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TO	Murray England
COPY	Jack McConchie
FROM	Sheryl Paine
DATE	9 June 2010
FILE	380518.00 006CE
SUBJECT	Storm Durations for Selwyn District Council

During 2009 Opus reviewed all the rainfall information available to Selwyn District and developed a series of design rainfalls for those sites having high resolution temporal data. The reason for the review of the design rainfalls was to provide the most reliable site-specific rainfall information for use in planning and design. Selwyn District Council now require the longer design rainfalls to accurately plan and design infrastructure in larger catchments with larger critical storm durations (Tables 1-16 and Appendix A).

Table 1: Arthurs Pass design rainfall table (1955-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*Gumbel*
2.33	273.7	302.1	322.1
5	321.8	361.2	388.1
10	357.7	406.4	441.7
20	389.9	447.5	493.2
50	428.9	497.9	559.8
100	456.7	534.1	609.7

Table 2: Bull Creek design rainfall table (1962-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*Gumbel*	*Gumbel*
2.33	110.9	124.8	133.3
5	137.3	156.4	167.7
10	156.9	182.1	195.8
20	174.5	206.8	222.6
50	195.8	238.7	257.4
100	210.9	262.6	283.5

Table 3: Carrington design rainfall table (1989-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*GEV*	*PE3*
2.33	381.5	426.5	464.8
5	431.9	485.7	542.4
10	470.5	534.6	607.1
20	505.6	581.9	669.0
50	548.8	644.1	748.1
100	579.7	691.2	806.6

Table 4: Cheeseman design rainfall table (1990-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	145.9	161.6	175.9
5	174.7	194.5	213.0
10	197.6	220.9	242.9
20	219.2	245.9	271.3
50	246.9	277.8	307.6
100	267.3	301.5	334.6

Table 5: Christchurch Aero design rainfall table (1955-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	55.5	58.4	62.2
5	72.9	77.6	82.6
10	86.2	92.3	98.1
20	98.4	105.7	112.1
50	113.4	122.2	129.2
100	124.2	134.1	141.5

Table 6: Coopers Knob design rainfall table (1990-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	62.3	71.6	74.7
5	75.1	84.3	89.0
10	82.5	92.6	99.1
20	89.7	99.4	107.8
50	98.2	107.0	118.0
100	104.0	112.0	125.0

Table 7: Grasmere design rainfall table (1988-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*Gumbel*	*PE3*	*PE3*
2.33	99.0	110.8	119.5
5	119.1	133.0	144.3
10	135.4	149.5	163.8
20	151.0	164.3	182.0
50	171.2	182.2	204.6
100	186.4	194.8	221.0

Table 8: Highpeak Station design rainfall table (1987-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	116.4	124.6	130.7
5	159.9	173.1	179.2
10	197.2	215.0	220.0
20	233.5	255.9	259.3
50	280.5	308.8	309.8
100	315.5	348.4	347.2

Table 9: Lincoln Broadfield design rainfall table (1972-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	116.4	124.6	130.7
5	159.9	173.1	179.2
10	197.2	215.0	220.0
20	233.5	255.9	259.3
50	280.5	308.8	309.8
100	315.5	348.4	347.2

*Note: The daily record was used as it has a longer record.

Table 10: 13 Mile Bush design rainfall table (1988-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*Gumbel*	*Gumbel*
2.33	127.2	139.8	144.1
5	163.0	176.6	182.2
10	193.2	206.5	213.2
20	222.3	235.2	242.9
50	259.6	272.3	281.4
100	287.3	300.2	310.2

Table 11: Nigger Hill design rainfall table (1960-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	92.7	102.4	109.0
5	116.1	128.5	138.6
10	132.9	147.5	160.8
20	147.6	164.3	180.7
50	165.1	184.4	205.0
100	177.3	198.6	222.3

Table 12: Ranger Stream design rainfall table (1978-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	134.7	149.1	157.1
5	168.3	192.8	207.3
10	196.1	232.7	254.4
20	227.1	272.7	302.3
50	267.8	325.8	366.5
100	298.3	366.1	415.5

Table 13: Ridgens Road design rainfall table (1990-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	75.1	79.9	84.6
5	94.4	104.2	112.6
10	110.5	126.0	137.3
20	125.9	147.7	161.7
50	145.6	176.3	193.6
100	160.1	197.8	217.6

Table 14: Ridgens Road design rainfall table (1990-2009) without the 15/11/09 storm event (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	75.1	79.9	84.6
5	94.4	104.2	112.6
10	110.5	126.0	137.3
20	125.9	147.7	161.7
50	145.6	176.3	193.6
100	160.1	197.8	217.6

Table 15: Ryans Bridge design rainfall table (1996-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*Gumbel*	*Gumbel*	*Gumbel*
2.33	65.5	69.3	71.2
5	76.6	80.2	81.9
10	85.7	89.1	90.6
20	94.4	97.6	99.0
50	105.6	108.7	109.8
100	114.1	116.9	117.9

Table 16: Whitecliffs design rainfall table (1988-2009) (rainfall depths in mm).

	Duration		
ARI	**36-hrs**	**48-hrs**	**60-hrs**
Distribution	*PE3*	*PE3*	*PE3*
2.33	77.4	87.2	93.1
5	104.6	117.7	124.2
10	132.8	147.7	154.1
20	163.0	179.0	184.8
50	204.7	221.5	226.2
100	237.2	254.3	257.9

Appendix A – Frequency Analyses

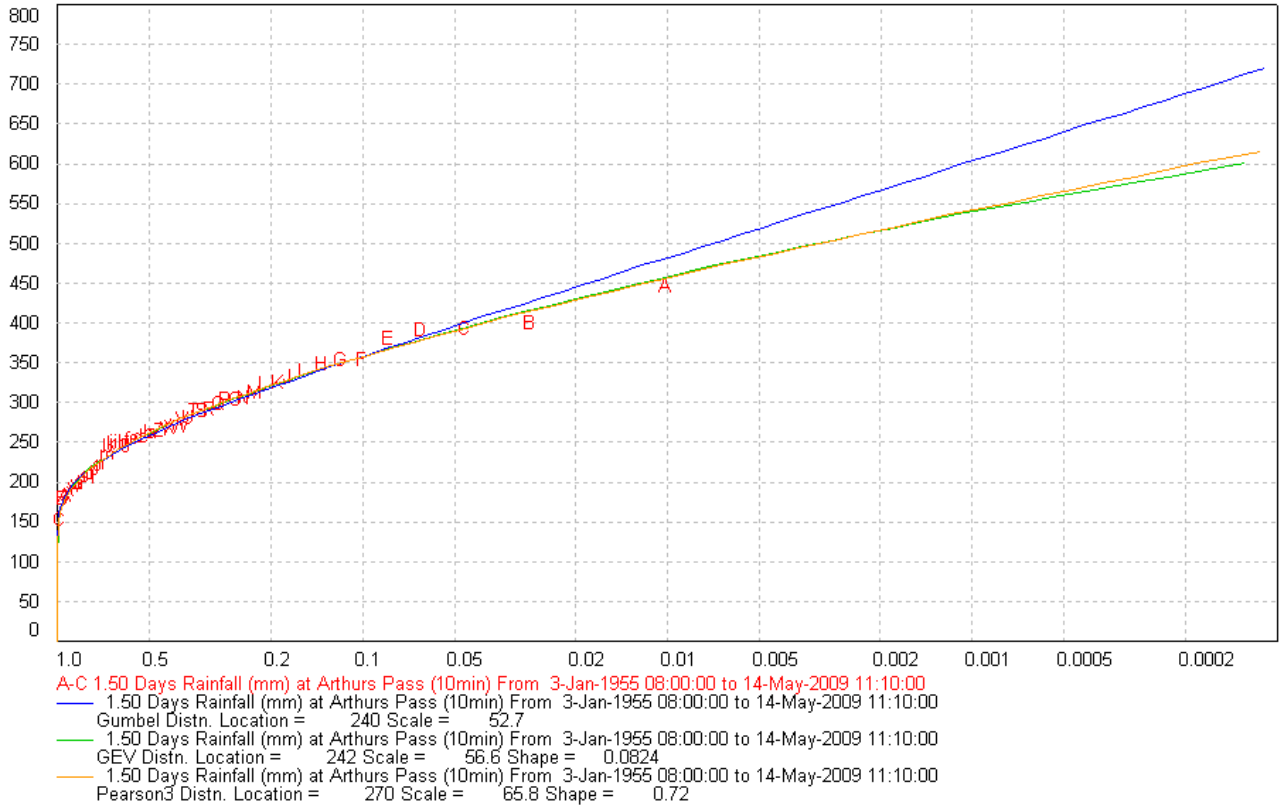

Figure A.1 Arthurs Pass 36-hour rainfall frequency analysis.

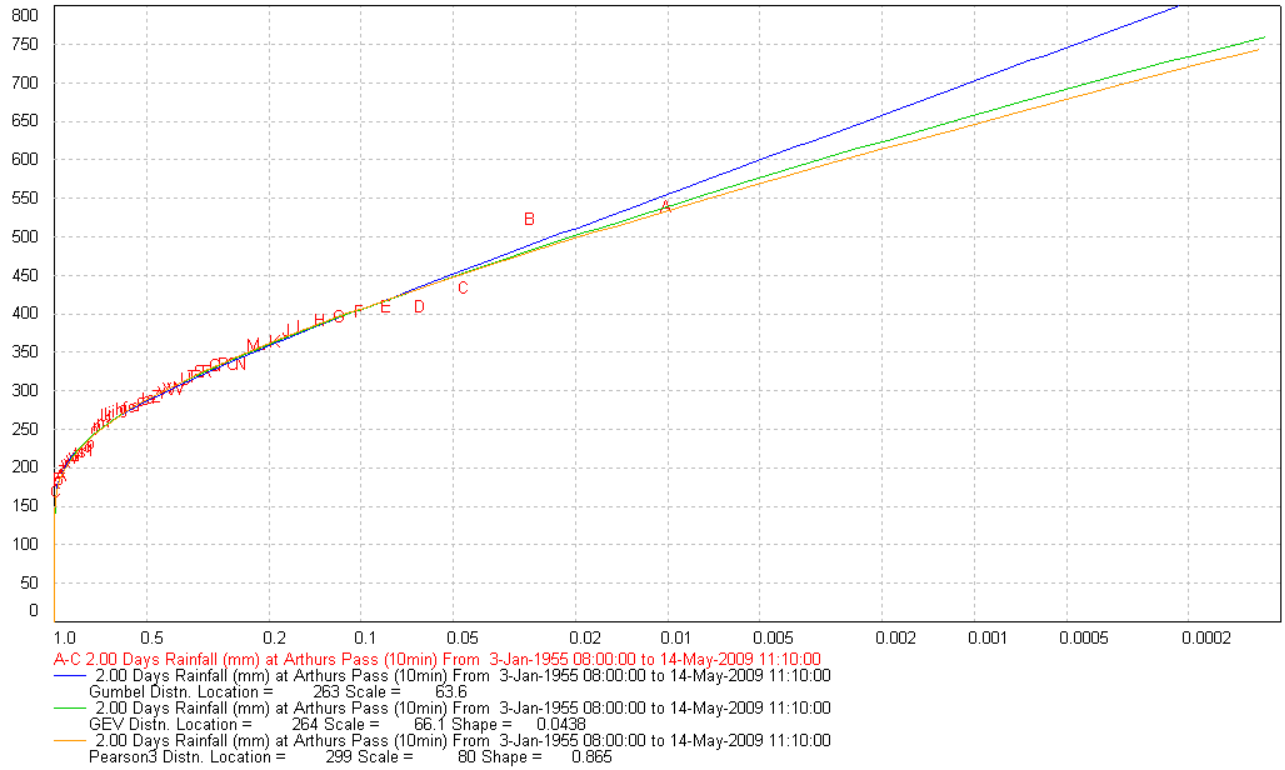

Figure A.2 Arthurs Pass 48-hour rainfall frequency analysis.

