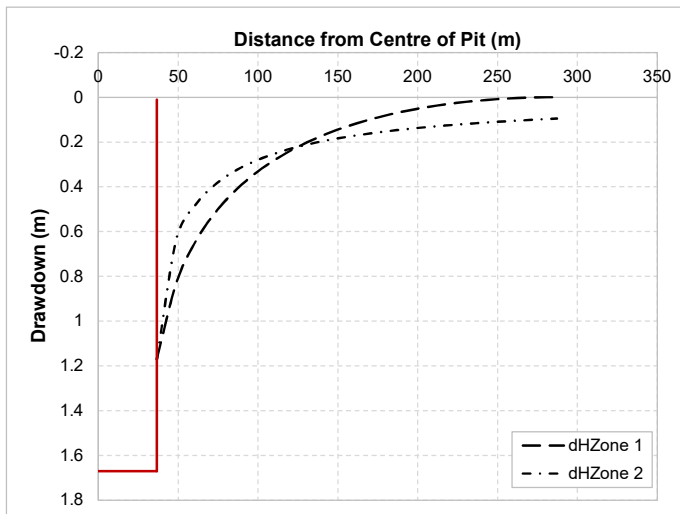
$$dH_{Zone2} = \frac{2(h_0 - d)}{\pi} \sin^{-1}\left(\frac{r_p}{r}\right)$$

$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h₀	1.67	m	initial saturated thickness above the base of Zone 1
h_p	0.5	m	saturated thickness at the pit wall
r_p	36.56366	m	effective pit radius
d	0.5	m	depth of the pit lake

r_0 is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_0 calculated by iterating equation A in analysis sheet 1 287 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
36.56366	1.17	1.2
49.1	0.8	0.6
61.6	0.6	0.5
74.2	0.5	0.4
86.7	0.4	0.3
99.2	0.3	0.3
111.8	0.3	0.2
124.3	0.2	0.2
136.8	0.2	0.2
149.4	0.1	0.2
161.9	0.1	0.2
174.4	0.1	0.2
186.9	0.1	0.1
199.5	0.05	0.1
212.0	0.04	0.1
224.5	0.02	0.1
237.1	0.02	0.1
249.6	0.01	0.1
262.1	0.00	0.1
274.7	0.00	0.1
287.2	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow to a mine pit. Ground Water 38, no. 2: 311-314.

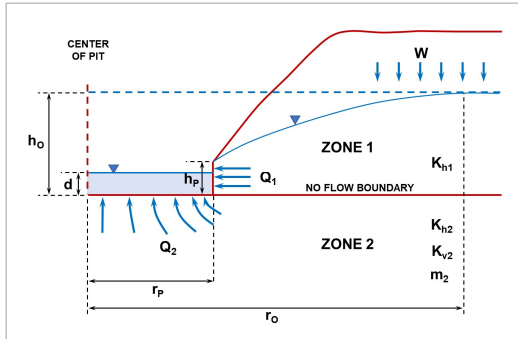
Analysed by: Toby Beisly
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland C Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.22	m	initial saturated thickness above the base of Zone 1
h _p	0.05	m	saturated thickness at the pit wall
r _p	46.18091	m	effective pit radius
d	0.05	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 250 m

Known h_o 1.22 m

h_o calculated using Equation A 1.22 m

Q₁ 1.5E-03 m³/s
1.3E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 3.9E-02 m³/s
3.4E+03 m³/day

Total Pit Inflow

Q_{TOT} 4.1E-02 m³/s
3503.75 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

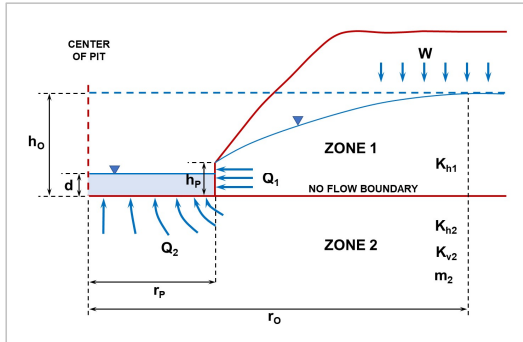
Analysed by: Toby Beisly
Checked by:

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland C Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1} \left(\frac{r_p}{r} \right)$$

