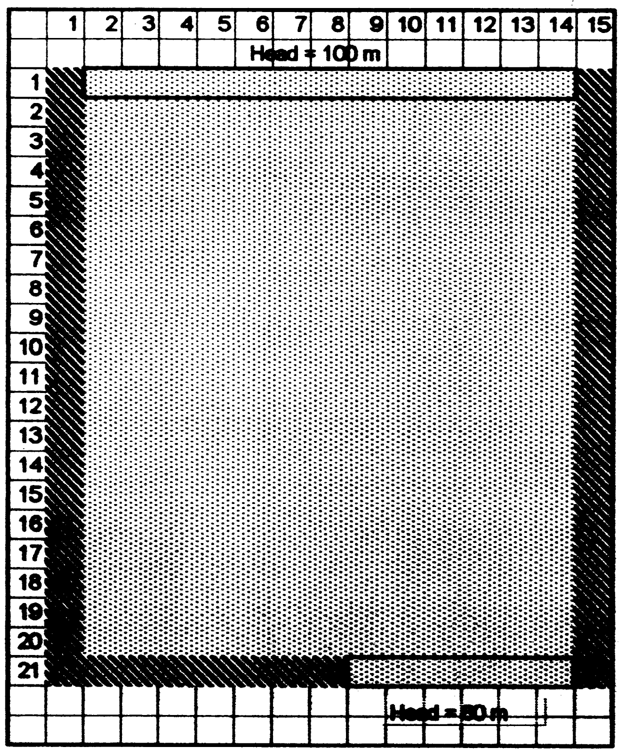
Solutions

CIVE 6361 Exercise #5 Flow Nets (2 Cases)

1) Construct a spreadsheet or computer program to numerically generate values of head in the aquifer system depicted below.



The system is homogeneous-isotropic. T = 10m/d. $\Delta x = \Delta y = 100$ m.

2) Construct a spreadsheet or computer program to numerically generate values of stream function in the aquifer.

3) Prepare a contour map using your computed values of head and stream function by contouring the heads in one pattern (color) and contouring the stream function in another pattern (color).

4) Comment on the effect of the shape of the boundary in the flow field.

