** range for sandstone updated in this revision to give lower minimum K value (taken from old falling head tests DPS27) ** updated southern launch depths incorporated (only making the cutting at section I 0.75m deeper and the cutting at section J a max of 1m deeper)

 Width of excavation (m) =
 45

 Length of excavation (m) =
 470

 Chainage 3250 - 3720m
 Assume same depth throughout

Linear Excavation Echline Corner (covered by long section G) (Scenario 1) Use section A

DUPUIT-THIEM EQUATION (unconfined aquifer, steady state conditions)	Empirical Formula of Sichardt
Q=piK(H ₀ ^{*/2} -h _u ^{*/2})/2.3log(R ₀ /re)	R ₀ =C(h ₀ - h)SQRT(K)
Where,	r_e rectangular excavation = SQRT(ab/pi)

though CIRIA 515 says $r_e = (a+b)/pi$

toot regulte for condetor		

 Range 6.64e-8 - 6.03e-6m/s (K test results for sandstone though book value range 1e-10 - 1e-6m/s)

 Sandstone max 8m thick (av thickness of sstn/gravel at S78 and DPS22)

 Calculated

 82.1
 Calculated

 Assume approx top of sstn (worst case) & 5.5m above aquifer base (elevation of properties)

 2.6m above aquifer base (worst case, where sandstone is deepest, S78) corresponds to target drawdown inside excavation

Where, Q=flow rate K=hydraulic conductivity D=aquifer thickness Ro=radius of influence re=effective radius H_e=rest water level h_w=dynamic water level Theim eng assumes a radi

Them eqn assumes a radius of influence = R0+Re Constant,C= 2000 (empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case))

Calculation of required flow (Thiem), Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
6.03E-06	8	8	2.5	27.01	82.1	109.1	0.00385	333	3.85	
6.03E-06	8	5.5	2.5	14.73	82.1	96.8	0.00276	238	2.76	Sandstone K
										range
6.64E-08	8	8	2.5	2.83	82.1	84.9	0.00036	31	0.36	Tange
6.64E-08	8	5.5	2.5	1.55	82.1	83.6	0.00027	23	0.27	

Linear Excavation Echline Corner (co	vered by long section G)	(Scenario 2)	Use section B						
$\begin{array}{l} \textbf{DUPUIT-THIEM EQUATION (unconfined} \\ Q=piK(H_o^{A2}\text{-}h_w^{A2})/2.3log(R_0\text{/re}) \end{array}$	aquifer, steady state condition	ions)	Empirical Formula of Sichardt R ₀ =C(h ₀ - h)SQRT(K)						
Where, Q=flow rate			r_e rectangular excavation = SQRT(ab/pi)	though CIRIA 515 says $r_e = (a+b)/pi$					
	Range 6.64e-8 - 6.03e-6m/s	K test results for sands	stone though book value range 1e-10 - 1e-6m/s), 4	E-5 m/s also shown as this gives upper K					
K=hydraulic conductivity		,	range for tested mudstone	· · · · · · · · · · · · · · · · · · ·	Width of excavation (m) =	45			
D=aquifer thickness	Sandstone max 12m thick (av	thickness of sstn at CS	R003A/CSR005A/BHS1020)		Length of excavation (m) =	470			
Ro=radius of influence	Calculated				Chainage 3250 - 3720m				
re=effective radius	82.1	Calculated	(X section of base of excavation typically 45m)		Assume same depth through	hout			
Ho=rest water level	Assume approx top of sstn (w	orst case) & 8m above a	aguifer base (elevation of properties)						
h _w =dynamic water level	6m above aquifer base, corres	sponds to target drawdo	wn inside excavation						
Their or accumes a radius of influence.	- P0 Po								

Constant,C= 2000 a radius e H0+Re (empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case))