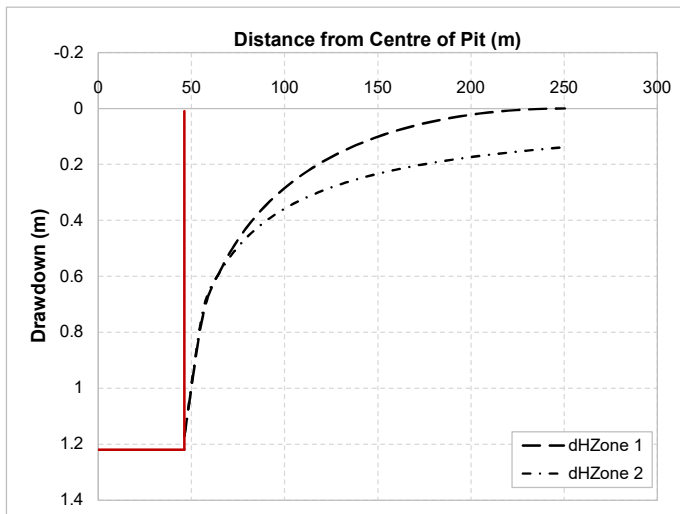
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.22	m	initial saturated thickness above the base of Zone 1
h_p	0.05	m	saturated thickness at the pit wall
r_p	46.18091	m	effective pit radius
d	0.05	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_o calculated by iterating equation A in analysis sheet 1

250 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
46.18091	1.17	1.2
56.4	0.7	0.7
66.6	0.6	0.6
76.8	0.5	0.5
87.0	0.4	0.4
97.2	0.3	0.4
107.4	0.2	0.3
117.7	0.2	0.3
127.9	0.2	0.3
138.1	0.1	0.3
148.3	0.1	0.2
158.5	0.1	0.2
168.7	0.1	0.2
178.9	0.05	0.2
189.1	0.03	0.2
199.4	0.02	0.2
209.6	0.01	0.2
219.8	0.01	0.2
230.0	0.00	0.2
240.2	0.00	0.1
250.4	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow to a mine pit. Ground Water 38, no. 2: 311-314.

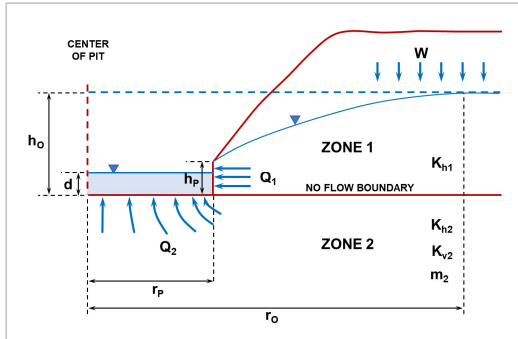
Analysed by: Toby
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland D Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.266998	m	initial saturated thickness above the base of Zone 1
h_p	0.47	m	saturated thickness at the pit wall
r_p	39.89423	m	effective pit radius
d	0.47	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 235 m

Known h_o 1.27 m

h_o calculated using Equation A 1.27 m

Q₁ 1.3E-03 m³/s
1.2E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 2.3E-02 m³/s
2.0E+03 m³/day

Total Pit Inflow

Q_{TOT} 2.4E-02 m³/s
2100.34 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

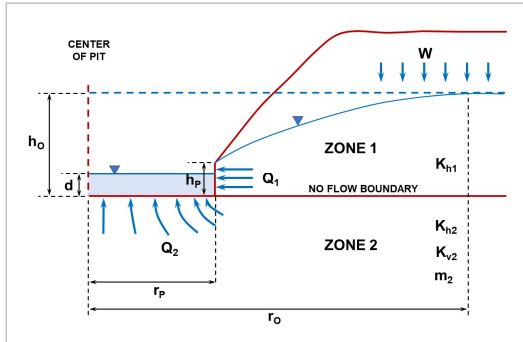
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
 PROJECT: Southern Links - Southern Block
 Project #: WGA242463
 Location: Wetland D Winter PWL
 Date: Friday, 13 March 2026
 Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone 1} = h_o - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_o^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone 2} = \frac{2(h_o - d)}{\pi} \sin^{-1} \left(\frac{r_p}{r} \right)$$

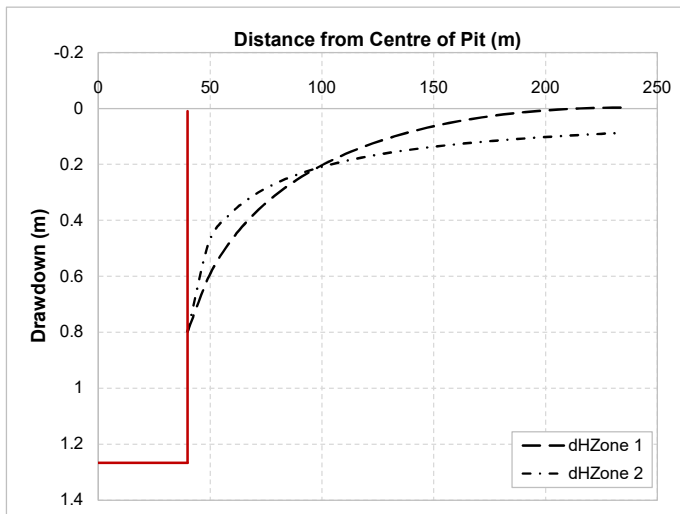
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.266998	m	initial saturated thickness above the base of Zone 1
h _p	0.47	m	saturated thickness at the pit wall
r _p	39.89423	m	effective pit radius
d	0.47	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_o calculated by iterating equation A in analysis sheet 1