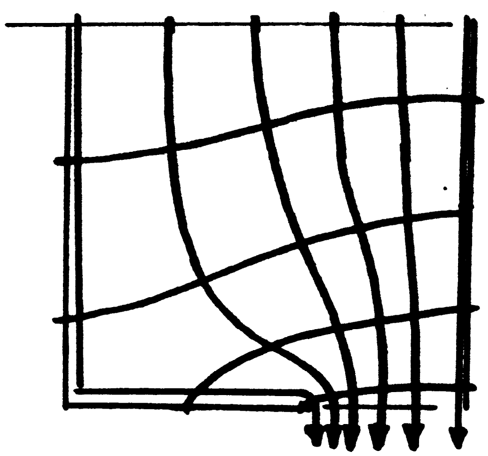
Boundary forces' flow towards outlet.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1		Head Function Spreadsheet																
2		Finite Difference Method to solve:					div(Kb grad(h)) =0											
3																		
4		Assume x and y are principal directions of anisotropy																
5																		
6		dx =	100	meters														
7		(dx)(dx) =	10000															
8																		
9		dy =	100	meters														
10		(dy)(dy) =	10000															
11		Kx-b field																
12		cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
13	rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
14	1	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
15	2	100	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
16	3	200	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
17	4	300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
18	5	400	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
19	6	500	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
20	7	600	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
21	8	700	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
22	9	800	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
23	10	900	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
24	11	1000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
25	12	1100	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
26	13	1200	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
27	14	1300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
28	15	1400	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
29	16	1500	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
30	17	1600	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
31	18	1700	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
32	19	1800	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
33	20	1900	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
34	21	2000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
35		meters	0	0	0	0	0	0	0	0	0					0	0	
36		Ky-b field																
37		cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
38	rows		0	100	200	300	400	500	600	700	800					1300	1400	meters
39	1	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
40	2	100	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
41	3	200	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
42	4	300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
43	5	400	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
44	6	500	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
45	7	600	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
46	8	700	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
47	9	800	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
48	10	900	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
49	11	1000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
50	12	1100	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
51	13	1200	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
52	14	1300	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
53	15	1400	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
54	16	1500	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
55	17	1600	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
56	18	1700	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
57	19	1800	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
58	20	1900	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
59	21	2000	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
60		meters	0	0	0	0	0	0	0	0	0					0	0	
61																		
62		Reset	1															
63		Iter	1700															
64		Head Fn																
65		cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
66	rows	.	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
67	1	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
68	2	100	99.84952	99.84952	99.84186	99.82656	99.80378	99.7741	99.73888	99.70847	99.662	99.62647	99.59617	99.57259	99.55654	99.54844	99.54844	
69	3	200	99.70669	99.70669	99.69136	99.6606	99.61445	99.55374	99.48094	99.401	99.32186	99.2477	99.18564	99.13764	99.10614	99.08877	99.08877	
70	4	300	99.57919	99.57919	99.55631	99.51002	99.43968	99.34547	99.23013	99.18155	98.97361	98.85766	98.76183	98.68719	98.6376	98.61274	98.61274	
71	5	400	99.47458	99.47458	99.44465	99.38349	99.2888	99.15832	98.99258	98.80153	98.61381	98.44835	98.31365	98.2125	98.14532	98.11185	98.11185	
72	6	500	99.3999	99.3999	99.36422	99.29048	99.17371	99.00641	98.70036	98.49819	98.23184	98.00029	97.83273	97.70383	97.61933	97.5776	97.5775	
73	7	600	99.36088	99.36088	99.32187	99.24051	99.10916	98.91327	98.62422	98.17986	97.80785	97.52026	97.38614	97.15077	97.05065	97.00133	97.00133	
74	8	700	99.36088	99.36088	99.32187	99.24051	99.10916	98.91327	98.62422	97.70672	97.29787	96.96056	96.71679	96.54346	96.43118	96.37583	96.37583	
75	9	800	98.38772	98.38772	98.33985	98.24116	98.08476	97.85722	97.53151	97.04656	96.63393	96.3081	96.06802	95.8751	95.75477	95.69498	95.69498	
76	10	900	97.46241	97.46241	97.40867	97.29952	97.13149	96.89936	96.59804	96.23408	95.884	95.5799	95.3321	95.14415	95.01783	94.95434	94.95434	
77	11	1000	96.59085	96.59085	96.53289	96.41675	96.24231	96.01071	95.72719	95.40771	95.08811	94.79538	94.54633	94.35156	94.21805	94.15022	94.15022	
78	12	1100	95.77724	95.77724	95.71531	95.59228	95.41029	95.17396	94.89231	94.58146	94.26535	93.96719	93.78627	93.4977	93.35261	93.27826	93.27826	
79	13	1200	95.02557	95.02557	94.95883	94.82676	94.63263	94.38253	94.08664	93.76047	93.42463	93.10175	92.81306	92.58038	92.4164	92.33196	92.33196	
80	14	1300	94.34064	94.34064	94.26768	94.12329	93.91094	93.63688	93.31126	92.94915	92.57095	92.20132	91.86706	91.59354	91.40067	91.30122	91.30122	
81	15	1400	93.72867	93.72867	93.64796	93.48777	93.25095	92.94281	92.57237	92.15393	91.70869	91.26551	90.85951	90.52607	90.29152	90.17102	90.17102	
82	16	1500	93.19741	93.19741	93.10773	92.92888	92.66228	92.31103	91.88147	91.30552	90.84437	90.29254	89.77938	89.35971	89.06831	88.92033	88.92033	
83	17	1600	92.75583	92.75583	92.65666	92.45776	92.15825	91.75758	91.25694	90.66232	89.99073	89.28089	88.60576	88.06509	87.70168	87.52167	87.52167	
84	18	1700	92.41343	92.41343	92.30532	92.08723	91.75538	91.30411	90.72638	90.0161	89.17536	88.23451	87.2977	86.59321	86.15167	85.94298	85.94298	
85	19	1800	92.17914	92.17914	92.06396	91.83047	91.47195	90.97708	90.32838	89.50035	88.46007	87.1841	85.7573	84.85838	84.36879	84.1556	84.1556	
86	20	1900	92.06002	92.06002	91.94091	91.69875	91.32486	90.80388	90.1097	89.19684	87.98048	86.28453	83.68902	82.71423	82.30951	82.15504	82.15504	
87	21	2000	92.06002	92.06002	91.94091	91.69875	91.32486	90.80388	90.1097	89.19684	87.98048	86.28453	80	80	80	80	80	
88		meters																
89																		
90		E49 formula																
91		((0.5*(F17+E17)/$B$7)*F49+(0.5*(D17+E17)/$B$7)*D49+(0.5*(E32+E33)/$B$10)*E48+(0.5*(E34+E33)/$B$10)*E50)/((0.5*(F17+E17)/$B$7)+(0.5*(D17+E17)/$B$7)+(0.5*(E32																
92		+E33)/$B$10)+(0.5*(E34+E33)/$B$10))																
93																		