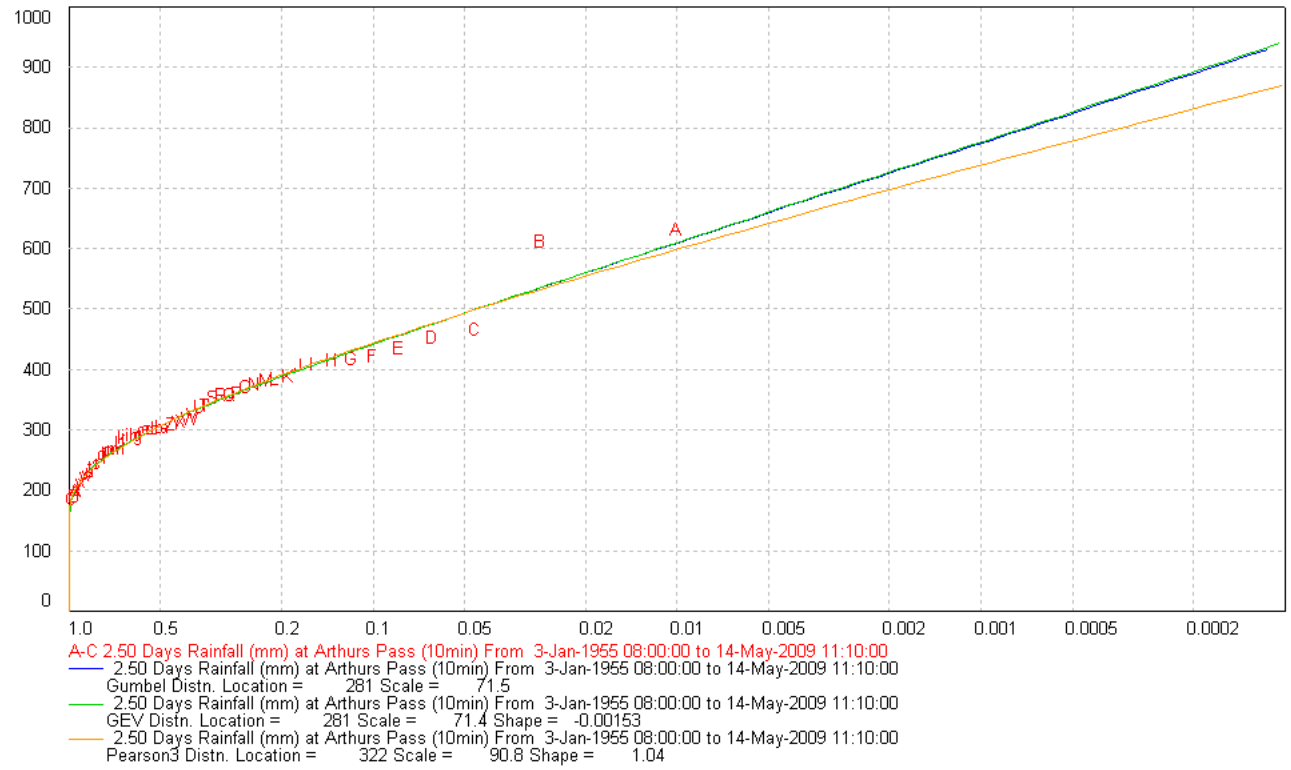

Figure A.3 Arthurs Pass 60-hour rainfall frequency analysis.

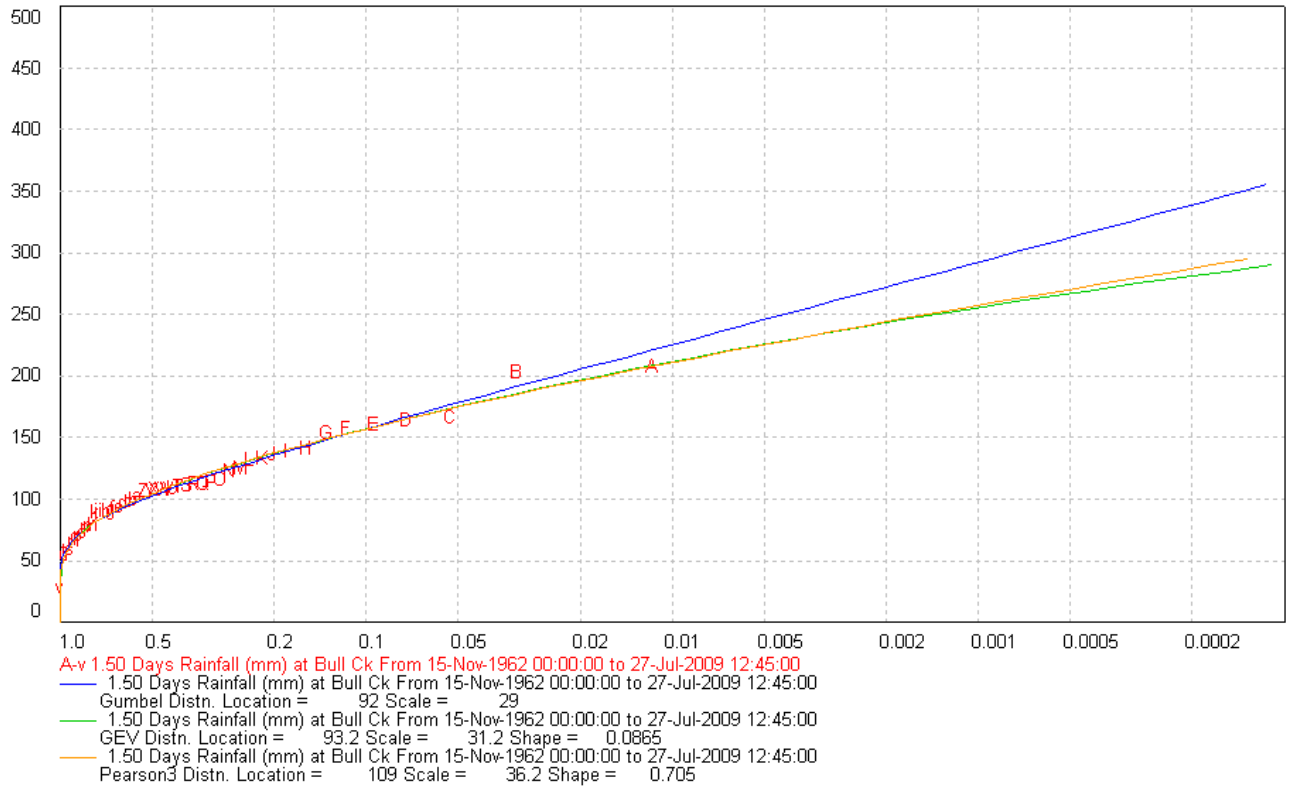

Figure A.4 Bull Creek 36-hour rainfall frequency analysis.

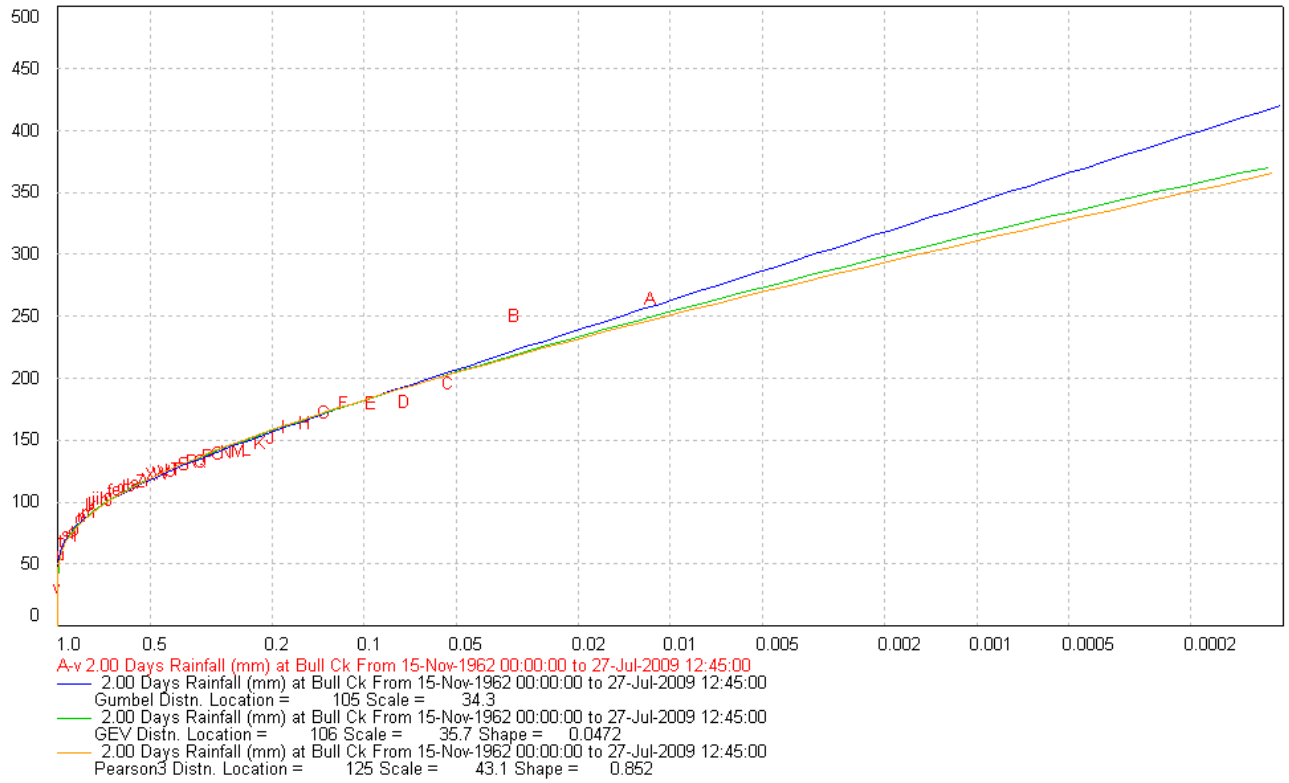

Figure A.5 Bull Creek 48-hour rainfall frequency analysis.

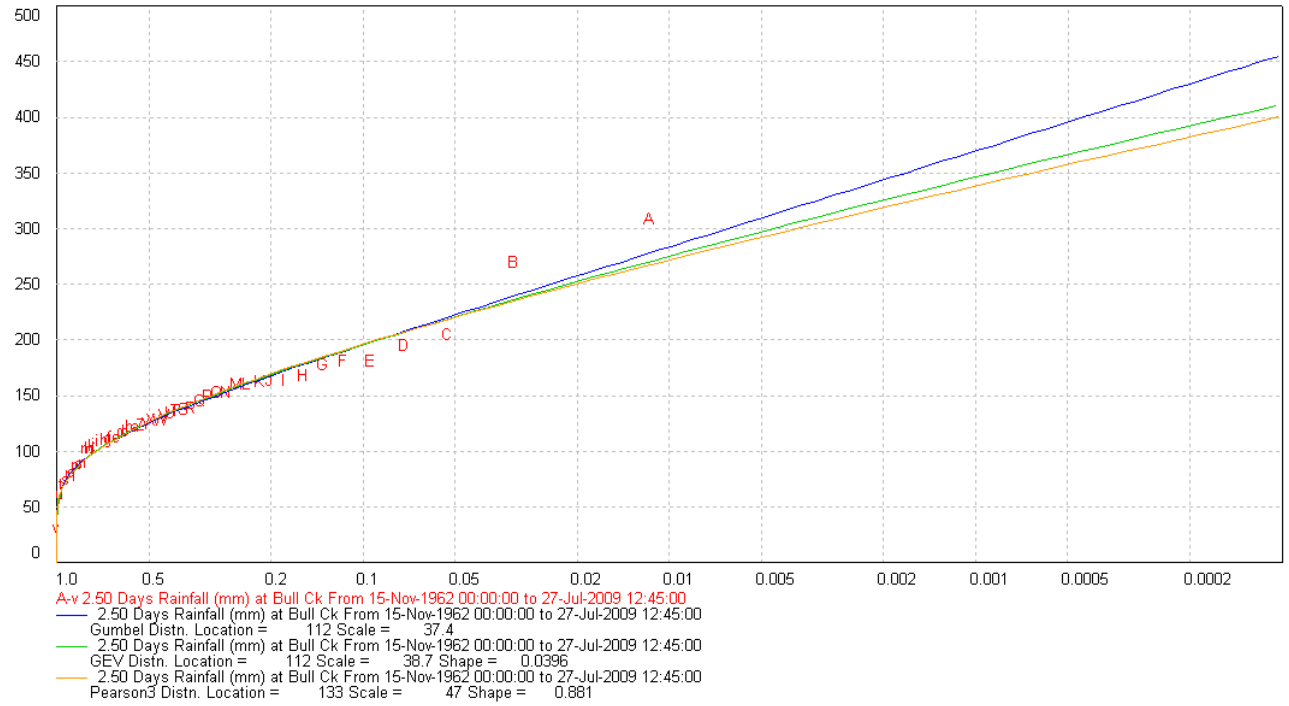

Figure A.6 Bull Creek 60-hour rainfall frequency analysis.