Calculation of requir	red flow (Thiem), Ca	alculation of radius of influe	nce (Sichardt)								
Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q		Í
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m³/d)	(l/s)		
											ĺ
6.03E-06	12	12	6	29.47	82.1	111.5	0.00668	577	6.68		1
6.03E-06	12	8	6	9.82	82.1	91.9	0.00470	406	4.70	Sandstone K	
										range	1
6.64E-08	12	12	6	3.09	82.1	85.1	0.00061	53	0.61	range	1
6.64E-08	12	8	6	1.03	82.1	83.1	0.00047	40	0.47		1
											1
4.00E-05	12	12	6	75.89	82.1	157.9	0.02075	1792	20.75		alue when maximun nge (included as C
4.00E-05	12	8	6	25.30	82.1	107.3	0.01311	1132	13.11	thickness input an and mudstone. Hi	
											K = 7.34 E-7 m/s

Linear Excavation Springfield (south) (covered by long section K) (Scenario 1) Use section D Where,

Q=flow rate						
K=hydraulic conductivity	Range 1e-9 - 1e-7m/s (K test	results for clayey drift.	Book value range for Boulder Clay 1e-12 - 1e-6m/s)	Width of excavation (m) = 45		
D=aquifer thickness	Boulder Clay max 9m thick	Length of excavation (m) = 340				
Ro=radius of influence	Calculated			Chainage 3720 - 4060m		
re=effective radius	69.8	Calculated	(X section of base of excavation typically 45m)	Assume same depth throughout		
Ho=rest water level	Approx top of boudler clay (worst case) or 4m above aquifer base where water strike in TPS96, though gw appears to be assoc with sandy lenses.					
h _w =dynamic water level	Om above aquifer base as bo	ulder clay base approx s	same at deepest part of cutting			
Theim eqn assumes a radius of influence =	= R0+Re					
Constant,C= 2000	(empirical calibration factor -	3000 for radial or 1500-	-2000 for linear excavation (3000 = worst case))			
Calculation of required flow (Thiem), Ca	alculation of radius of influe	nce (Sichardt)				

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
										[
1.00E-07	9	9	0	5.69	69.8	75.5	0.00032	28	0.32	Range of K
1.00E-07	9	4	0	2.53	69.8	72.3	0.00014	12	0.14	values for
										boulder
1.00E-09	9	9	0	0.57	69.8	70.4	0.00003	3	0.03	clay/superfici
1.00E-09	9	4	0	0.25	69.8	70.0	0.00001	1	0.01	als
										[
6.03E-06	9	9	0	44.20	69.8	114.0	0.00313	271	3.13	Using upper
6.03E-06	9	4	0	19.64	69.8	89.4	0.00122	106	1.22	K limit for

Linear Excavation Springfield (south) (covered by long section K) (Scenario 2) Use section E

Q=flow rate				
K=hydraulic conductivity	Range 6.64e-8 - 6.03e-6m/s	(K test results for sands	stone though book value range 1e-10 - 1e-6m/s)	Width of excavation (m) = 45
D=aquifer thickness	Use depth of base of sandsto	one to		Length of excavation (m) = 340
Ro=radius of influence	Calculated			Chainage 3720 - 4060m
re=effective radius	69.8	Calculated	(X section of base of excavation typically 45m)	Assume same depth throughout
Ho=rest water level	Max w.l. recorded approx. 10	m above aquifer base a	t DPS39 (though the installation covers the whole section and max water level recording is qu	uestionable therefore conservative)
h _w =dynamic water level	2.5m above sstn aquifer base	e at deepest part of cutti	ing	

Them eqn assumes a radius of influence = R0+Re Constant,C= 2000 (empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case))

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m³/d)	(l/s)	
										1
6.03E-06	6.5	10	2.5	36.83	69.8	106.6	0.00419	362	4.19	Sandston
6.64E-08	6.5	10	2.5	3.87	69.8	73.7	0.00036	31	0.36	range

Linear Excavation Springfield (north)(covered by long section L) (Scenario 1) Use section M