	Head Function Spreadsheet																
	Finite Difference Method to solve:				div(1/Kb grad(h)) =0												
	Assume x and y are principal directions of anisotropy																
	dx =	100	meters														
	(dx)(dx) =	10000															
	dy =	100	meters														
	(dy)(dy) =	10000															
	1/Ky·b field																
	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
2	100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
3	200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
4	300	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
5	400	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
6	500	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
7	600	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
8	700	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
9	800	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
10	900	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
11	1000	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
12	1100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
13	1200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
14	1300	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
15	1400	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
16	1500	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
17	1600	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
18	1700	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
19	1800	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
20	1900	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
21	2000	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	meters	0	0	0	0	0	0	0	0	0					0	0	
	1/Kx·b field																
	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800					1300	1400	meters
1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
2	100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
3	200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
4	300	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
5	400	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
6	500	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
7	600	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
8	700	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
9	800	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
10	900	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
11	1000	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
12	1100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
13	1200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
14	1300	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
15	1400	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
16	1500	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
17	1600	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
18	1700	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
19	1800	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
20	1900	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
21	2000	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	meters	0	0	0	0	0	0	0	0	0					0	0	
	Reset	1															
	Iter	2463															
	Head Fn																
	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
1	0	0	0.35714	0.71429	1.07143	1.42857	1.78571	2.14286	2.5	2.85714	3.21429	3.57143	3.92857	4.28571	4.64286	5	
2	100	0	0.35624	0.71245	1.06861	1.42473	1.78082	2.13697	2.49331	2.84999	3.20715	3.56405	3.92309	4.28178	4.64001	5	
3	200	0	0.35536	0.71066	1.06585	1.4209	1.77586	2.13089	2.48626	2.84236	3.19947	3.55775	3.91716	4.27732	4.63858	5	
4	300	0	0.35455	0.70899	1.06321	1.41716	1.77085	2.12447	2.4785	2.8337	3.19063	3.54951	3.91026	4.27207	4.636	5	
5	400	0	0.35385	0.70753	1.06085	1.41367	1.7659	2.11765	2.46958	2.82331	3.17983	3.53941	3.9018	4.26651	4.63284	5	
6	500	0	0.35333	0.70641	1.059	1.41079	1.76143	2.11065	2.45884	2.81013	3.16599	3.52648	3.89104	4.25882	4.62884	5	
7	600	0	0.35304	0.7058	1.05795	1.40904	1.75838	2.10468	2.44501	2.79236	3.14752	3.50949	3.87704	4.2489	4.62371	5	
8	700	0	0.35304	0.7058	1.05795	1.40904	1.75838	2.10468	2.42416	2.76679	3.12224	3.4869	3.85874	4.23605	4.61708	5	
9	800	0	0.33937	0.67903	1.01922	1.36004	1.70132	2.04222	2.38017	2.7284	3.08776	3.45714	3.83497	4.21946	4.60855	5	
10	900	0	0.32541	0.65174	0.97986	1.31059	1.64465	1.98269	2.32589	2.67887	3.04327	3.41891	3.80455	4.19828	4.59768	5	
11	1000	0	0.31054	0.62265	0.93789	1.25782	1.58399	1.91802	2.26183	2.61791	2.98755	3.37068	3.76604	4.17142	4.58388	5	
12	1100	0	0.2941	0.59043	0.89123	1.19879	1.51546	1.84358	2.18551	2.54338	2.91833	3.31022	3.71752	4.13748	4.56642	5	
13	1200	0	0.27544	0.55374	0.83781	1.13068	1.43546	1.75532	2.09326	2.45175	2.83218	3.23435	3.65633	4.09458	4.54432	5	
14	1300	0	0.25392	0.51126	0.77559	1.05064	1.3404	1.64899	1.98046	2.3382	2.72428	3.13868	3.57888	4.04017	4.51628	5	
15	1400	0	0.22896	0.46182	0.70265	0.9559	1.2265	1.5198	1.84137	2.1963	2.58808	3.01721	3.48033	3.97094	4.48062	5	
16	1500	0	0.20011	0.40439	0.61728	0.84382	1.08988	1.36233	1.66892	2.01755	2.41453	2.86173	3.35428	3.88266	4.43526	5	
17	1600	0	0.1671	0.33835	0.51827	0.71223	0.92688	1.17072	1.45442	1.79045	2.19077	2.66091	3.19242	3.77013	4.37778	5	
18	1700	0	0.12995	0.26363	0.40523	0.55993	0.7347	0.93927	1.18759	1.49906	1.89718	2.39873	2.98436	3.62766	4.30573	5	
19	1800	0	0.08906	0.18099	0.27907	0.38759	0.5127	0.66405	0.85763	1.12101	1.50015	2.05248	2.71862	3.45041	4.2175	5	
20	1900	0	0.04531	0.09219	0.14247	0.19864	0.26448	0.3466	0.45786	0.6272	0.92994	1.59241	2.38722	3.23787	4.11384	5	
21	2000	0	0	0	0	0	0	0	0	0	0	1	2	3	4	5	
	meters																
	E49 formula																
	((0.5*(F17+E17)/$B$7)*F49+(0.5*(D17+E17)/$B$7)*D49+(0.5*(E32+E33)/$B$10)*E48+(0.5*(E34+E33)/$B$10)*E50)/((0.5*(F17+E17)/$B$7)+(0.5*(D17+E17)/$B$7)+(0.5*(E3																
	2+E33)/$B$10)+(0.5*(E34+E33)/$B$10))																