235 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
39.89423	0.796998	0.8
49.6	0.6	0.5
59.4	0.5	0.4
69.1	0.4	0.3
78.9	0.3	0.3
88.6	0.3	0.2
98.4	0.2	0.2
108.1	0.2	0.2
117.9	0.1	0.2
127.6	0.1	0.2
137.3	0.1	0.1
147.1	0.1	0.1
156.8	0.1	0.1
166.6	0.04	0.1
176.3	0.03	0.1
186.1	0.02	0.1
195.8	0.01	0.1
205.6	0.00	0.1
215.3	0.00	0.1
225.1	0.00	0.1
234.8	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

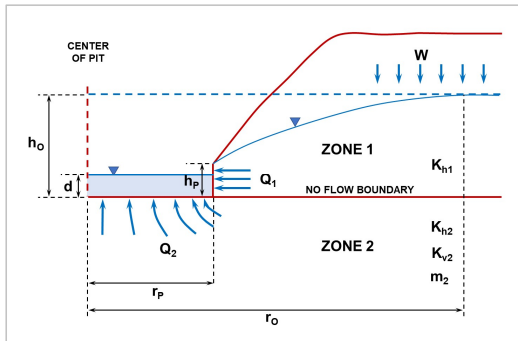
Analysed by: Toby Beisly
 Checked by: _____

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland E Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.246998	m	initial saturated thickness above the base of Zone 1
h_p	0.4	m	saturated thickness at the pit wall
r_p	37.21086	m	effective pit radius
d	0.4	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 231 m

Known h_o 1.25 m

h_o calculated using Equation A 1.25 m

Q₁ 1.3E-03 m³/s
1.1E+02 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 2.3E-02 m³/s
2.0E+03 m³/day

Total Pit Inflow

Q_{TOT} 2.4E-02 m³/s
2079.67 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

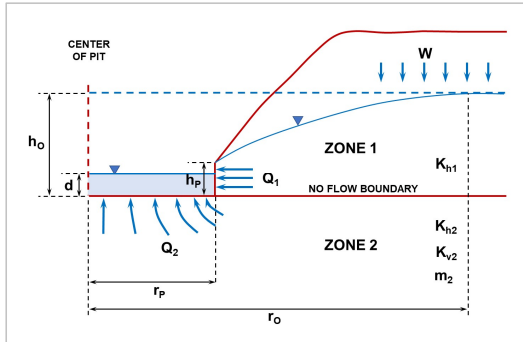
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland E Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone\ 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone\ 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1}\left(\frac{r_p}{r}\right)$$

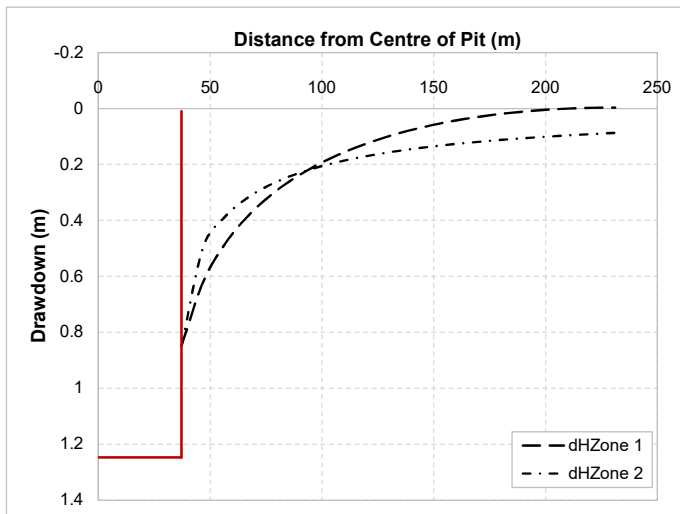
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
Kh1	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
Kh2	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
Kv2	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h0	1.246998	m	initial saturated thickness above the base of Zone 1
hp	0.4	m	saturated thickness at the pit wall
rp	37.21086	m	effective pit radius
d	0.4	m	depth of the pit lake

r_0 is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_0 calculated by iterating equation A in analysis sheet 1

231 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
37.21086	0.846998	0.8
46.9	0.6	0.5
56.6	0.5	0.4
66.3	0.4	0.3
76.0	0.3	0.3
85.7	0.3	0.2
95.4	0.2	0.2
105.1	0.2	0.2
114.8	0.1	0.2
124.4	0.1	0.2
134.1	0.1	0.2
143.8	0.1	0.1
153.5	0.1	0.1
163.2	0.04	0.1
172.9	0.03	0.1
182.6	0.02	0.1
192.3	0.01	0.1
202.0	0.00	0.1
211.7	0.00	0.1
221.4	0.00	0.1
231.1	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow to a mine pit. Ground Water 38, no. 2: 311-314.