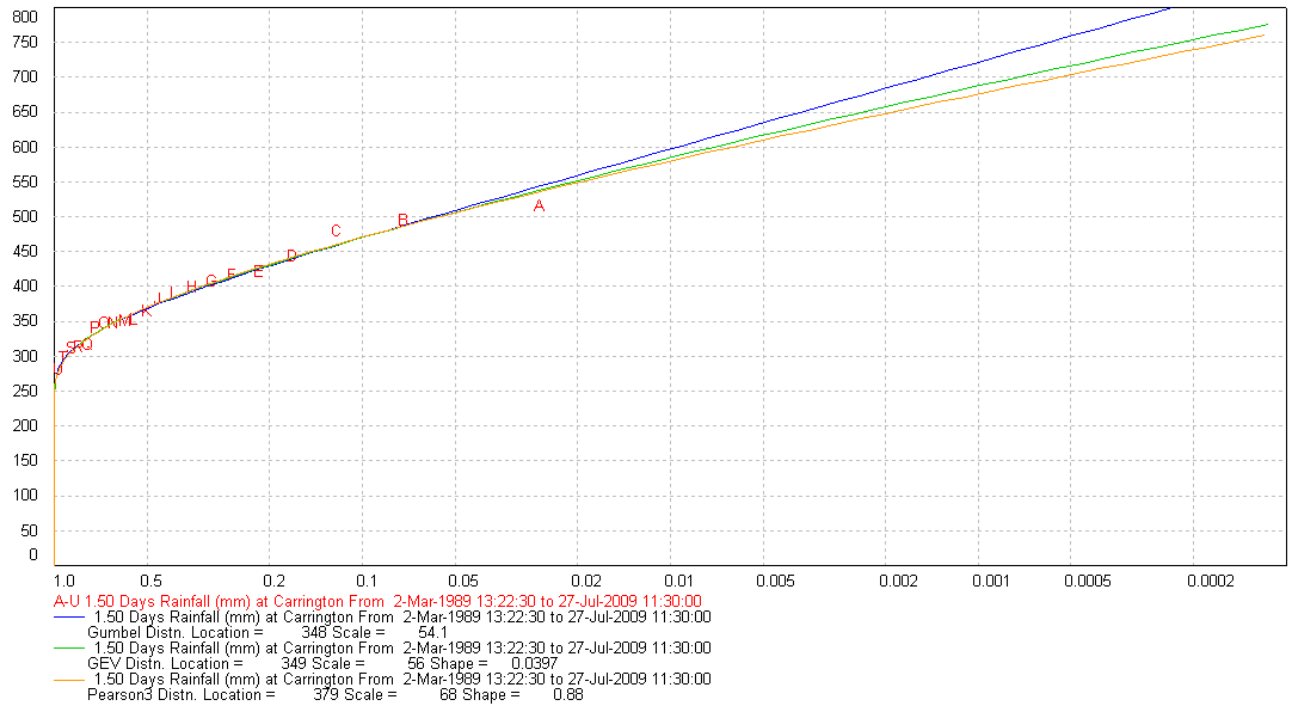

Figure A.7 Carrington 36-hour rainfall frequency analysis.

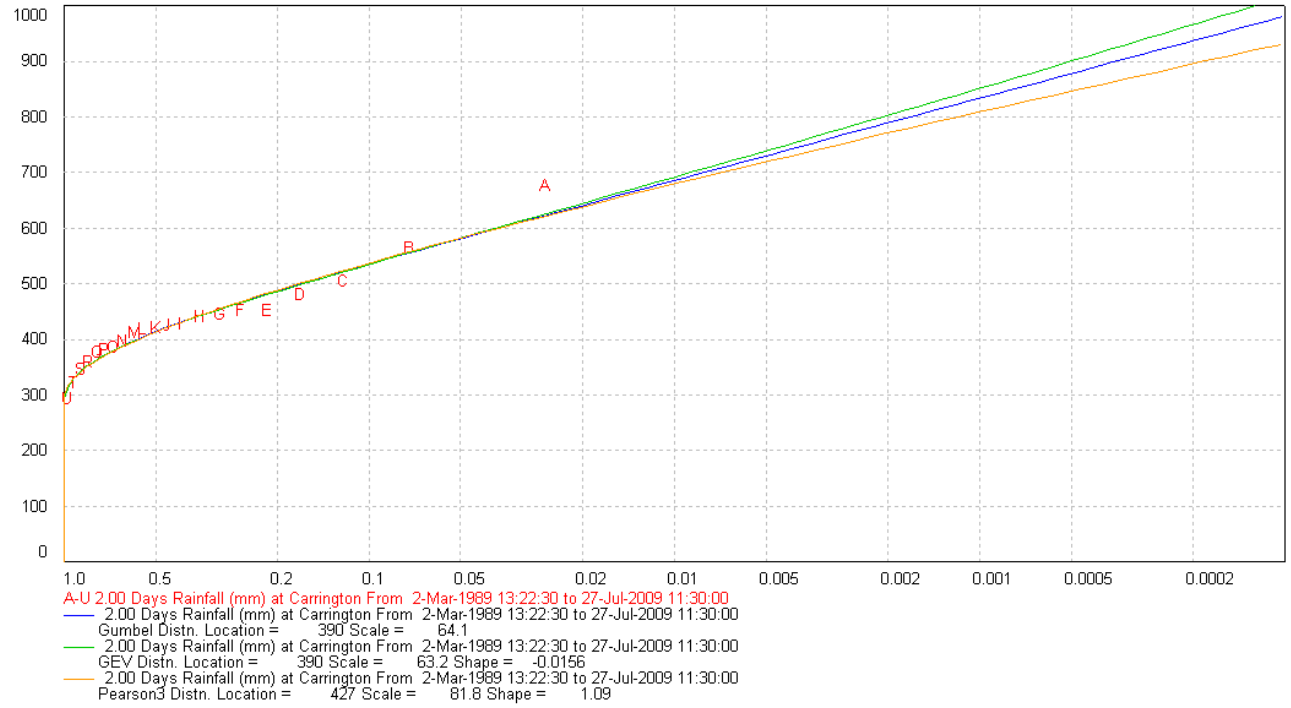

Figure A.8 Carrington 48-hour rainfall frequency analysis.

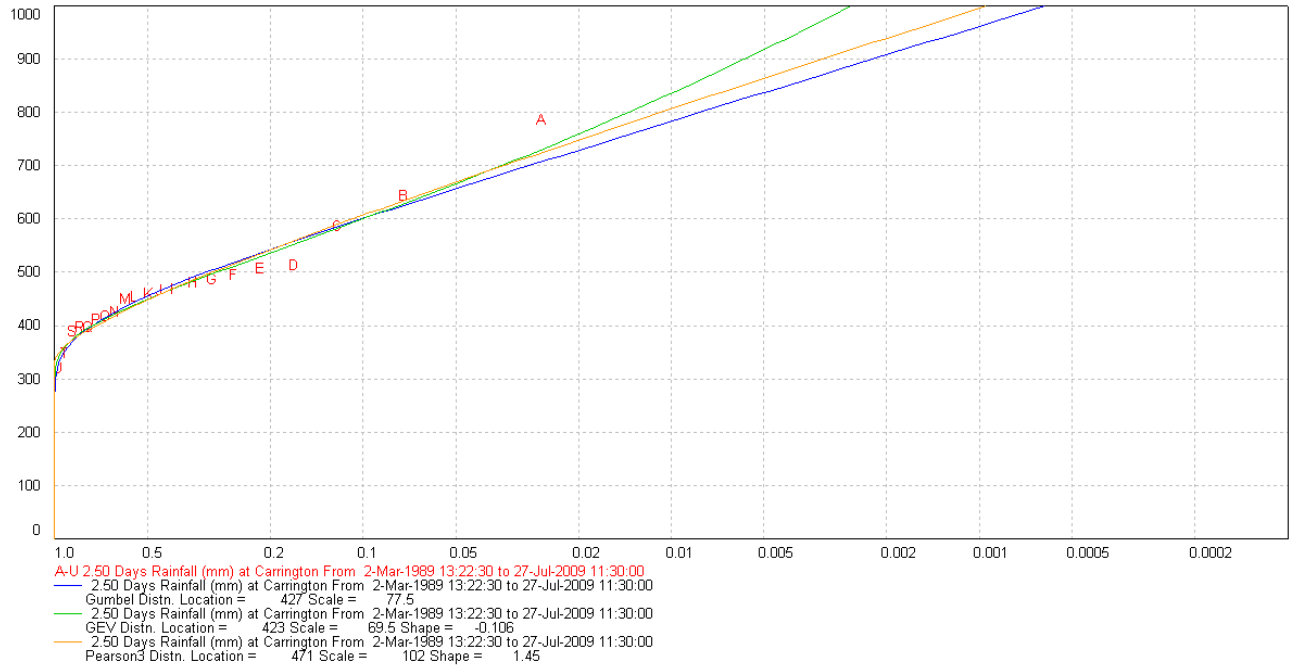

Figure A.9 Carrington 60-hour rainfall frequency analysis.

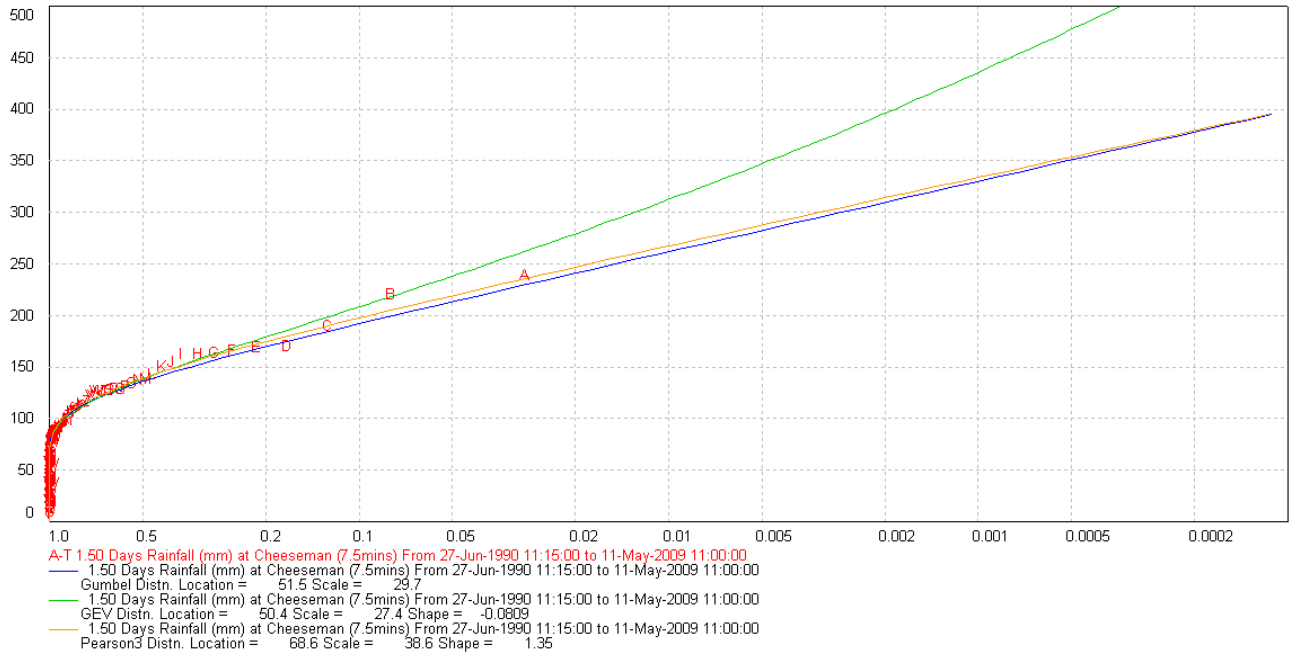

Figure A.10 Cheeseman 36-hour rainfall frequency analysis.