Q=flow rate								
K=hydraulic conductivity	Range 6.64e-8 - 6	03e-6m/s K test results for sa	ndstone and 2.5E-5 m/s tested K for dolerite	Width of excavation (m) = 45				
D=aquifer thickness	Use depth of base	of sandstone (+ small section	of dolerite - group together)	Length of excavation $(m) = 190$				
Ro=radius of influence	Calculated			Chainage 4060 - 4250m (ending approx where the cutting stops)				
re=effective radius	52.2	Calculated	(X section of base of excavation typically 45m)	Assume same depth throughout				
H _o =rest water level	Elevation of prope	Elevation of properties above aquifer base (11), or top of aquifer (4) (no reliable sstn/dolerite w.l.s within the cutting for this section so use height of houses as worst case scenario)						
h _w =dynamic water level	0m as base of cutt	Om as base of cutting coincides with aquifer base						

Theim eqn assumes a radius of influence – R0-Re Constant,C= 2000 (empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case))

Calculation of required flow (Thiem), Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m³/d)	(l/s)	
2.50E-05	4	11	0	110.00	69.8	179.8	0.01005	869	10.05	Tested
2.50E-05	4	4	0	40.00	69.8	109.8	0.00278	240	2.78	dolerite and
										sandstone
6.64E-08	4	11	0	5.67	69.8	75.5	0.00032	28	0.32	
6.64E-08	4	4	0	2.06	69.8	71.8	0.00011	10	0.11	range

Linear Excavation Springfield (north) (covered by long section L) (Scenario 2) Use section I Q=flow rate

K=hydraulic conductiv	vity	Range 6.64e-8 - 6.03e-6m/s k	ange 6.64e-8 - 6.03e-6m/s K test results for sandstone							
D=aquifer thickness		Use depth of base of sandstor	ne							
Ro=radius of influenc	e	Calculated								
r _e =effective radius		52.2	Calculated	(X section of base of excavation typically 45m)						
H _o =rest water level		Top of aquifer (15m). NB. BH	S1031 sstn installation is	dry (no water recorded in the cutting) so this is a very conservative estimate						
h _w =dynamic water lev	/el	12.5 = base of cutting above b	case of aquifer							
Theim eqn assumes a	a radius of influence =	= R0+Re								
Constant,C=	2000	(empirical calibration factor - 3	3000 for radial or 1500-2	000 for linear excavation (3000 = worst case))						

Calculation of required flow (Thiem), Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
On an alternative law (and (a)	This is the second start	11 (m)	h. (m)	Influence De (m)		((m ³ /n)	(ma ³ /al)	(1/-)	

Width of excavation (m) = 45 Length of excavation (m) = 190 Chainage 4006 - 4250m (ending approx where the cutting stops) Assume same depth throughout

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
6.03E-06	15	15	12.5	12.28	69.8	82.1	0.00805	695	8.05	Tested
										dolerite and
6.64E-08	15	15	12.5	1.29	69.8	71.1	0.00078	68	0.78	sandstone K
										range

Linear Excavation	Linn Mill (covered	by long section L)		Use section I and F
Where,				
Q=flow rate				
K=hydraulic conductiv	rity	Range 6.64e-8 - 6.03e-6m/s H	test results for sands	stone
D=aquifer thickness		Use depth of base of sandsto	ne	
Ro=radius of influence	e	Calculated		
r _e =effective radius		52.2	Calculated	(X section of base of excavation typically 45m)
H _o =rest water level		Elevation of properties above	aquifer base (16m - w	rorst case), or top of aquifer (15m - as recorded)
h _w =dynamic water lev	el	12.5 = base of cutting above I	base of aquifer	
Theim eqn assumes a	a radius of influence	= R0+Re		
Constant,C=	2000	(empirical calibration factor -	3000 for radial or 1500	0-2000 for linear excavation (3000 = worst case))

Width of excavation (m) = 45 Length of excavation (m) = 190 Chainage 4006 - 4250m (ending approx where the cutting stops) Assume same depth throughout

Calculation of required flow (Thiem), Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
6.03E-06	15	16	12.5	17.19	69.8	87.0	0.00859	742	8.59	Tested
6.03E-06	15	15	12.5	12.28	69.8	82.1	0.00805	695	8.05	dolerite and
										sandstone K
6.64E-08	15	16	12.5	1.80	69.8	71.6	0.00082	71	0.82	
6.64E-08	15	15	12.5	1.29	69.8	71.1	0.00078	68	0.78	range

Note: Linn Mill Burn is at approx the same elevation as the top of the aquifer (35mAOD) so use Ho = 15. and Ro + re above to see if dewatering will affect Linn Mill Burn

Note: Society Road properties approx. 20 mAOD so far below the base of the cutting

Where.