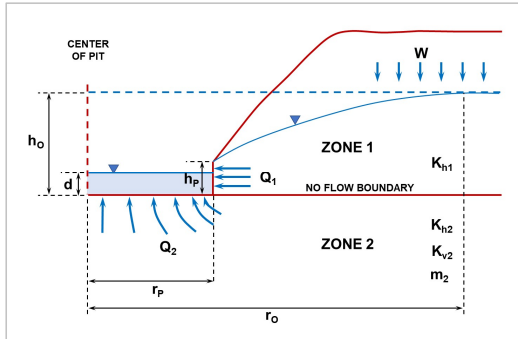
Analysed by: Toby
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland F Winter PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	0.8	m	initial saturated thickness above the base of Zone 1
h _p	0.4	m	saturated thickness at the pit wall
r _p	32.89762	m	effective pit radius
d	0.4	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 152 m

Known h_o 0.80 m

h_o calculated using Equation A 0.80 m

Q₁ 5.5E-04 m³/s
4.8E+01 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 9.5E-03 m³/s
8.2E+02 m³/day

Total Pit Inflow

Q_{TOT} 1.0E-02 m³/s
869.11 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

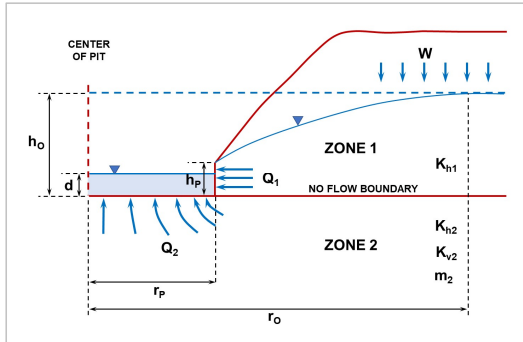
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
 PROJECT: Southern Links - Southern Block
 Project #: WGA242463
 Location: Wetland F Winter PWL
 Date: Friday, 13 March 2026
 Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone2} = \frac{2(h_0 - d)}{\pi} \sin^{-1}\left(\frac{r_p}{r}\right)$$

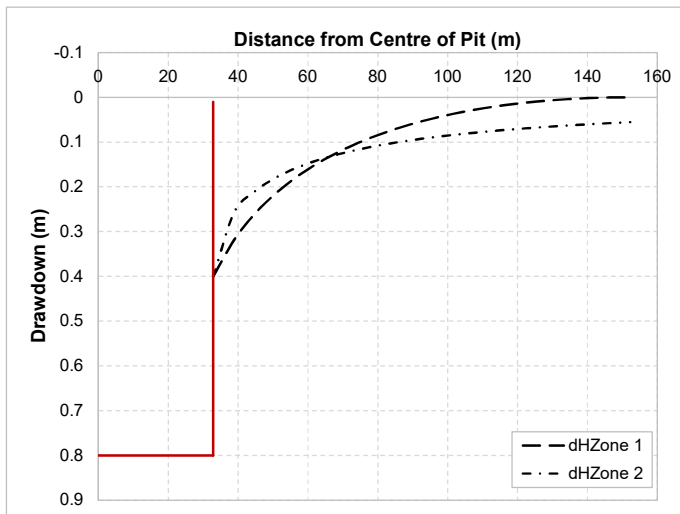
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	0.000404	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h ₀	0.8	m	initial saturated thickness above the base of Zone 1
h _p	0.4	m	saturated thickness at the pit wall
r _p	32.89762	m	effective pit radius
d	0.4	m	depth of the pit lake

r₀ is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r₀ calculated by iterating equation A in analysis sheet 1

152 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
32.89762	0.4	0.4
38.9	0.3	0.3
44.8	0.3	0.2
50.8	0.2	0.2
56.8	0.2	0.2
62.7	0.1	0.1
68.7	0.1	0.1
74.7	0.1	0.1
80.6	0.1	0.1
86.6	0.1	0.1
92.6	0.1	0.1
98.5	0.0	0.1
104.5	0.0	0.1
110.5	0.02	0.1
116.4	0.02	0.1
122.4	0.01	0.1
128.4	0.01	0.1
134.3	0.00	0.1
140.3	0.00	0.1
146.3	0.00	0.1
152.2	0.00	0.1