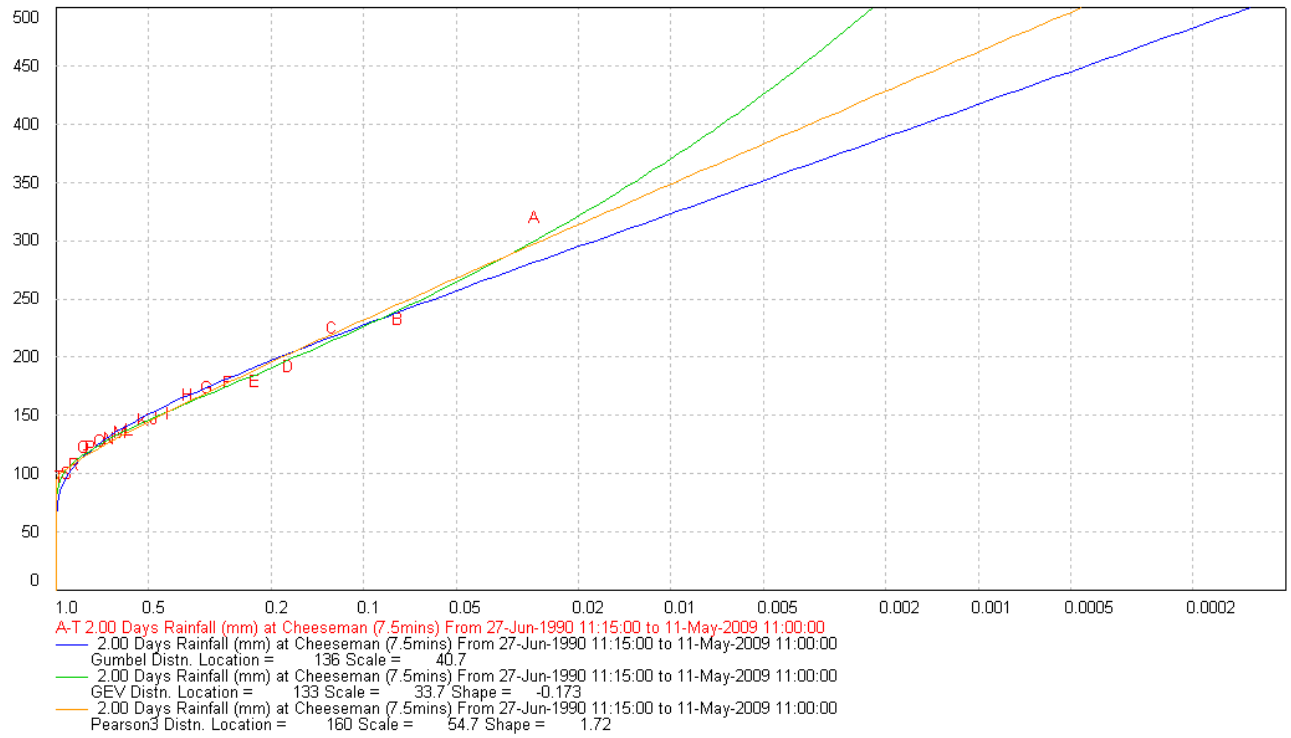

Figure A.11 Cheeseman 48-hour rainfall frequency analysis.

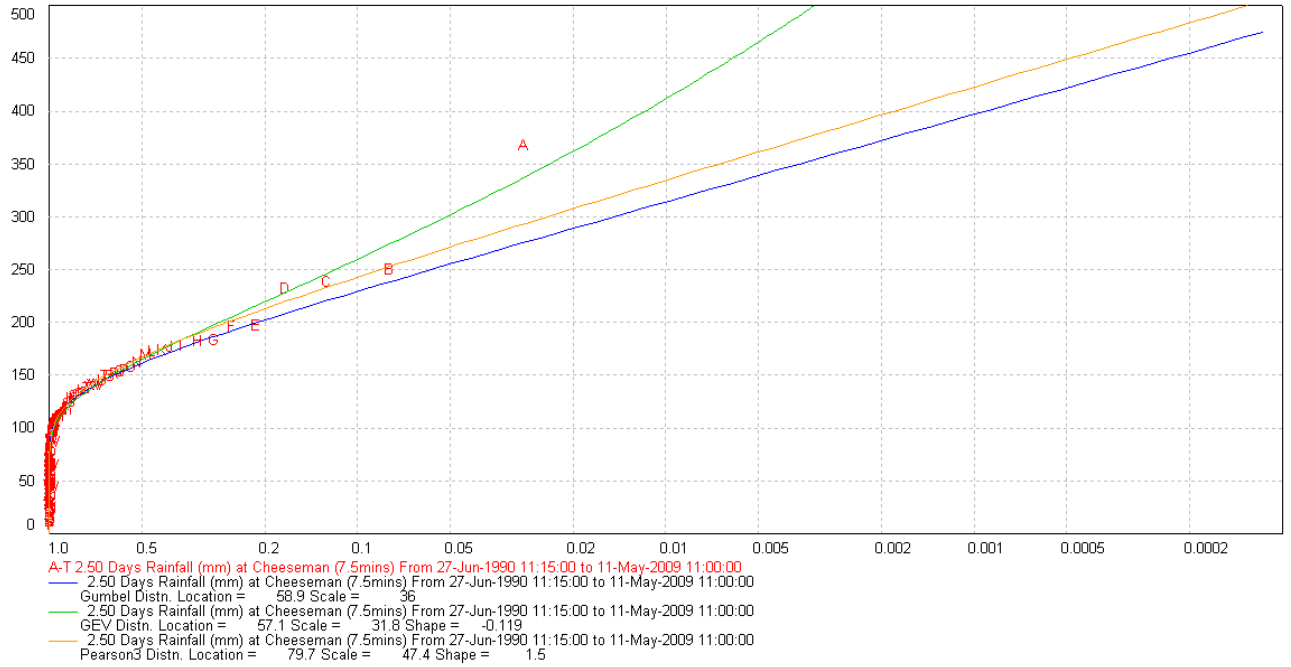

Figure A.12 Cheeseman 60-hour rainfall frequency analysis.

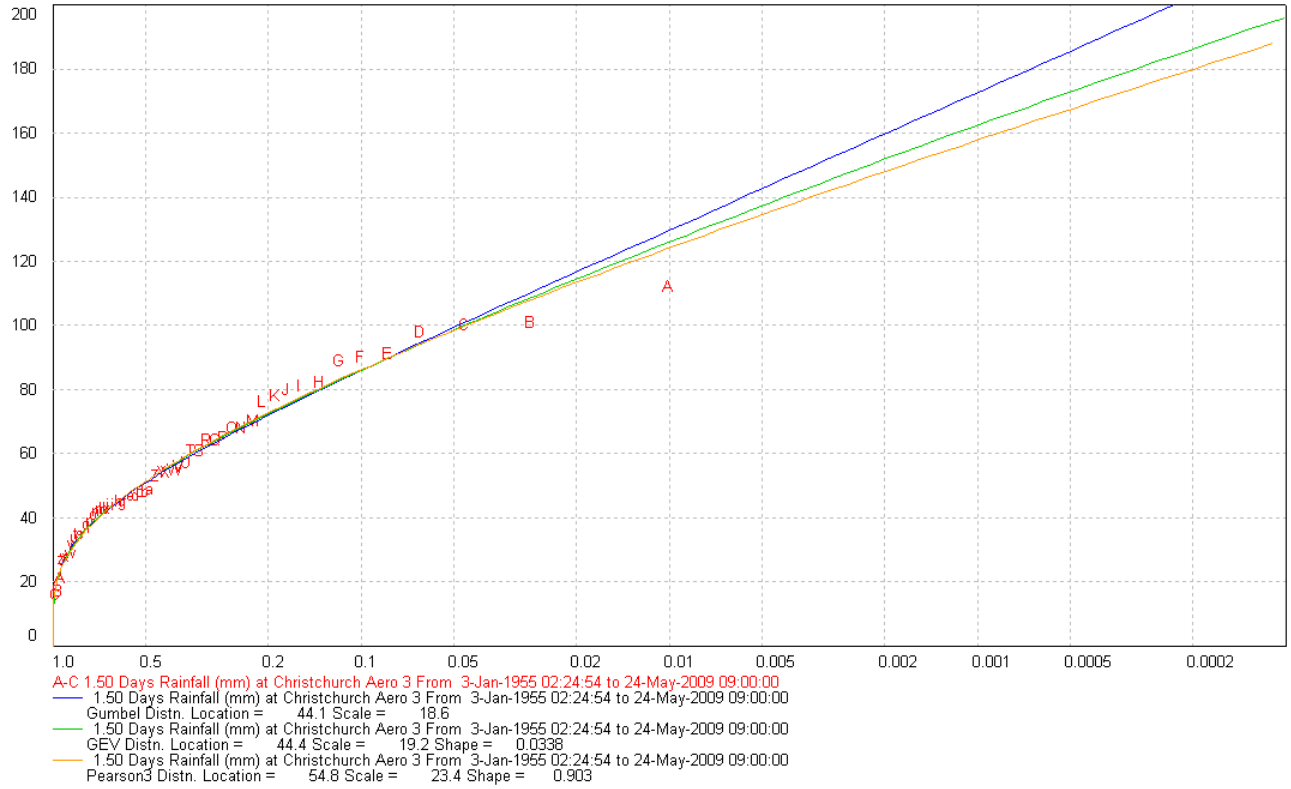

Figure A.13 Christchurch Aero 36-hour rainfall frequency analysis.

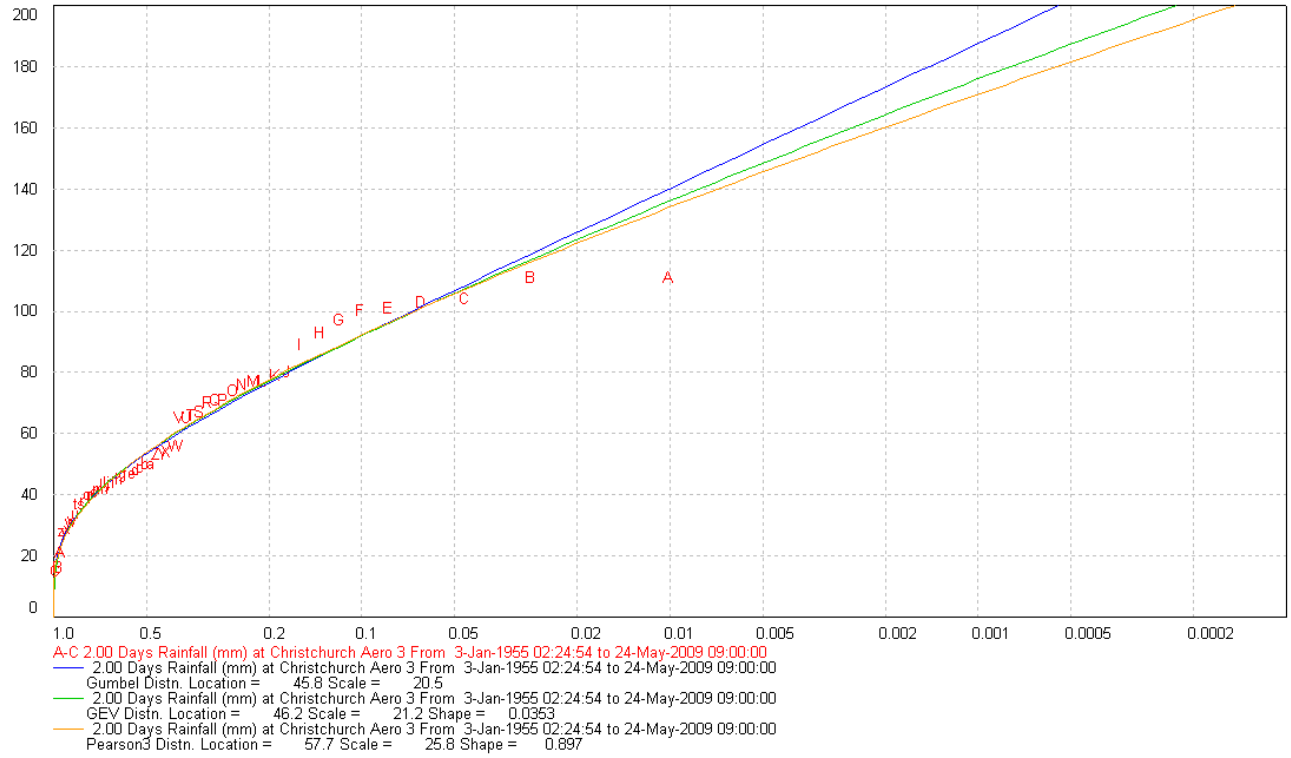

Figure A.14 Christchurch Aero 48-hour rainfall frequency analysis.