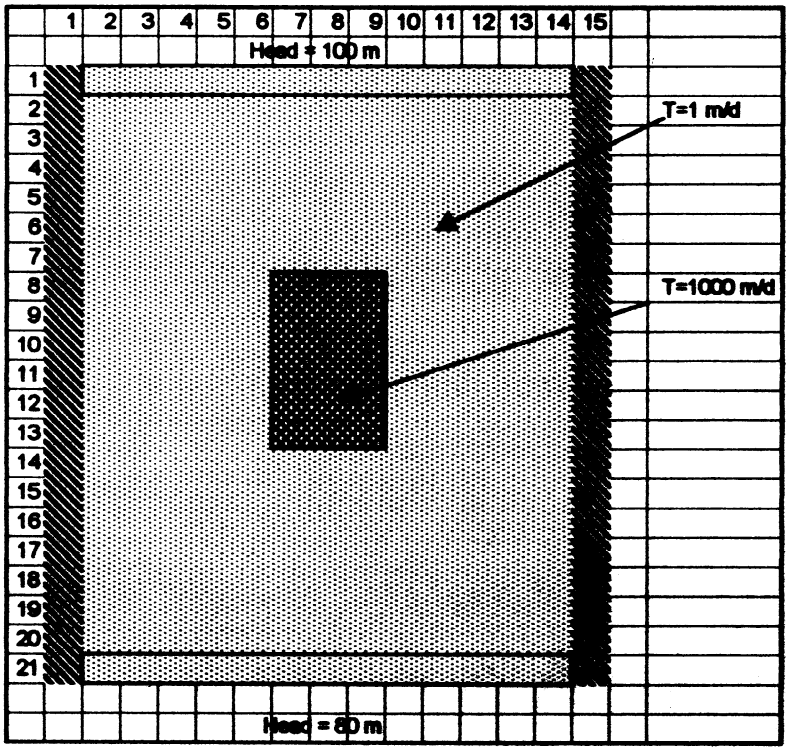
	Head Fn															
	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	mete
1	0	0	0.357	0.714	[illegible]	1.429	1.786	[illegible]	2.5	2.857	[illegible]	3.571	3.929	4.286	4.643	5	
2	100	0	0.356	0.712	[illegible]	1.425	1.781	[illegible]	2.493	2.85	[illegible]	3.565	3.923	4.282	4.641	5	
3	200	0	0.355	0.711	[illegible]	1.421	1.776	[illegible]	2.486	2.842	[illegible]	3.558	3.917	4.278	4.639	5	
4	300	0	0.355	0.709	[illegible]	1.417	1.771	[illegible]	2.479	2.834	[illegible]	3.55	[illegible]	4.273	4.636	5	
5	400	0	0.354	0.708	[illegible]	1.414	1.766	[illegible]	2.47	2.823	[illegible]	3.539	[illegible]	4.267	4.633	5	
6	500	0	0.353	0.706	[illegible]	1.411	1.761	[illegible]	2.459	2.81	[illegible]	3.526	[illegible]	4.259	4.629	5	
7	600	0	0.353	0.706	[illegible]	1.409	1.758	[illegible]	2.445	2.792	[illegible]	3.509	3.877	4.249	4.624	5	
8	700	0	0.353	0.706	[illegible]	1.409	1.758	[illegible]	2.424	2.767	[illegible]	3.487	3.859	4.236	4.617	5	
9	800	0	0.339	0.679	[illegible]	1.36	1.701	[illegible]	2.38	2.728	[illegible]	3.457	3.835	4.219	4.609	5	
10	900	0	0.325	0.652	[illegible]	1.311	1.645	[illegible]	2.326	2.679	[illegible]	3.419	3.805	[illegible]	4.598	5	
11	1000	0	0.311	0.623	[illegible]	1.258	1.584	[illegible]	2.262	2.618	[illegible]	3.371	3.766	[illegible]	4.584	5	
12	1100	0	0.294	0.59	0.891	1.199	1.515	[illegible]	2.186	2.543	2.918	3.31	3.718	4.137	4.566	5	
13	1200	0	0.275	0.554	0.838	[illegible]	1.435	1.755	[illegible]	2.452	2.832	[illegible]	3.656	[illegible]	4.544	5	
14	1300	0	0.254	0.511	0.776	[illegible]	1.34	1.649	[illegible]	2.338	2.724	[illegible]	3.579	[illegible]	4.516	5	
15	1400	0	0.229	0.462	0.703	0.956	[illegible]	1.52	[illegible]	2.196	2.588	[illegible]	3.48	[illegible]	4.481	5	
16	1500	0	0.2	0.404	0.617	0.844	[illegible]	1.362	1.669	[illegible]	2.415	2.862	[illegible]	3.883	4.435	5	
17	1600	0	0.167	0.338	0.518	0.712	0.927	[illegible]	1.454	[illegible]	2.191	2.661	[illegible]	3.77	[illegible]	5	
18	1700	0	0.13	0.264	0.405	0.56	0.735	0.939	[illegible]	1.499	[illegible]	2.399	2.984	3.628	4.306	5	
19	1800	0	0.089	0.181	0.279	0.388	0.513	0.664	0.858	[illegible]	1.5	[illegible]	2.719	[illegible]	[illegible]	5	
20	1900	0	0.045	0.092	0.142	0.199	0.264	0.347	0.458	0.627	[illegible]	1.592	[illegible]	[illegible]	[illegible]	5	
21	2000	0	0	[illegible]	0	0	0	0	0	0	0	1	2	3	4	5	
	meters																

rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
1	0	100	100	100	100	100	100	100	100	100	100	100	[illegible]	[illegible]	[illegible]	[illegible]	100
2	100	99.8	99.8	99.8	99.8	99.8	99.8	99.7	99.7	99.7	99.6	99.6	99.6	99.6	99.5	99.5	
3	200	99.7	99.7	99.7	99.7	99.6	99.6	99.5	99.4	99.3	99.2	99.2	99.1	99.1	99.1	99.1	
4	300	99.6	99.6	99.6	99.5	99.4	99.3	99.2	99.1	99	98.9	98.8	98.7	98.6	98.6	[illegible]	98
5	400	99.5	99.5	99.4	99.4	99.3	99.2	99	98.8	98.6	98.4	[illegible]	98.2	98.1	98.1	98.1	
6	500	99.4	99.4	99.4	99.3	99.2	99	98.8	98.5	98.2	98	97.8	97.7	97.6	97.6	97.6	
7	600	99.4	99.4	99.3	99.2	99.1	98.9	98.6	[illegible]	97.8	97.5	97.3	97.2	97.1	97	97	
8	700	99.4	99.4	99.3	99.2	99.1	98.9	[illegible]	97.8	97.3	97	96.7	96.5	[illegible]	[illegible]	[illegible]	96
9	800	[illegible]	[illegible]	98.3	98.2	98.1	97.9	97.5	97	96.6	[illegible]	96.1	95.9	95.8	95.7	95.7	
10	900	97.5	97.5	97.4	97.3	97.1	96.9	96.6	[illegible]	95.9	95.6	95.3	95.1	95	95	95	94
11	1000	[illegible]	[illegible]	96.5	96.4	96.2	96	95.7	95.4	95.1	94.8	[illegible]	94.4	94.2	94.2	94.2	
12	1100	95.8	95.8	95.7	95.6	95.4	95.2	94.9	[illegible]	94.3	94	93.7	93.5	93.4	93.3	93.3	
13	1200	95	95	95	94.8	[illegible]	[illegible]	94.1	93.8	93.4	93.1	92.8	[illegible]	[illegible]	[illegible]	[illegible]	92
14	1300	94.3	[illegible]	94.3	94.1	93.9	93.6	93.3	92.9	[illegible]	[illegible]	91.9	91.6	91.4	91.3	[illegible]	90
15	1400	93.7	93.7	93.6	93.5	93.3	92.9	92.6	[illegible]	91.7	91.3	90.9	[illegible]	90.3	90.2	90.2	
16	1500	93.2	93.2	93.1	92.9	92.7	[illegible]	91.9	91.4	90.8	[illegible]	89.8	89.4	[illegible]	[illegible]	[illegible]	88
17	1600	92.8	92.8	92.7	92.5	[illegible]	91.8	91.3	90.7	90	89.3	[illegible]	[illegible]	87.7	[illegible]	[illegible]	86
18	1700	92.4	92.4	92.3	[illegible]	91.8	91.3	90.7	90	89.2	[illegible]	[illegible]	86.6	86.2	[illegible]	85.9	
19	1800	92.2	92.2	[illegible]	91.8	91.5	91	[illegible]	89.5	[illegible]	[illegible]	85.8	[illegible]	[illegible]	84.2	[illegible]	84
20	1900	[illegible]	[illegible]	91.9	91.7	91.3	[illegible]	90.1	89.2	88	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	82.2	82
21	2000	92.1	[illegible]	91.9	91.7	91.3	90.8	90.1	89.2	88	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	80



FLOWNET

1) Construct a spreadsheet or computer program to numerically generate values of head in the aquifer system depicted below.



The system is isotropic in both zones, but non-homogeneous. $\Delta x = \Delta y = 100$ m.

2) Construct a spreadsheet or computer program to numerically generate values of stream function in the aquifer.

3) Prepare a contour map using your computed values of head and stream function by contouring the heads in one pattern (color) and contouring the stream function in another pattern (color).

4) Comment on the effect of the high-permeability inclusion in the flow field. What physical situation (s) could it represent?

Flow focus towards high T.

– Backfill after excavation with high K material (landfill)

Head Function Spreadsheet

Finite Difference Method to solve: div(Kb grad(h)) =0

Assume x and y are principal directions of anisotropy

dx =	100	meters
(dx)(dx	10000	
dy =	100	meters
(dy)(dy	10000	

Kx*b field

	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2	100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
3	200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
4	300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	700	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
9	800	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
10	900	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
11	1000	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
12	1100	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
13	1200	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
14	1300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
15	1400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
16	1500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
17	1600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
18	1700	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
19	1800	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
20	1900	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
21	2000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	meters	0	0	0	0	0	0	0	0	0					0	0	

Ky*b field

	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800					1300	1400	meters
1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2	100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
3	200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
4	300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	700	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
9	800	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
10	900	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
11	1000	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
12	1100	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
13	1200	1	1	1	1	1	1	1000	1000	1000	1	1	1	1	1	1	
14	1300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
15	1400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
16	1500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
17	1600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
18	1700	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
19	1800	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
20	1900	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
21	2000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	meters	0	0	0	0	0	0	0	0	0					0	0	