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

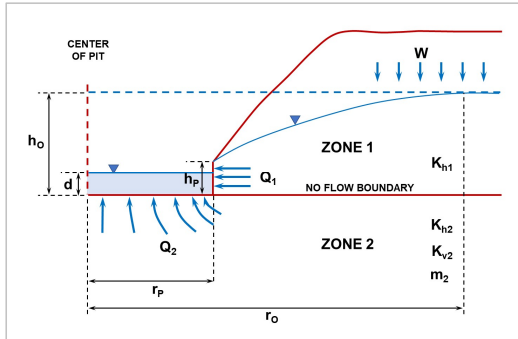
Analysed by: Toby Beisly
 Checked by: _____

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland A - Summer Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	2.50E-05	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.04	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	52.62	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 105 m

Known h_o 1.04 m

h_o calculated using Equation A 1.04 m

Q₁ 2.0E-04 m³/s
1.8E+01 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 4.0E-02 m³/s
3.4E+03 m³/day

Total Pit Inflow

Q_{TOT} 4.0E-02 m³/s
3434.50 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

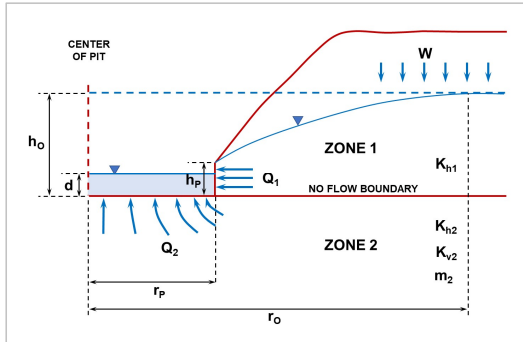
Analysed by: Toby Beisly
Checked by:

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland A - Summer Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1} \left(\frac{r_p}{r} \right)$$

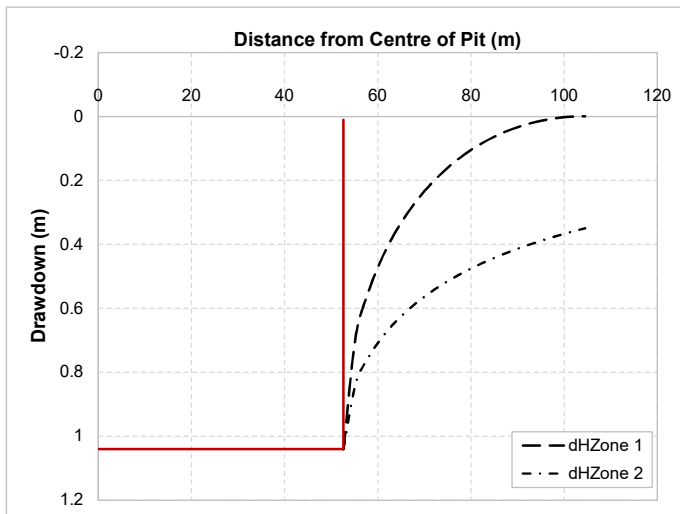
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000025	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h₀	1.04	m	initial saturated thickness above the base of Zone 1
h_p	0	m	saturated thickness at the pit wall
r_p	52.6241	m	effective pit radius
d	0	m	depth of the pit lake

r_0 is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_0 calculated by iterating equation A in analysis sheet 1

105 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
52.6241	1.04	1.0
55.2	0.7	0.8
57.8	0.6	0.8
60.4	0.5	0.7
63.0	0.4	0.7
65.6	0.3	0.6
68.2	0.3	0.6
70.8	0.2	0.6
73.4	0.2	0.5
76.0	0.1	0.5
78.6	0.1	0.5
81.2	0.1	0.5
83.8	0.1	0.5
86.3	0.05	0.4
88.9	0.04	0.4
91.5	0.03	0.4
94.1	0.02	0.4
96.7	0.01	0.4
99.3	0.00	0.4
101.9	0.00	0.4
104.5	0.00	0.3

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow to a mine pit. Ground Water 38, no. 2: 311-314.

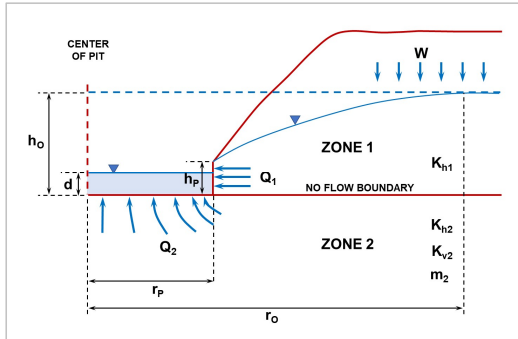
Analysed by: Toby _____
Checked by: _____