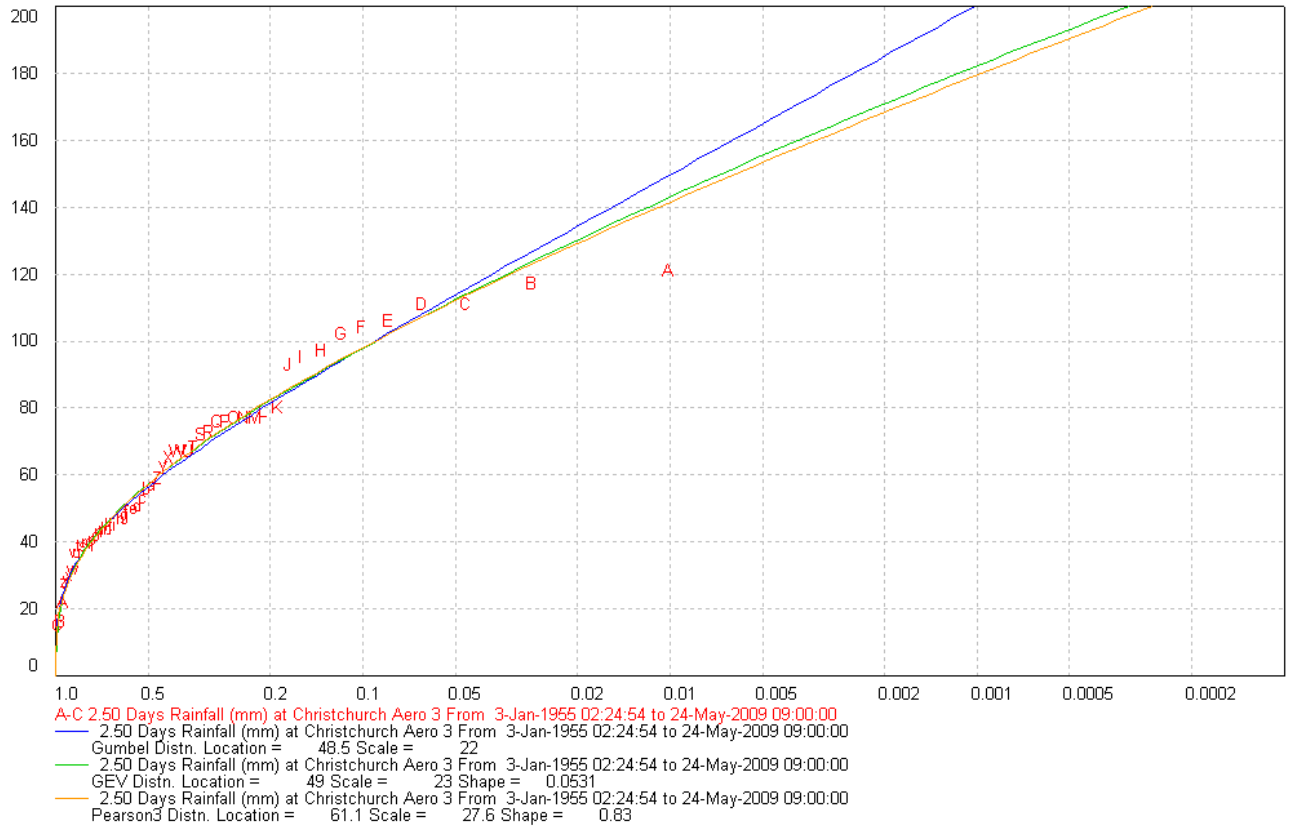

Figure A.15 Christchurch Aero 60-hour rainfall frequency analysis.

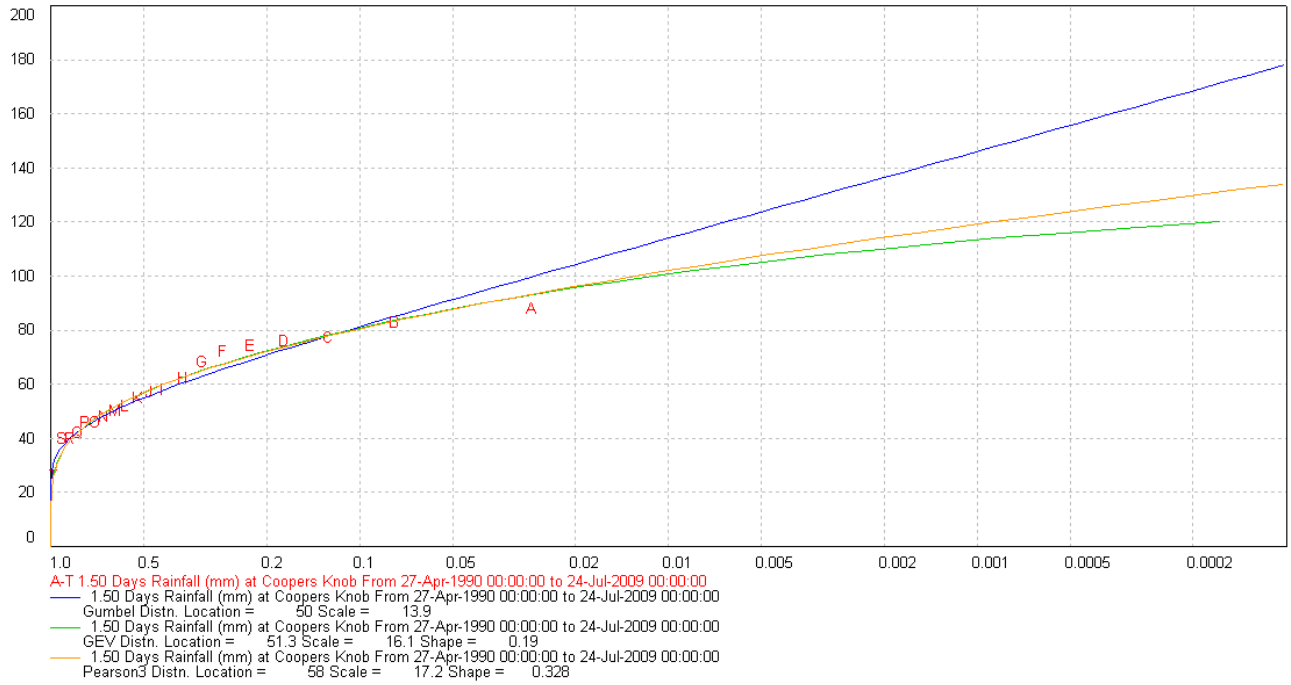

Figure A.16 Coopers Knob 36-hour rainfall frequency analysis.

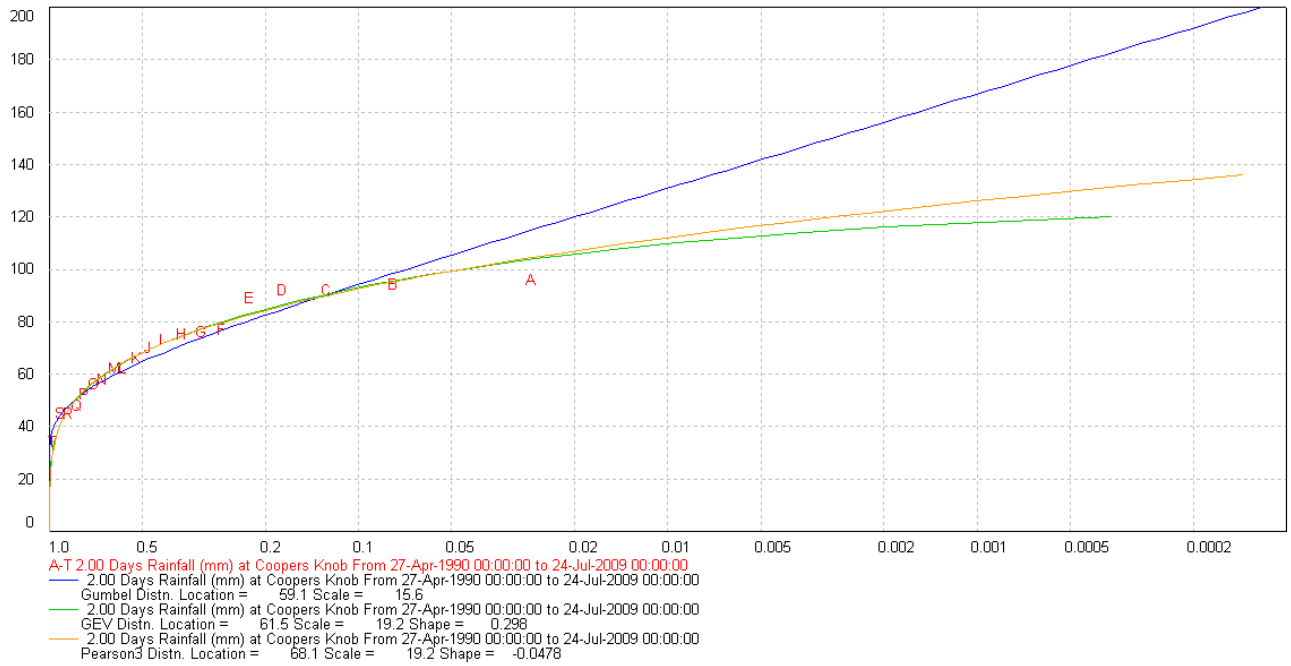

Figure A.17 Coopers Knob 48-hour rainfall frequency analysis.

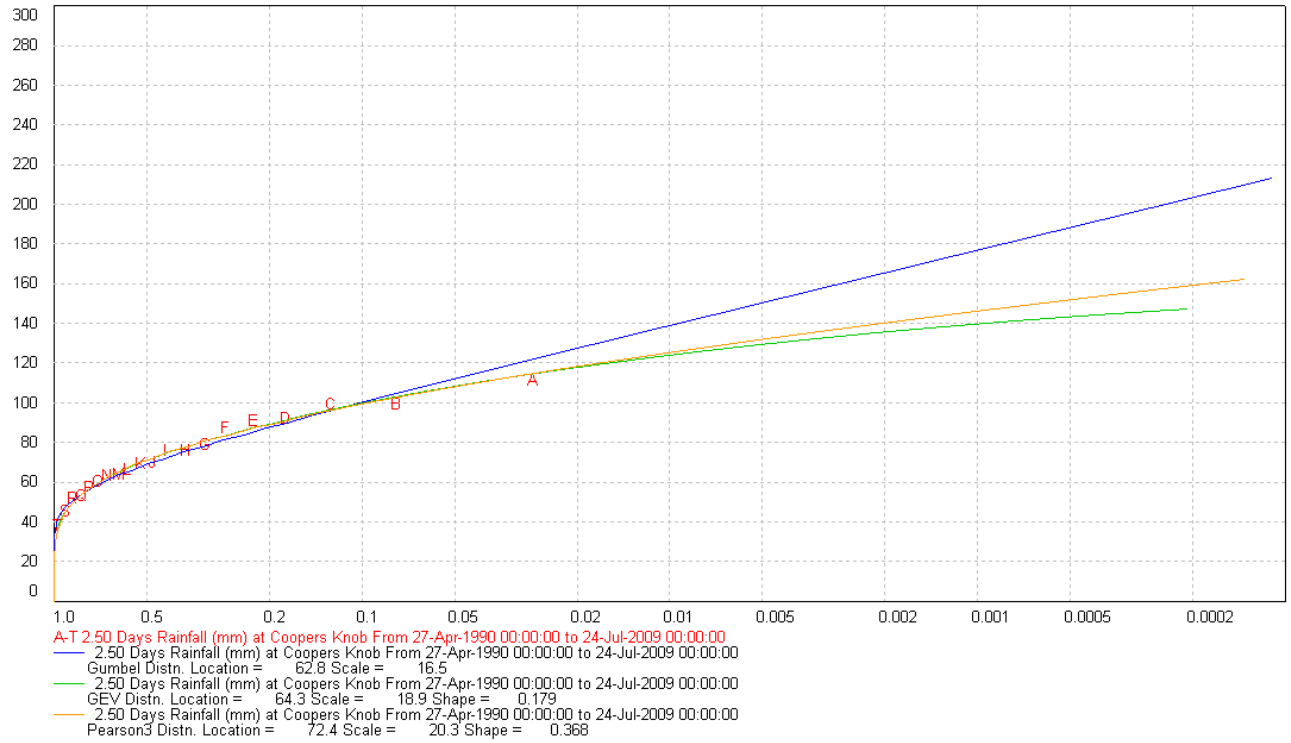

Figure A.18 Coopers Knob 60-hour rainfall frequency analysis.