Reset	1
Iter	6948

Head Fn

	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
1	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
2	100	99.9811	99.9811	99.9802	99.9782	99.9753	99.9713	99.9662	99.9599	99.9522	99.9432	99.9335	99.9243	99.9171	99.9131	99.9131	
3	200	99.9632	99.9633	99.9614	99.9575	99.9517	99.9430	99.9337	99.9213	99.9050	99.8872	[illegible]	99.8467	99.831	99.8223	99.8223	
4	300	99.9473	99.9473	99.9445	99.9389	99.9302	99.9185	99.9037	99.8856	99.8627	99.8333	99.7988	99.7649	99.7370	99.7229	99.7229	
5	400	99.9343	99.9343	99.9307	99.9232	99.9118	99.8963	99.877	99.8549	99.8262	99.7865	99.7387	99.6763	99.6327	[illegible]	[illegible]	
6	500	99.925	99.925	99.9207	99.9117	99.8977	99.878	99.8533	99.831	99.8029	99.7477	99.6836	99.5768	99.5081	99.4786	99.4786	
7	600	99.9281	99.9281	99.9154	99.9054	99.8893	99.8648	99.8274	99.8131	99.887	99.74	99.5881	99.4504	99.3525	99.2982	99.2982	
8	700	99.9281	99.9281	99.9154	99.9054	99.8893	99.8688	99.8274	99.8131	99.8872	99.8865	99.5337	99.3892	99.1674	99.0626	99.0626	
9	800	99.3686	99.3687	99.4135	99.5156	99.6562	99.8094	99.8097	99.805	99.8019	99.8011	99.42	99.0967	98.8853	98.7454	98.7454	
10	900	98.7405	98.7405	98.8625	99.0875	99.4107	99.7961	99.797	99.7955	99.794	99.7929	99.2488	98.7924	98.472	98.3884	98.3884	
11	1000	98.0225	98.0226	98.2086	98.5614	99.1032	99.785	99.7865	99.7862	99.7853	99.7837	98.9899	98.3523	97.9222	97.7879	97.7879	
12	1100	97.1188	97.1189	97.3561	97.8543	98.6559	99.7749	99.7772	99.7776	99.7767	99.7743	98.575	97.7047	97.1567	96.8933	96.8933	
13	1200	95.978	95.9781	96.2509	96.844	97.8913	99.761	99.7689	99.7705	99.7687	99.7607	97.8311	96.7351	96.1868	95.8156	95.8156	
14	1300	94.5647	94.5648	94.8253	95.3797	96.3845	97.7294	99.7573	99.7633	99.757	97.7111	96.2538	95.2979	94.7199	94.4467	94.4467	
15	1400	92.8911	92.8912	93.1061	93.5453	94.2177	95.0951	95.9861	96.1933	95.9781	95.0728	94.1754	93.4829	93.0282	92.8849	92.8849	
16	1500	91.0027	91.0027	91.1628	91.4776	91.9261	92.4474	92.8907	93.0459	92.8895	92.4268	91.892	91.4304	91.1054	90.9397	90.9397	
17	1600	88.9543	88.9543	89.0651	89.2762	89.5617	89.8698	90.1155	90.2022	90.1074	89.8529	89.5356	89.2413	89.0234	88.909	88.909	
18	1700	86.7952	86.7953	86.8669	87.0006	87.175	87.3545	87.4914	87.54	87.4852	87.342	87.1561	86.976	86.838	86.764	86.764	
19	1800	84.5647	84.5647	84.6068	84.6843	84.7831	84.8821	84.9555	84.9813	84.9514	84.8739	84.771	84.6686	84.5805	84.545	84.545	
20	1900	82.292	82.292	82.3114	82.3467	82.3913	82.4351	82.4673	82.4785	82.4652	82.4311	82.3853	82.3391	82.3025	82.2825	82.2825	
21	2000	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	
	meters																

E49 formula

[illegible]5*(F17+E17)/[illegible]7)*F49+(0.5*(D17+E17)/[illegible]7)*D49+(0.5*(E32+E3[illegible]10)*E48+(0.5*(E34+E[illegible]10)*E[illegible]5*(F17+E17)/[illegible]7)+(0.5*(D17+E17)/[illegible]7)+(0.5*(E3
2+E33)/[illegible]10)+(0.5*(E34+E33)/[illegible]10)

Head Function Spreadsheet

Finite Difference Method to solve: div(1/Kb grad(h)) =0

Assume x and y are principal directions of anisotropy

dx =	100	meters	
(dx)(dx	10000		
dy =	100	meters	
(dy)(dy	10000		

1/Ky*b field

	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2	100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
3	200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
4	300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	700	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
9	800	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
10	900	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
11	1000	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
12	1100	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
13	1200	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
14	1300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
15	1400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
16	1500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
17	1600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
18	1700	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
19	1800	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
20	1900	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
21	2000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	meters	0	0	0	0	0	0	0	0	0					0	0	

1/Kx*b field

	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800					1300	1400	meters
1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2	100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
3	200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
4	300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	700	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
9	800	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
10	900	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
11	1000	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
12	1100	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
13	1200	1	1	1	1	1	1	0.001	0.001	0.001	1	1	1	1	1	1	
14	1300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
15	1400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
16	1500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
17	1600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
18	1700	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
19	1800	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
20	1900	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
21	2000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	meters	0	0	0	0	0	0	0	0	0					0	0	