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland B - Summer Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$\begin{aligned}
 \text{A } h_o &= \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}, \\
 \text{B } Q_1 &= W \pi (r_o^2 - r_p^2), \\
 \text{C } Q_2 &= 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d), \\
 \text{D } m_2 &= \sqrt{\frac{K_{h2}}{K_{v2}}}
 \end{aligned}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	2.50E-05	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.14	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	36.56366	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 91 m

Known h_o 1.14 m
 h_o calculated using Equation A 1.14 m

Q₁ 1.7E-04 m³/s
1.5E+01 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 3.0E-02 m³/s
2.6E+03 m³/day

Total Pit Inflow

Q_{TOT} 3.0E-02 m³/s
2617.41 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

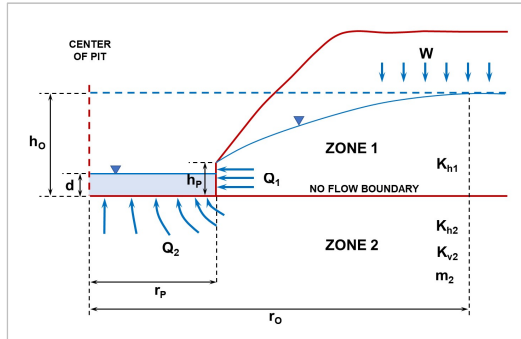
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland B - Summer Dry Pit
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone1} = h_o - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_o^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone2} = \frac{2(h_o - d)}{\pi} \sin^{-1}\left(\frac{r_p}{r}\right)$$

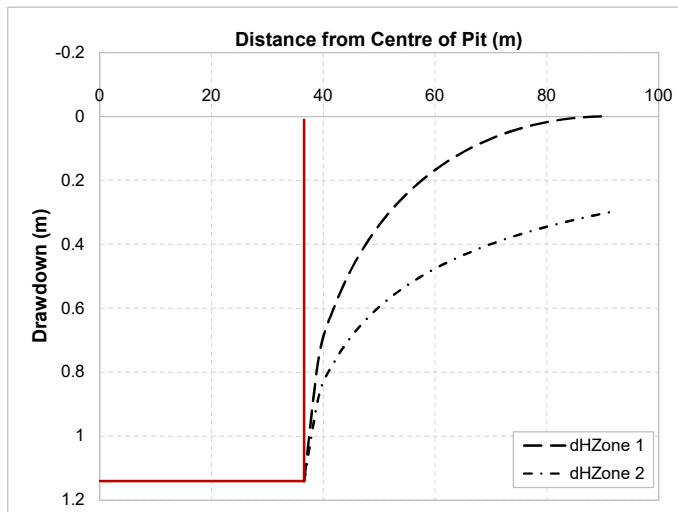
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	0.000025	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.14	m	initial saturated thickness above the base of Zone 1
h _p	0	m	saturated thickness at the pit wall
r _p	36.56366	m	effective pit radius
d	0	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_o calculated by iterating equation A in analysis sheet 1

91 m



Drawdown curves			
r	dH _{Zone 1}	dH _{Zone 2}	
36.56366	1.14	1.1	
39.3	0.7	0.9	
42.0	0.6	0.8	
44.8	0.5	0.7	
47.5	0.4	0.6	
50.2	0.3	0.6	
52.9	0.3	0.6	
55.7	0.2	0.5	
58.4	0.2	0.5	
61.1	0.2	0.5	
63.9	0.1	0.4	
66.6	0.1	0.4	
69.3	0.1	0.4	
72.0	0.06	0.4	
74.8	0.04	0.4	
77.5	0.03	0.4	
80.2	0.02	0.3	
83.0	0.01	0.3	
85.7	0.00	0.3	
88.4	0.00	0.3	
91.1	0.00	0.3	

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

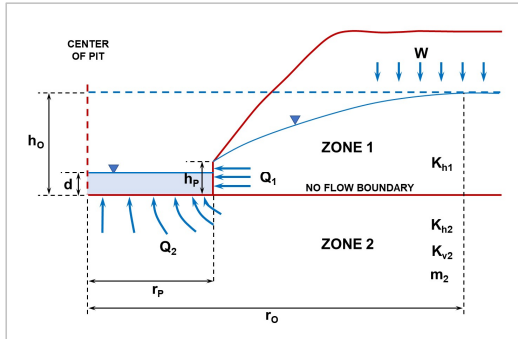
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland A Summer PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$\begin{aligned}
 \text{A } h_o &= \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}, \\
 \text{B } Q_1 &= W \pi (r_o^2 - r_p^2), \\
 \text{C } Q_2 &= 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d), \\
 \text{D } m_2 &= \sqrt{\frac{K_{h2}}{K_{v2}}}
 \end{aligned}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	2.50E-05	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.04	m	initial saturated thickness above the base of Zone 1
h_p	0.5	m	saturated thickness at the pit wall
r_p	52.62	m	effective pit radius
d	0.5	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 99 m