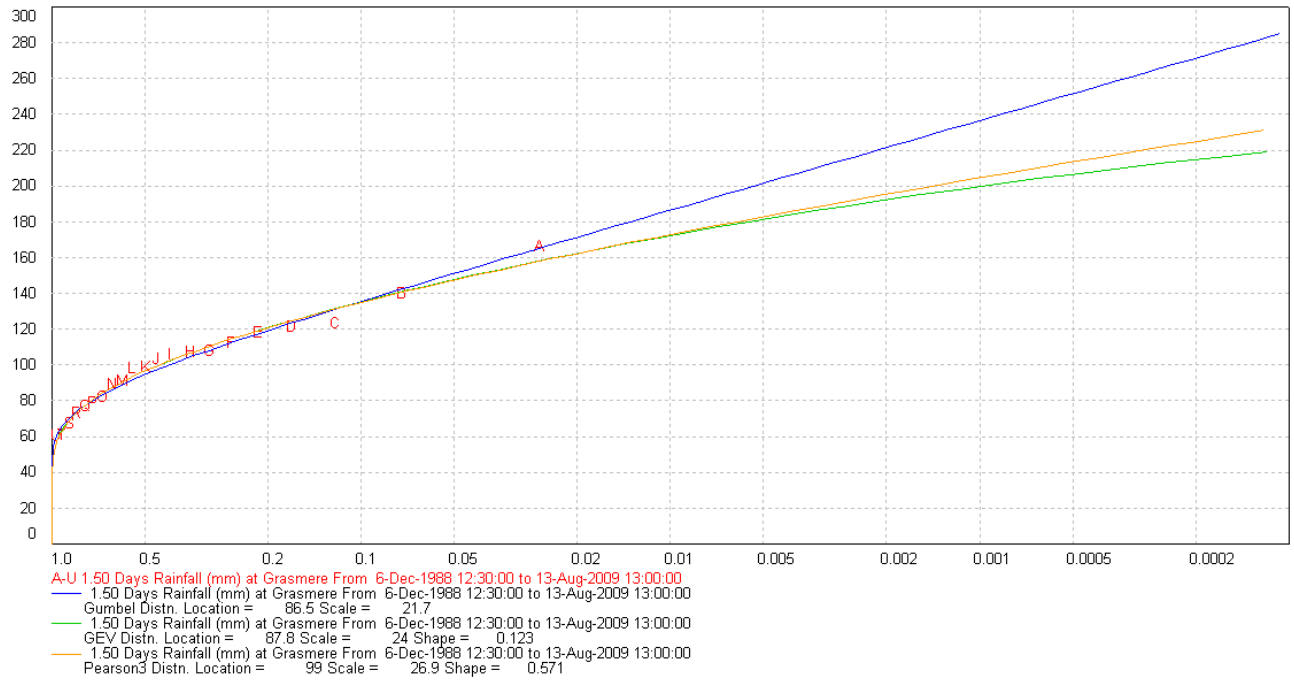

Figure A.19 Grassmere 36-hour rainfall frequency analysis.

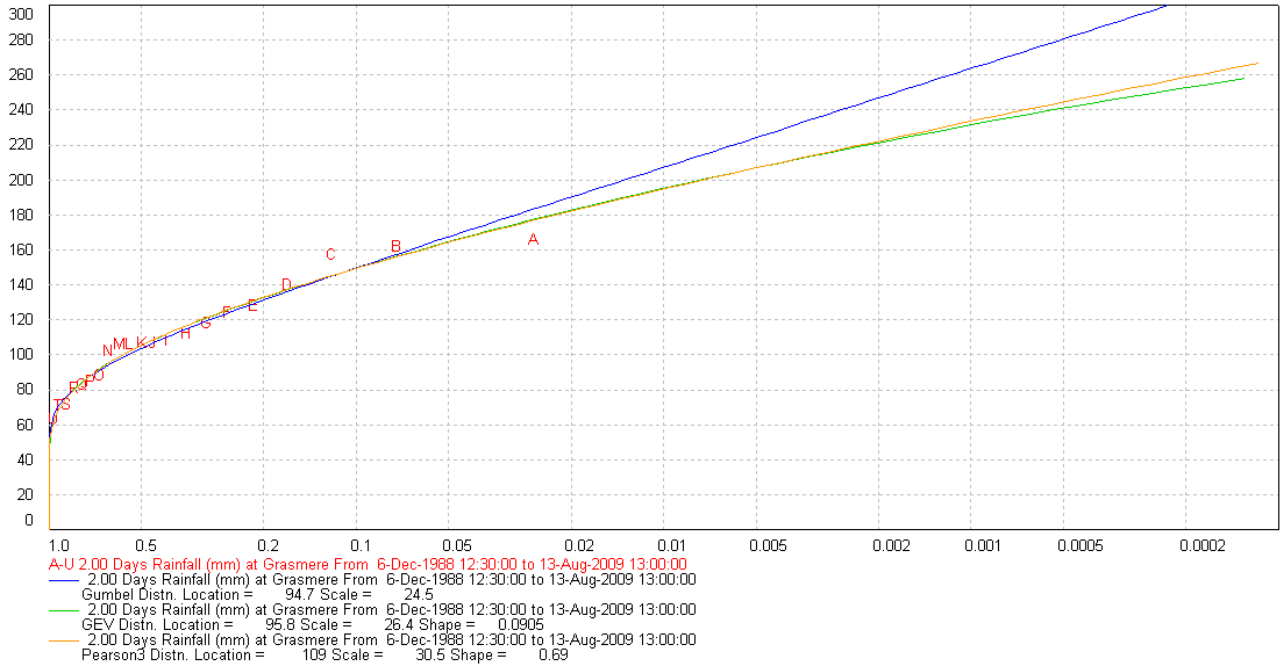

Figure A.20 Grassmere 48-hour rainfall frequency analysis.

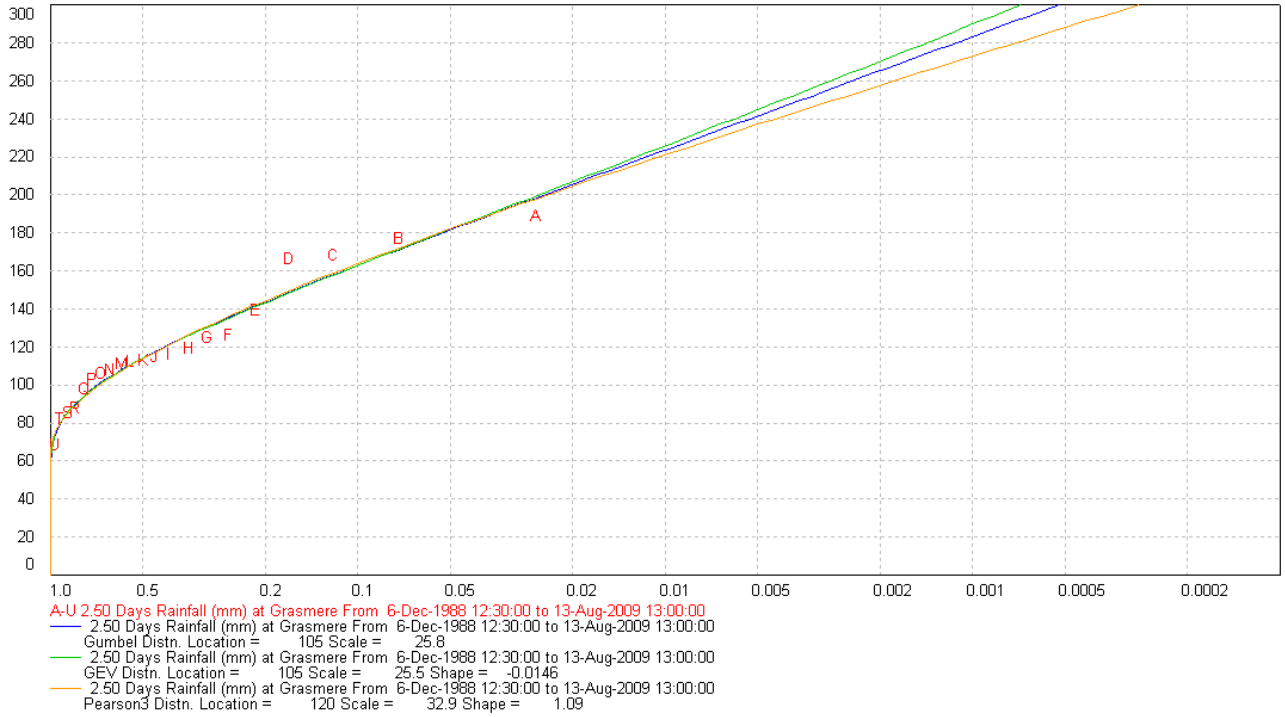

Figure A.21 Grassmere 60-hour rainfall frequency analysis.

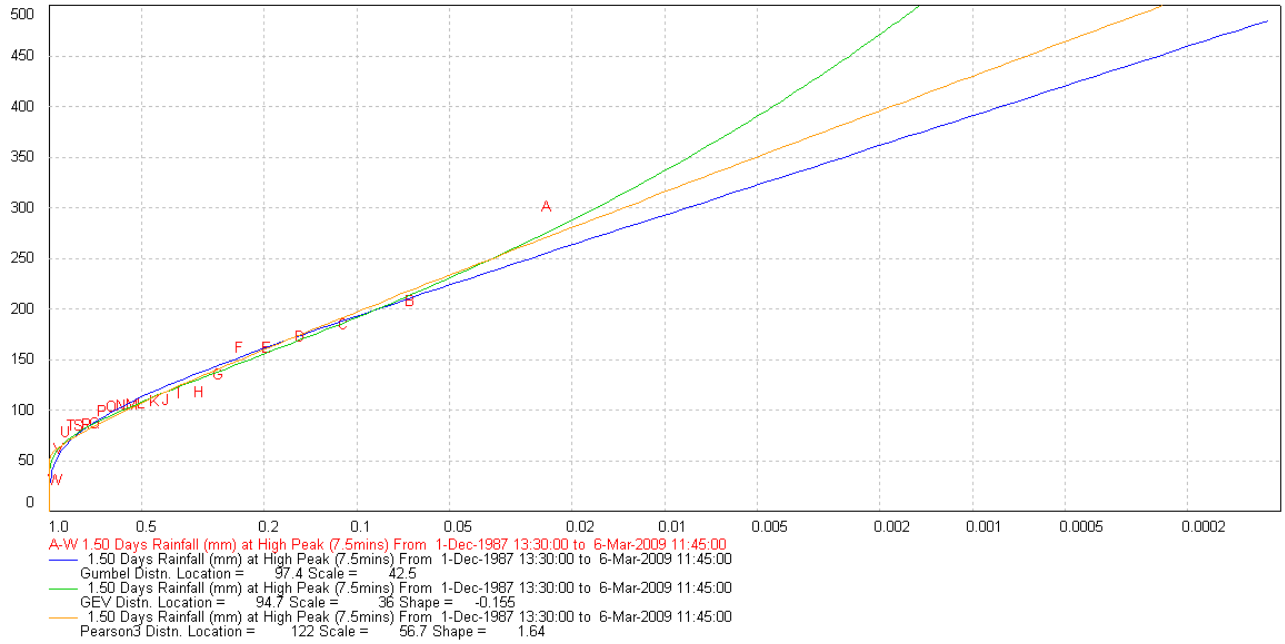

Figure A.22 Highpeak Station 36-hour rainfall frequency analysis.

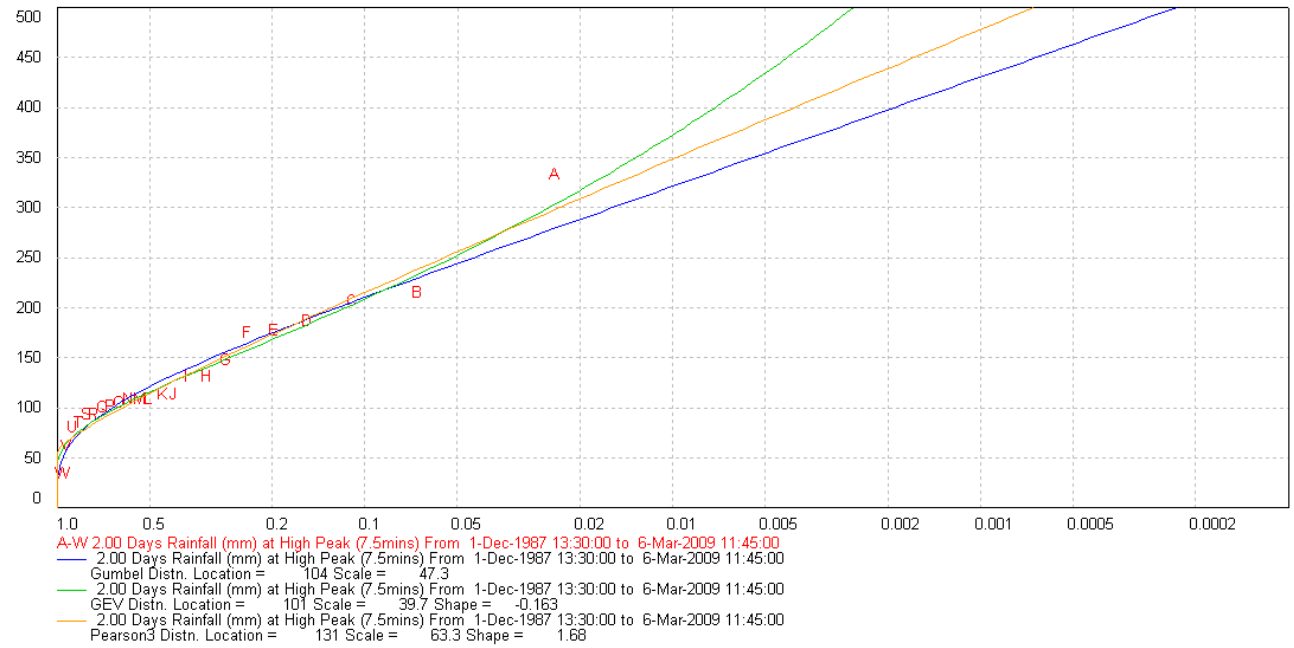

Figure A.23 Highpeak Station 48-hour rainfall frequency analysis.