Where, Q=flow rate

Ho=rest water level

7.34E-07 *Using mean K value from pump tests analysis

(X section of base of excavation typically 45m)

** range for sandstone updated in this revision to give lower minimum K value (taken from old falling head tests DPS27 - previously missed) ** updated southern launch depths incorporated (only making the cutting at section I 0.75m deeper and the cutting at section J a max of 1m deeper)

Linear Excavation Echline Corner (covered by long section G) (Scenario 1) Use section A Empirical Formula of Sichardt DUPUIT-THIEM FOUNTION (unconfined aquifer, steady state conditions)

DOPOID-THIEM EQUATION (unconnined aquiler, steady state conditions)	Empirical Formula of
Q=piK(H _o ^2-h _w ^2)/2.3log(R ₀ /re)	R ₀ =C(h ₀ - h)SQRT(K)

though CIRIA 515 says r_e = (a+b)/pi r_e rectangular excavation = SQRT(ab/pi)

Where, Q=flow rate K=hydraulic conductivity D=aquifer thickness Ro=radius of influence r_e=effective radius 7.34E-07 sstn (pump test) Sandstone max 8m thick (av thickness of sstn/gravel at S78 and DPS22) Calculated
82.1
Calculated



Assume approx top of sstn (worst case) & 5.5m above aquifer base (elevation of properties)
 hardynamic water level
 2.5m above aquifer base (work case) where sandstone is deepest, S78) corresponds to target drawdown inside excavation

 Theim eqn assumes a radius of influence
 = R0+Re

 Constant,C=
 2000

 (empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case))

Calculation of required flow (Thiem), Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
7.34E-07	8	8	2.5	9.42	82.1	91.5	0.00123	106	1.23	Sandstone K
7.34E-07	8	5.5	2.5	5.14	82.1	87.2	0.00091	79	0.91	range

Linear Excavation Echline Corner (co red by long section G) (Scenario 2) Use section B

DUPUIT-THIEM EQUATION (unconfined aquifer, steady state conditions) $Q{=}piK(H_o'^2{-}h_w'2)/2.3log(R_0're)$

Empirical Formula of Sichardt R₀=C(h₀ - h)SQRT(K)

though CIRIA 515 says re = (a+b)/pi re rectangular excavation = SQRT(ab/pi)

K=hydraulic conductivity D=aguifer thickness	7.34E-7 Sandstone max 12m thick (av thick		e-5 m/s also shown as this gives upper K range for tes
Ro=radius of influence	Calculated	111033 01 3311 21 001100	54/06/10/10/10/10/10/10/10/10/10/10/10/10/10/
re=effective radius	82.1	Calculated	(X section of base of excavation typically 45m)
H _o =rest water level	Assume approx top of sstn (worst	case) & 8m above aquife	er base (elevation of properties)
h _w =dynamic water level	6m above aquifer base, correspon	ids to target drawdown i	nside excavation
Theim eqn assumes a radius of influence =	R0+Re		
Constant,C= 2000	(empirical calibration factor - 3000	for radial or 1500-2000	for linear excavation (3000 = worst case))

Width of excavation (m) = 45Length of excavation (m) = 470Chainage 3250 - 3720m Assume same depth throughout

(empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case)) Calculation of required flow (Thiem) Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
7.34E-07	12	12	6	10.28	82.1	92.3	0.00211	182	2.11	
7.34E-07	12	8	6	3.43	82.1	85.5	0.00158	136	1.58	
4.00E-05	12	12	6	75.89	82.1	157.9	0.02075	1792	20.75	Heighest K value when maximum mudstone K inc in the range (included as CSR003A used for thick
4.00E-05	12	8	6	25.30	82.1	107.3	0.01311	1132	13.11	input and this BH includes interbedded sstn a mudstone. Highly Unlikely. CRT in this area gave
										7 24 E-7 m/c