Known h_o 1.04 m
 h_o calculated using Equation A 1.04 m

Q₁ 1.7E-04 m³/s
1.5E+01 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 2.1E-02 m³/s
1.8E+03 m³/day

Total Pit Inflow

Q_{TOT} 2.1E-02 m³/s
1789.13 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

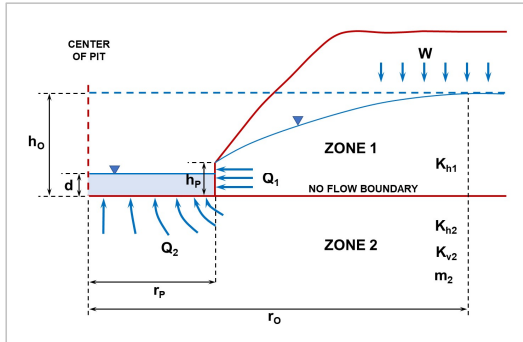
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland A Summer PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1} \left(\frac{r_p}{r} \right)$$

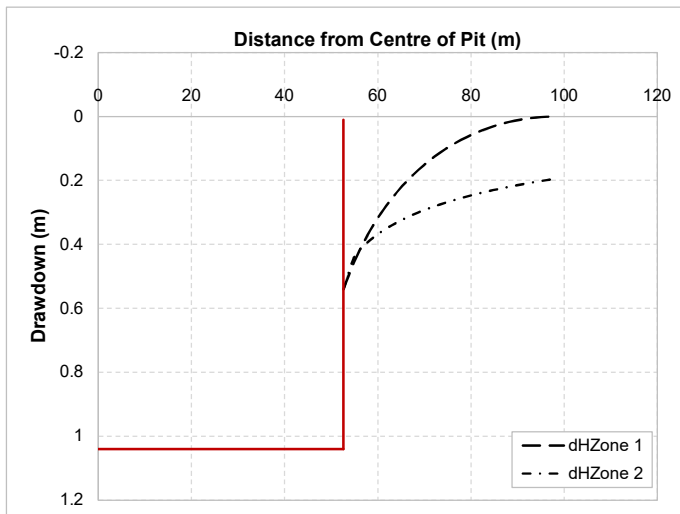
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000025	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h_o	1.04	m	initial saturated thickness above the base of Zone 1
h_p	0.5	m	saturated thickness at the pit wall
r_p	52.6241	m	effective pit radius
d	0.5	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_o calculated by iterating equation A in analysis sheet 1

99 m



Drawdown curves

r	dH _{Zone 1}	dH _{Zone 2}
52.6241	0.54	0.5
54.9	0.5	0.4
57.2	0.4	0.4
59.5	0.3	0.4
61.8	0.3	0.4
64.1	0.2	0.3
66.4	0.2	0.3
68.7	0.2	0.3
71.0	0.1	0.3
73.3	0.1	0.3
75.6	0.1	0.3
77.9	0.1	0.3
80.2	0.1	0.2
82.5	0.04	0.2
84.8	0.03	0.2
87.1	0.02	0.2
89.4	0.01	0.2
91.7	0.01	0.2
94.0	0.00	0.2
96.3	0.00	0.2
98.6	0.00	0.2

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

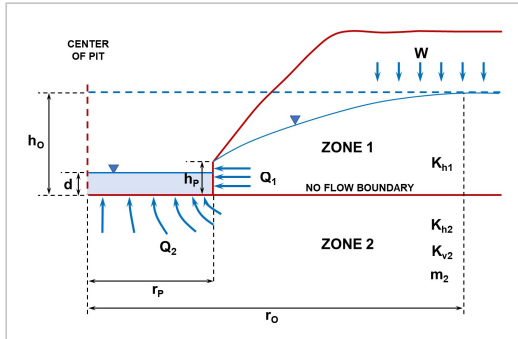
Analysed by: Toby
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.

INFLOW TO OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland B Summer PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$A \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$B \quad Q_1 = W \pi (r_o^2 - r_p^2)$$

$$C \quad Q_2 = 4 r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$D \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K _{h1}	2.50E-05	m/s	horizontal hydraulic conductivity in Zone 1
K _{h2}	4.04E-04	m/s	horizontal hydraulic conductivity in Zone 2
K _{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h _o	1.14	m	initial saturated thickness above the base of Zone 1
h _p	0.5	m	saturated thickness at the pit wall
r _p	36.56366	m	effective pit radius
d	0.5	m	depth of the pit lake