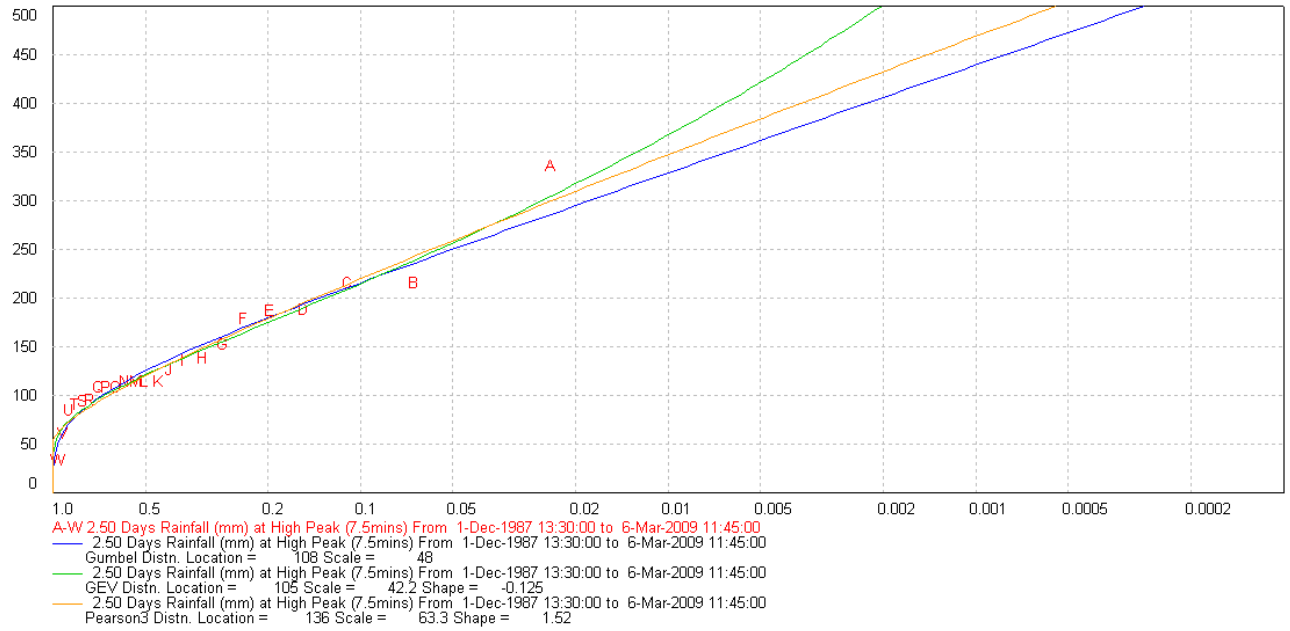

Figure A.24 Highpeak Station 60-hour rainfall frequency analysis.

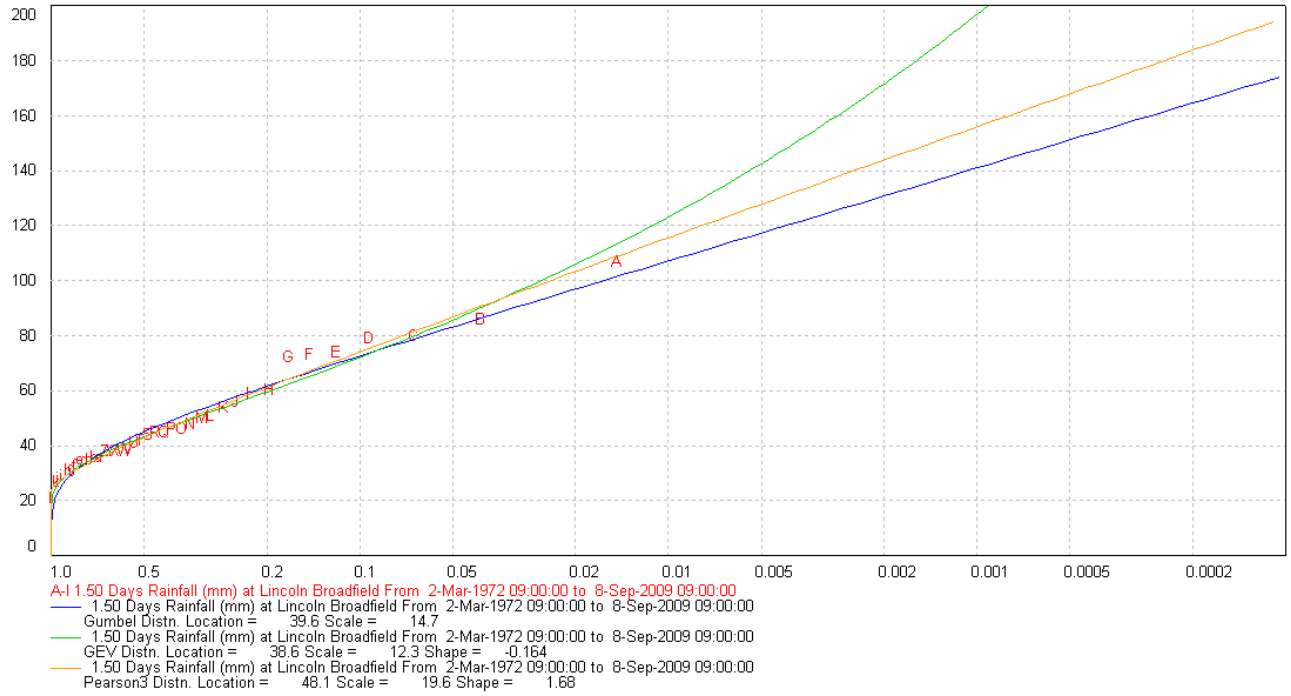

Figure A.25 Lincoln Broadfield 36-hour rainfall frequency analysis.

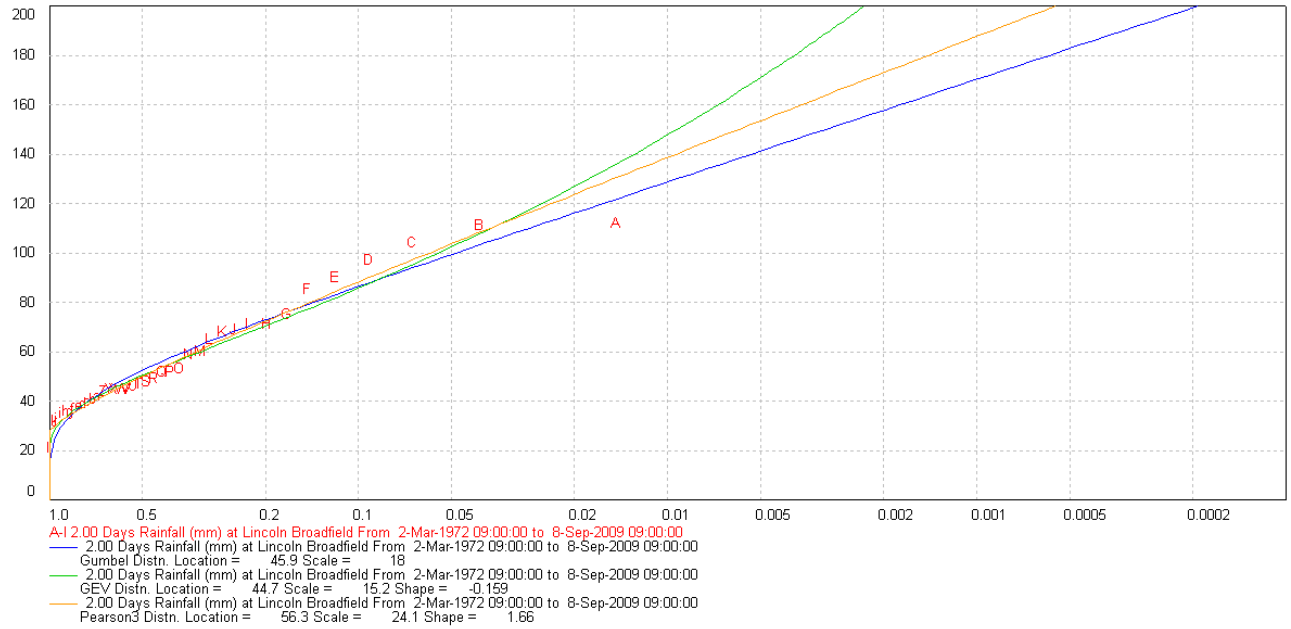

Figure A.26 Lincoln Broadfield 48-hour rainfall frequency analysis.

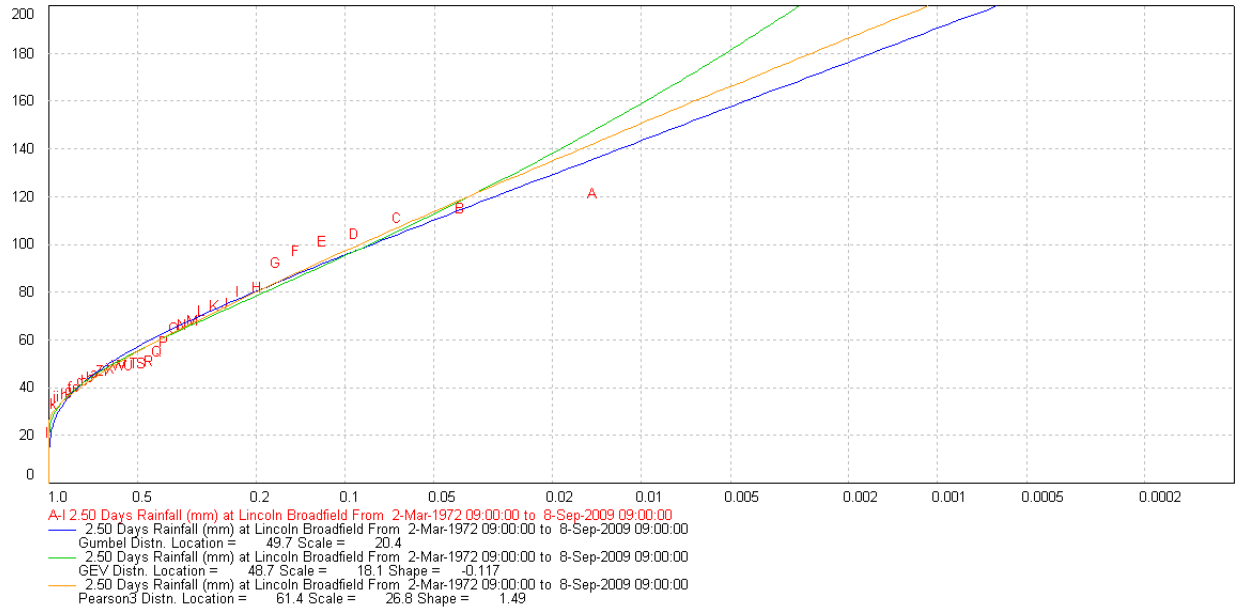

Figure A.27 Lincoln Broadfield 60-hour rainfall frequency analysis.

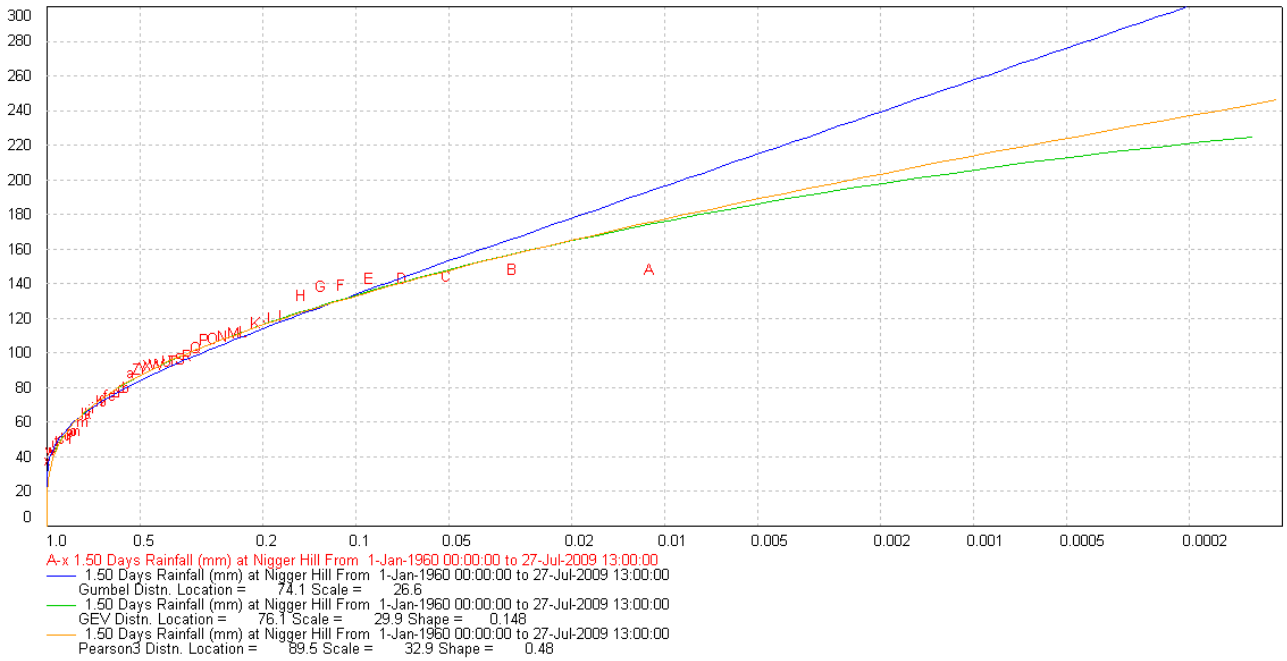

Figure A.28 Nigger Hill 36-hour rainfall frequency analysis.