Linear Excavation Springfield (south) (covered by long section K) (Scenario 1) Use section D

Where,	,, , , ,	, ,		
Q=flow rate				
K=hydraulic conductivity	Range 1e-9 - 1e-7m/s (K test resu	Its for clayey drift. Boo	ok value range for Boulder Clay 1e-12 - 1e-6m/s)	Width of excavation (m) = 45
D=aquifer thickness	Boulder Clay max 9m thick			Length of excavation (m) = 340
Ro=radius of influence	Calculated			Chainage 3720 - 4060m
re=effective radius	69.8	Calculated	(X section of base of excavation typically 45m)	Assume same depth throughout
Ho=rest water level	Approx top of boudler clay (worst	case) or 4m above the	aquifer base (water strike in TPS96), though gw appears to be assoc with sandy lenses.	
h _w =dynamic water level	Om above aquifer base as boulder	clay base approx san	ne at deepest part of cutting	
Theim eqn assumes a radius of influence	= R0+Re			
	/ ··· / // // / / 0000			

(empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case)) Constant,C= 2000

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
1.00E-07	9	9	0	5.69	69.8	75.5	0.00032	28	0.32	Range of K
1.00E-07	9	4	0	2.53	69.8	72.3	0.00014	12	0.14	values for
										boulder
1.00E-09	9	9	0	0.57	69.8	70.4	0.00003	3	0.03	clay/superficia
1.00E-09	9	4	0	0.25	69.8	70.0	0.00001	1	0.01	ls
7.34E-07	9	9	0	15.42	69.8	85.2	0.00094	81	0.94	Using
7 34E-07	9	4	0	6.85	69.8	76.6	0.00039	34	0.39	sandstone K

Linear Excavation Springfield (south) (covered by long section K) (Scenario 2) Use section E

Q=flow rate				
K=hydraulic conductivity		7.34E-07 sstn (pump test)		Width of excavation (m) = 45
D=aquifer thickness	Use depth of base of sar	idstone to		Length of excavation (m) = 340
Ro=radius of influence	Calculated			Chainage 3720 - 4060m
re=effective radius	69.8	Calculated	(X section of base of excavation typically 45m)	Assume same depth throughout
H _o =rest water level	Max w.l. recorded approx	c. 10m above aquifer base a	t DPS39 (though the installation covers the whole section and max levels	are questionable therefore conservative estimates)
h _w =dynamic water level	2.5m above sstn aquifer	base at deepest part of cutti	ng	

Theim eqn assumes a radius of influence = R0+Re Constant,C= 2000 (empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case))

Calculation of required flow (Thiem), Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
7.34E-07	6.5	10	2.5	12.85	69.8	82.6	0.00128	111	1.28	

Linear Excavation Springfield (north)(covered by long section L) (Scenario 1) Use section M

Q=flow rate				
K=hydraulic conductivity	7.34e-7 (pump test se	tn) and 2.5E-5 m/s tested K for d	olerite	Width of excavation (m) = 45
D=aquifer thickness	Use depth of base of	sandstone (+ small section of do	erite - group together)	Length of excavation (m) = 190
Ro=radius of influence	Calculated			Chainage 4060 - 4250m (ending approx where the cutting stops)
re=effective radius	52.2	Calculated	(X section of base of excavation typically 45m)	Assume same depth throughout
H.=rest water level	Elevation of propertie	s above aquifer base (11) or ton	of aquifer (4) (no reliable will a for this section so use height of houses as worst case a	cenario)

Elevation of prope se (11), or top of aquifer (4) (no reliable w.l.s for this

h_w=dynamic water level 0m as base of cutting coincides with aquifer base

Them eqn assumes a radius of influence = R0+Re Constant,C= 2000 (empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case))

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
2.50E-05	4	11	0	110.00	69.8	179.8	0.01005	869	10.05	Tested
2.50E-05	4	4	0	40.00	69.8	109.8	0.00278	240	2.78	dolerite and
										CRT
7.34E-07	4	11	0	18.85	69.8	88.6	0.00117	101	1.17	sandstone k
7.34E-07	4	4	0	6.85	69.8	76.6	0.00039	34	0.39	range