Reset	1	
Iter	9549	

Head Fn

	cols	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
rows		0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	meters
1	0	0	0.35714	0.71429	1.07143	1.42857	1.78571	2.14286	2.5	2.85714	3.21429	3.57143	3.92857	4.28571	4.64286	5	
2	100	0	0.36153	0.72322	1.0852	1.44753	1.81013	2.1727	2.53459	2.89407	3.2525	3.60607	3.95811	4.30881	4.65382	5	
3	200	0	0.36575	0.73186	1.09062	1.46622	1.83459	2.20321	2.5780	2.93524	3.29395	3.64546	3.99817	4.3296	4.66562	5	
4	300	0	0.36963	0.73904	1.1112	1.48413	1.8580	2.23473	2.61817	2.98134	3.34262	3.69006	4.0275	4.35881	4.67987	5	
5	400	0	0.37291	0.74888	1.12219	1.50031	1.88177	2.26675	2.65301	3.03733	3.40431	3.74787	4.07316	4.38787	4.69486	5	
6	500	0	0.37533	0.75170	1.13058	1.51315	1.9012	2.29869	2.70099	3.10985	3.48944	3.82314	4.1302	4.42406	4.71322	5	
7	600	0	0.37662	0.75454	1.13521	1.52051	1.91318	2.31782	2.74361	3.21164	3.62805	3.92586	4.20889	4.46737	4.73387	5	
8	700	0	0.37662	0.75454	1.13521	1.52051	1.91318	2.31782	2.74432	3.53338	3.85867	4.05658	4.2775	4.51143	4.75367	5	
9	800	0	0.34892	0.67523	0.9932	1.27683	1.47975	1.48347	2.74153	4.0470	4.05128	4.1681	4.34155	4.54718	4.76869	5	
10	900	0	0.31182	0.61227	0.88631	1.11065	1.24819	1.25134	2.68054	4.12875	4.13181	4.2226	4.37583	4.56564	4.77793	5	
11	1000	0	0.29411	0.57571	0.82913	1.03206	1.15261	1.15581	2.64852	4.11993	4.12386	4.21548	4.36891	4.56241	4.77638	5	
12	1100	0	0.2889	0.56731	0.82246	1.03504	1.17597	1.17973	2.59581	4.01968	4.02348	4.14634	4.32673	4.53772	4.76519	5	
13	1200	0	0.29417	0.58219	0.85755	1.11287	1.33757	1.67145	2.54329	3.44485	3.88293	4.01966	4.25296	4.49654	4.74866	5	
14	1300	0	0.30561	0.60973	0.91269	1.22051	1.55676	2.00457	2.54313	3.08743	3.54486	3.87642	4.16891	4.44882	4.7249	5	
15	1400	0	0.31852	0.63843	0.96296	1.29974	1.6644	2.08855	2.53731	2.9954	3.41265	3.77227	4.09743	4.40494	4.70411	5	
16	1500	0	0.33004	0.66252	1.00099	1.35106	1.72856	2.11592	2.53015	2.94423	3.33087	3.70258	4.0436	4.3694	4.6866	5	
17	1600	0	0.33912	0.68063	1.02741	1.38296	1.75885	2.13243	2.52314	2.9133	3.29281	3.65637	4.00499	4.34246	4.6729	5	
18	1700	0	0.3458	0.69348	1.04504	1.40252	1.76746	2.13979	2.51668	2.893	3.26352	3.6251	3.97755	4.32255	4.66252	5	
19	1800	0	0.35061	0.70245	1.05676	1.41463	1.77668	2.14261	2.51077	2.87852	3.24316	3.60296	3.95755	4.30767	4.65464	5	
20	1900	0	0.35418	0.70896	1.06492	1.42254	1.78203	2.1432	2.50528	2.86715	3.22765	3.58601	3.94282	4.29594	4.64036	5	
21	2000	0	0.35714	0.71429	1.07143	1.42857	1.78571	2.14286	2.5	2.85714	3.21429	3.57143	3.92857	4.28571	4.64286	5	
	meters																

E49 formula

=((0.5*(F17+E17)/$B$7)*F49+(0.5*(D17+E17)/$B$7)*D49+(0.5*(E32+E33)/$B$10)*E48+(0.5*(E34+E33)/$B$10)*E50)/((0.5*(F17+E17)/$B$7)+(0.5*(D17+E17)/$B$7)+(0.5*(E3
2+E33)/$B$10)+(0.5*(E34+E33)/$B$10))

1	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2	100	99.981	99.981	99.98	99.978	99.975	99.971	99.966	99.96	99.952	99.943	99.934	99.924	99.917	99.913	99.913
3	200	99.963	99.963	99.961	99.958	99.952	99.944	99.934	99.921	99.906	99.887	99.867	99.847	99.831	99.822	99.822
4	300	99.947	99.947	99.945	99.939	99.93	99.918	99.904	[illegible]	[illegible]	99.833	99.799	99.765	99.738	99.723	99.723
5	400	99.934	99.934	99.931	[illegible]	99.912	99.896	99.877	99.855	99.826	99.784	99.731	99.676	99.633	99.609	99.609
6	500	99.925	99.925	99.921	99.912	99.898	99.878	99.853	99.831	99.803	99.748	99.664	99.577	99.508	99.471	99.471
7	600	99.92	99.92	99.915	99.905	99.889	99.865	99.827	99.813	99.807	[illegible]	99.599	99.459	99.352	99.295	99.295
8	700	99.92	99.92	99.915	[illegible]	99.889	99.865	99.827	99.813	99.807	99.807	99.534	99.309	99.147	99.063	99.063
9	800	[illegible]	[illegible]	99.414	99.516	99.656	99.809	99.81	99.805	99.802	99.801	99.42	99.097	98.865	98.745	98.745
10	900	98.748	98.749	98.862	99.088	99.411	99.796	99.797	99.795	99.794	99.793	99.249	98.792	98.472	[illegible]	98.308
11	1000	98.023	98.023	98.201	[illegible]	99.103	99.785	99.786	99.786	99.785	99.784	98.99	[illegible]	97.922	97.708	97.708
12	1100	97.119	97.119	97.356	97.854	98.656	99.775	99.777	99.778	99.777	99.774	98.675	97.705	97.157	96.893	96.893
13	1200	95.978	95.978	96.251	96.844	[illegible]	99.761	99.769	99.77	99.765	99.762	97.831	96.735	96.107	95.816	95.816
14	1300	94.565	94.565	94.825	95.38	96.305	97.729	99.757	99.763	99.757	[illegible]	96.254	95.298	94.72	94.447	94.447
15	1400	92.891	92.891	93.106	93.545	94.218	95.095	[illegible]	[illegible]	95.978	95.673	94.175	93.483	93.028	92.805	[illegible]
16	1500	[illegible]	[illegible]	[illegible]	91.478	91.926	92.447	92.899	93.046	92.89	92.427	91.892	91.43	[illegible]	90.94	90.94
17	1600	88.954	88.954	89.065	89.276	89.562	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	89.536	89.241	89.023	88.909	88.909
18	1700	86.795	86.795	86.867	87.001	87.175	87.355	87.491	87.54	87.485	87.342	87.156	86.976	86.838	86.764	86.764
19	1800	84.565	84.565	84.607	84.684	84.783	84.882	84.955	84.981	84.951	84.874	84.771	84.669	84.589	84.545	84.545
20	1900	82.292	82.292	82.311	82.347	82.391	82.435	82.467	82.478	82.465	82.431	82.385	82.339	82.303	82.282	82.282
21	2000	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