r_o is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Inflow from Zone 1

Radius of influence r_o calculated by iterating equation A 86 m

Known h_o 1.14 m

h_o calculated using Equation A 1.14 m

Q₁ 1.5E-04 m³/s
1.3E+01 m³/day

Inflow from Zone 2

Anisotropy parameter calculated using equation D 2.236068

Q₂ 1.7E-02 m³/s
1.5E+03 m³/day

Total Pit Inflow

Q_{TOT} 1.7E-02 m³/s
1474.08 m³/day

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

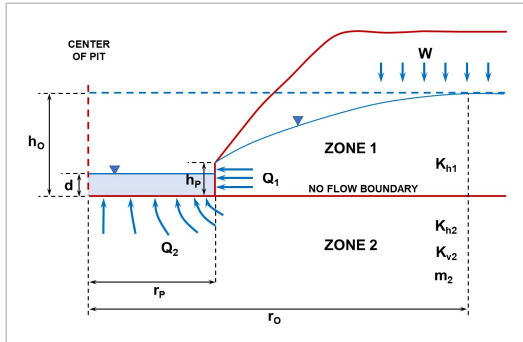
Analysed by: Toby _____ Beisly _____
Checked by: _____

Notes: The hydraulic conductivity of 4.04E-04 used in this assessment is a minimum estimate.

GROUNDWATER DRAWDOWN AROUND OPEN PIT - APPROXIMATION

WGA

CLIENT: Barker & Associates
PROJECT: Southern Links - Southern Block
Project #: WGA242463
Location: Wetland B Summer PWL
Date: Friday, 13 March 2026
Document #: WGA242463-RP-HG-0003_A



$$dH_{Zone\ 1} = h_0 - \sqrt{h_p^2 + \frac{W}{k_{h1}} \left[r_0^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$dH_{Zone\ 2} = \frac{2(h_0 - d)}{\pi} \sin^{-1}\left(\frac{r_p}{r}\right)$$

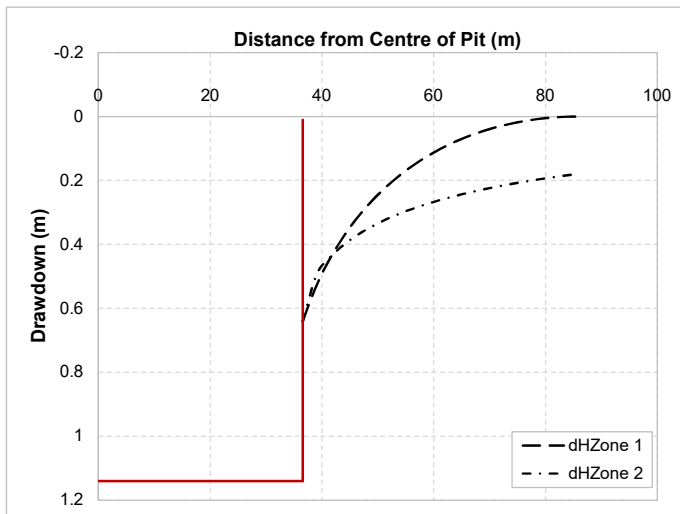
$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

W	7.93E-09	m/s	recharge flux
K_{h1}	0.000025	m/s	horizontal hydraulic conductivity in Zone 1
K_{h2}	0.000404	m/s	horizontal hydraulic conductivity in Zone 2
K_{v2}	8.08E-05	m/s	vertical hydraulic conductivity in Zone 2
h₀	1.14	m	initial saturated thickness above the base of Zone 1
h_p	0.5	m	saturated thickness at the pit wall
r_p	36.56366	m	effective pit radius
d	0.5	m	depth of the pit lake

r_0 is the radius of influence measured from the center of the pit beyond which groundwater drawdown is nil.

Radius of influence r_0 calculated by iterating equation A in analysis sheet 1

86 m



Drawdown curves		
r	dH _{Zone 1}	dH _{Zone 2}
36.56366	0.64	0.6
39.0	0.5	0.5
41.5	0.4	0.4
44.0	0.4	0.4
46.5	0.3	0.4
48.9	0.3	0.3
51.4	0.2	0.3
53.9	0.2	0.3
56.4	0.2	0.3
58.9	0.1	0.3
61.3	0.1	0.3
63.8	0.1	0.2
66.3	0.1	0.2
68.8	0.05	0.2
71.2	0.03	0.2
73.7	0.02	0.2
76.2	0.01	0.2
78.7	0.01	0.2
81.1	0.00	0.2
83.6	0.00	0.2
86.1	0.00	0.2

Reference: Marinelli, F. & Niccoli W. L. 2000.
 Simple analytical equations for estimating ground water inflow
 to a mine pit. Ground Water 38, no. 2: 311-314.

Analysed by: Toby
Checked by:

Notes: The drawdown curves apply along the no-flow boundary line at an elevation equivalent to the base of the pit.
 The dH_{Zone2} line does not take into account recharge from above.
 Drawdown projections are initial approximations only.