Linear Excavation Springfield (north)(covered by long section L) (Scenario 2) Use section I

Q=flow rate K=hydraulic conductivity

D=aquifer thickness Ro=radius of influence

re=effective radius

H_o=rest water level

h_w=dynamic water level

7.34E-07 sstn (pump test) Use depth of base of sandstone Calculated 52.2 Calculated (X section of base of excavation typically 45m) Max w.l. recorded corresponds with top of aquifer (15m) 12.5 = base of cutting above base of aquifer

Width of excavation (m) = 45Length of excavation (m) = 190Chainage 4060 - 4250m (ending approx where the cutting stops) Assume same depth throughout

Theim eqn assumes a radius of influence = R0+Re Constant,C= 2000 (empirical calibration factor - 3000 for radial or 1500-2000 for linear excavation (3000 = worst case))

Calculation of required flow (Thiem), Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	1
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
7.34E-07	15	15	12.5	4.28	69.8	74.1	0.00266	230	2.66	
]

Linear Excavation Linn Mill (covered	by long section L)		Use section I and F
Where,			
Q=flow rate			
K=hydraulic conductivity	7.34E-07	sstn (pump test)	
D=aquifer thickness	Use depth of base of sandstone		
Ro=radius of influence	Calculated		
r _e =effective radius	52.2	Calculated	(X section of base of excavation typically 45m)
Ho=rest water level	Elevation of properties above aqui	ifer base (16m - worst ca	ase), or top of aquifer (15m - as recorded)
h _w =dynamic water level	12.5 = base of cutting above base	of aquifer	
Theim eqn assumes a radius of influence	= R0+Re		
Constant,C= 2000	(empirical calibration factor - 3000) for radial or 1500-2000	for linear excavation (3000 = worst case))

Width of excavation (m) = 45Length of excavation (m) = 190Chainage 4060 - 4250m (ending approx where the cutting stops) Assume same depth throughout

Calculation of required flow (Thiem). Calculation of radius of influence (Sichardt)

Hydraulic	Aquifer			Calculated Radius of	Effective Radius	Ro + re	Calculated Flow Q	Flow Q	Flow Q	
Conductivity (m/s)	Thickness (m)	H ₀ (m)	h _w (m)	Influence Ro (m)	r _e (m)	(m)	(m ³ /s)	(m ³ /d)	(l/s)	
7.34E-07	15	16	12.5	6.00	69.8	75.8	0.00279	241	2.79	
7.34E-07	15	15	12.5	4.28	69.8	74.1	0.00266	230	2.66	

Note: Linn Mill Burn is at approx the same elevation as the top of the aquifer (35mAOD) so use Ho = 15, and Ro + re above to see if dewatering will affect Linn Mill Burn

Note: Society Road properties approx. 20 mAOD so far below the base of the cutting

Predicted Inflows

	Chainage	Length of section	Min estimted inflow (m ³ /day)	Max. estimated inflow using max K derived from falling head test values (m ³ /day)	Max estimated inflow using sandstone K derived from pumping test analysis (m3/day)
Ecline	3250 - 3720m	470	23	577 or 1792 (the latter figure if mudstone K of 4 x 10 ⁻⁵ m/s used)	182 or 1792 (if mudstone K of 4 x 10 ⁻⁵ m/s used)
Springfield (south)	3720 - 4060m	340	1	362	111
Springfield (north)	4060 - 4250m	190	10	869	869 * (dolerite higher K value)
Total Inflow			34	1808 or 3023	1162 or 2772

Predicted radius of influence and drawdown

	Minimum distance from centre of cutting to receptor (m), r _i	Max estimated R _o + re	Drawdown at radius r _i (m)
Ecline	180	157.9	0
Springfield (south)	270	114.0	0
Springfield (north)	227	179.8	0
Linn Mill properties	137	87.0	0
Linn Mill Burn	186	82.1	0
Society Road	The elevation of the properti will not occur	es is below the base	of the cutting so dewatering

Notes

 $R_o =$ calculated radius of influence

R_e = effective radius of excavation

 r_i = minimum distance from the centre of the cutting to the receptor