98

90

1	0		0	0.3571	0.7[illegible]43	1.0714	1.4286	1.7857	2.1429	2.5	2.8571	3.2143	3.5[illegible]14	3.9286	4.28[illegible]7	4.6429		5
2	100		0	0.3615	0.7[illegible]32	1.0852	1.4475	1.8101	2.1727	2.5346	2.8949	3.2525	3.[illegible]069	3.9581	4.3[illegible]68	4.6538		5
3	200		0	0.3658	0.7[illegible]19	1.0986	1.4662	1.8346	2.2032	2.5708	2.9352	3.294	3.[illegible]455	3.990[illegible]	4.[illegible]296	4.6656		5
4	300		0	0.3696	0.7[illegible]98	1.1112	[illegible].4841	1.8588	2.2347	2.6102	2.9813	3.3426	3[illegible]6909	4.02[illegible]5	4[illegible]3558	4.6791		5
5	400		0	0.3729	0.7[illegible]67	1.1222	[illegible].5003	1.8818	[illegible].2667	2.6538	3.0373	3.4043	[illegible].7479	4[illegible]732	[illegible].3871	4.6948		5
6	500		0	0.3753	0.7[illegible]18	1.1306	1[illegible]5132	1.9012	2[illegible]2967	2.701	3.1098	3.48[illegible]	3.8231	[illegible].130[illegible]	4.4245	4.7132		5
7	600		0	0.3766	0.75[illegible]5	1.1352	1.[illegible]205	1.9132	2.[illegible]178	2.7436	3.2116	[illegible]6204	3.[illegible]25	[illegible].2	4.4674	4.7336		5
8	700		0	0.3766	0.754[illegible]	1.1352	1.52[illegible]	[illegible].9132	2.31[illegible]	2.7443	3[illegible]334	3.[illegible]7	4.0566	4[illegible]2775	4.5114	4.7537		5
9	800		0	0.3409	0.6752	[illegible].9932	1.276	1.4798	1.[illegible]35	2.741[illegible]	[illegible]478	4.0513	4.1681	4.342	4.5472	4.7697		5
10	900		0	0.3118	0.6123	0.[illegible]863	1.1106	1.2482	1.251[illegible]	[illegible].69[illegible]	[illegible].1288	4.1318	4.2226	[illegible].375	4.5656	4.7779		5
11	1000		0	0.2941	0.5757	0.[illegible]291	1.0321	1.1526	1.155[illegible]	2[illegible]640[illegible]	[illegible].1199	4.1231	4.2155	[illegible].3699	4.5624	4.7764		5
12	1100		0	0.2889	0.5673	0.[illegible]225	1.0358	1.176	1.1[illegible]7	[illegible].5958	[illegible]019[illegible]	[illegible].0235	4.1463	4[illegible]3267	4.5377	4.7652		5
13	1200		0	0.2942	0.5822	0[illegible]8576	1.1129	1.[illegible]76	1.67[illegible]	2.5433	3.44[illegible]	3.8029	[illegible]0197	4[illegible]253	4.4965	4.7467		5
14	1300		0	0.3056	0.6097	[illegible].9127	1.2[illegible]05	1.5568	2[illegible]046	2.5431	3.0874	3.[illegible]449	3.876[illegible]	4.16[illegible]	4.4488	4.7249		5
15	1400		0	0.3185	0.6384	0.963	[illegible]2997	1.6644	[illegible].0806	2.5373	2.9954	3.41[illegible]6	3.7723	[illegible].0974	4.4049	4.7041		5
16	1500		0	0.33	0.662[illegible]	1.001	[illegible].3511	1.7206	2.1159	2.5301	2.9442	3.3381	[illegible].7026	4.[illegible]36	[illegible].3694	4.6866		5
17	1600		0	0.3391	0.68[illegible]6	1.027[illegible]	1.383	1.750[illegible]	2.1324	2.5231	2.9133	3.2928	3[illegible]6564	4.0[illegible]5	4[illegible]3425	4.6729		5
18	1700		0	0.3458	0.6[illegible]35	1.04[illegible]	1.4025	1.767[illegible]	2.1398	2.5167	2.893	3.2635	3.[illegible]251	3.977[illegible]	4[illegible]3225	4.6625		5
19	1800		0	0.3506	0.7[illegible]25	1.056[illegible]	1.4146	1.776[illegible]	2.1426	2.5108	2.8785	3.2432	3.[illegible]03	3.957[illegible]	4.[illegible]077	4.6546		5
20	1900		0	0.3542	0.[illegible]09	1.064[illegible]	1.4225	1.78[illegible]	2.1432	2.5053	2.8671	3.2277	3.[illegible]86	3.942[illegible]	4.[illegible]959	4.6484		5
21	2000		0	0.3571	0.7[illegible]43	1.071[illegible]	1.4286	1.785[illegible]	2.1429	2.5	2.8571	3.2143	3.5[illegible]14	3.9286	4.[illegible]857	4.6429		5

Flow Focus to High T inclusion