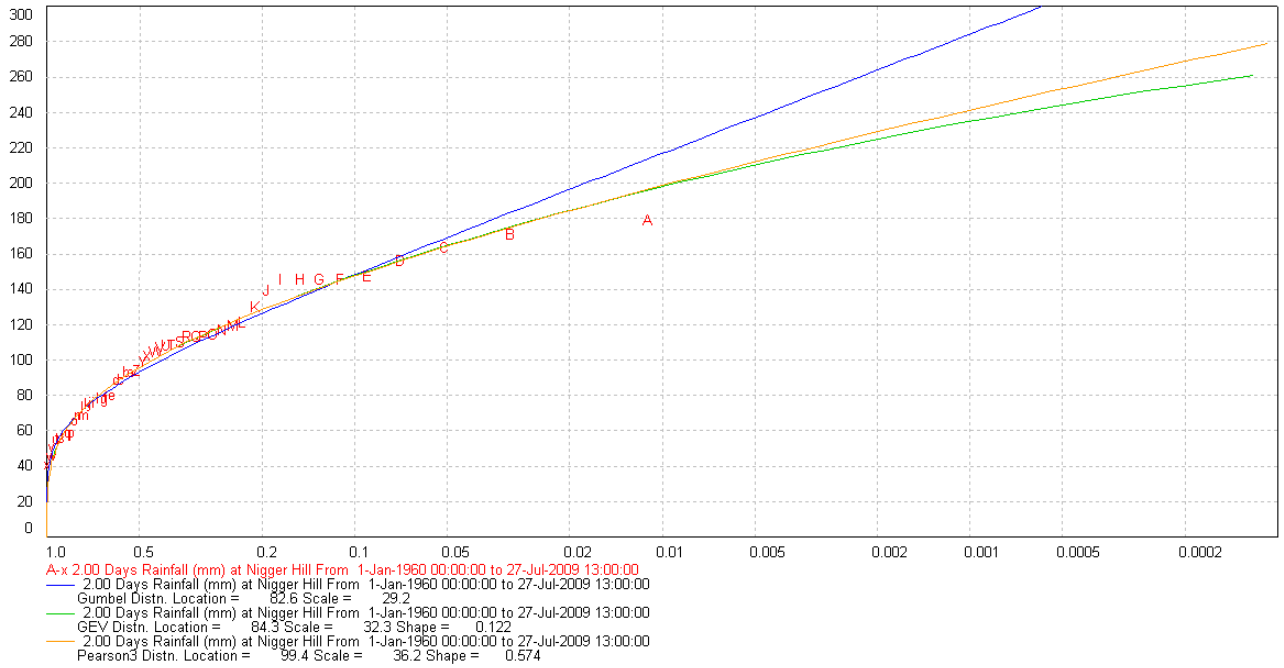

Figure A.29 Nigger Hill 48-hour rainfall frequency analysis.

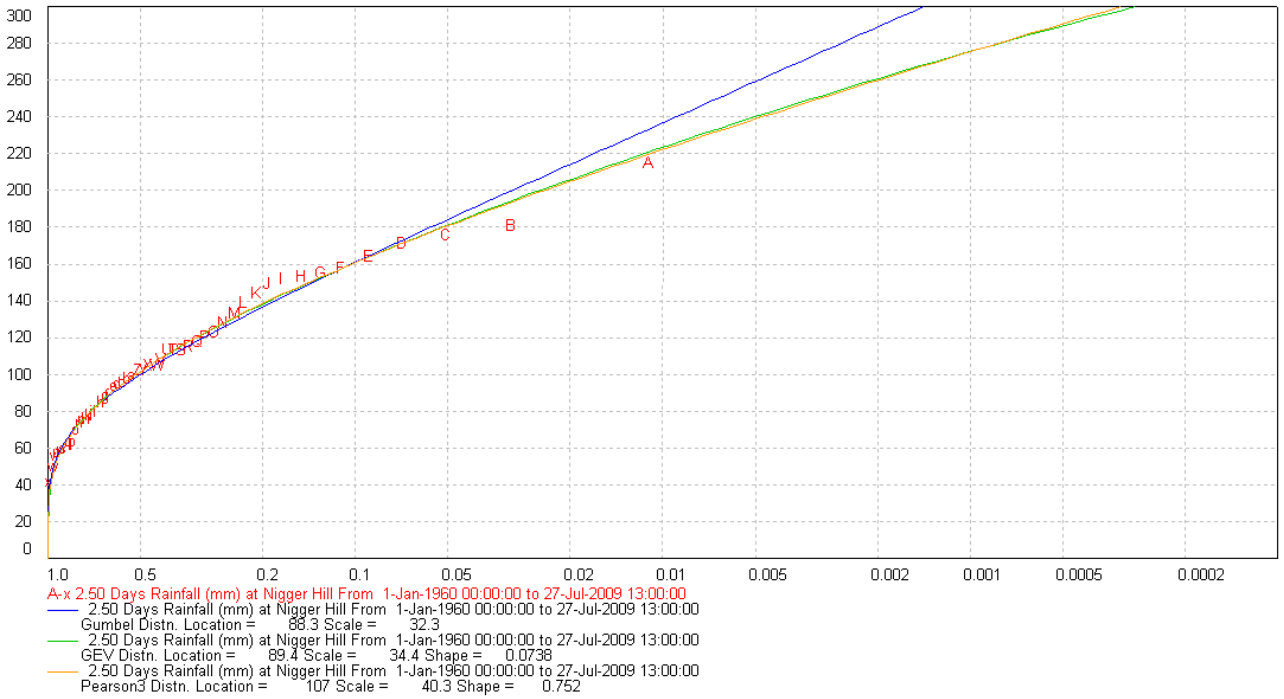

Figure A.30 Nigger Hill 60-hour rainfall frequency analysis.

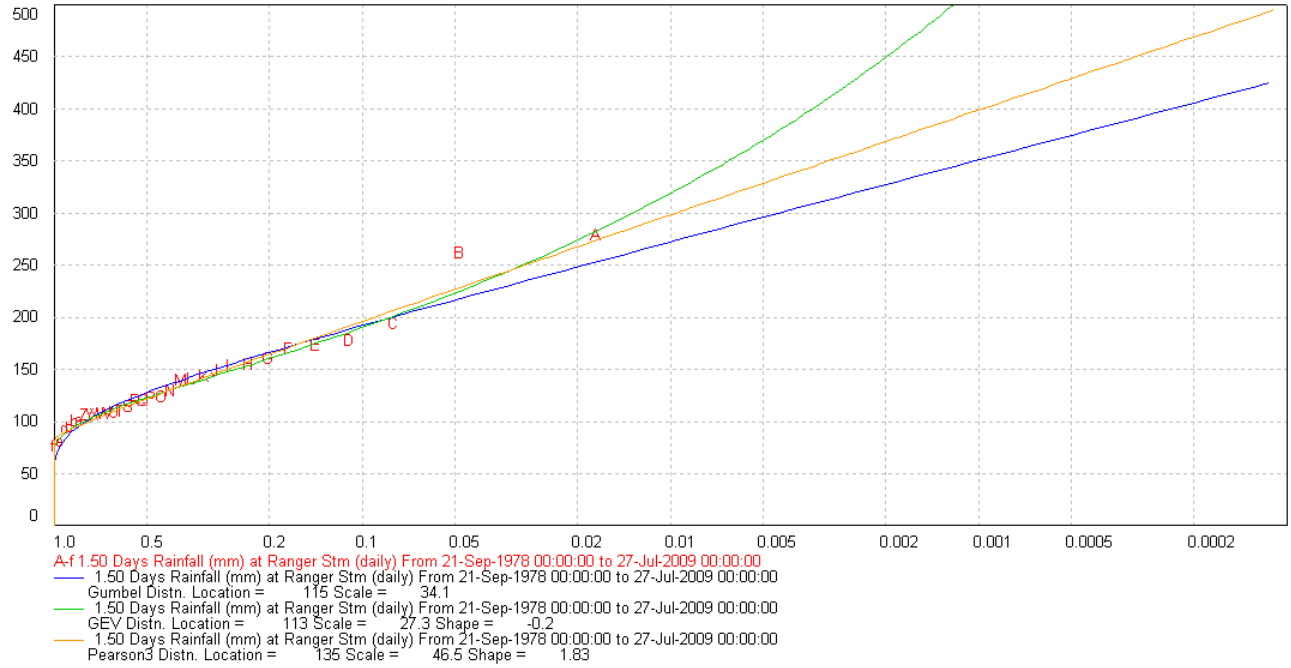

Figure A.31 Ranger Stream 36-hour rainfall frequency analysis.

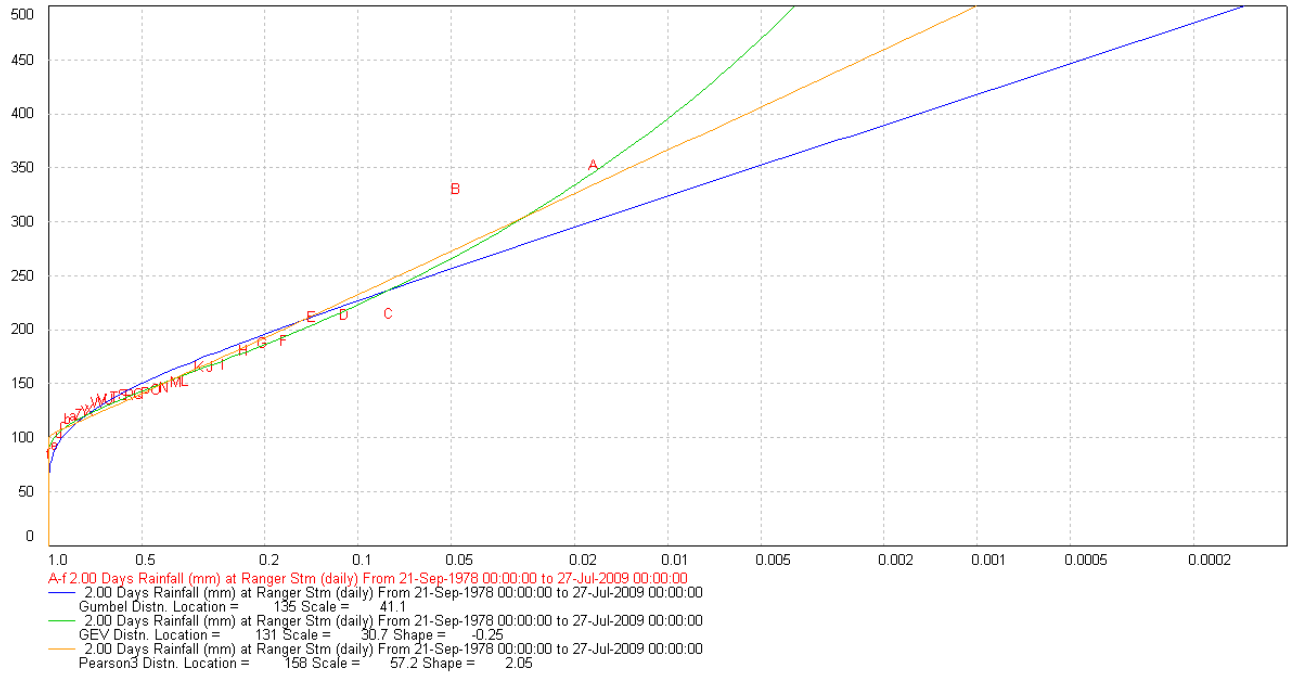

Figure A.32 Ranger Stream 48-hour rainfall frequency analysis.

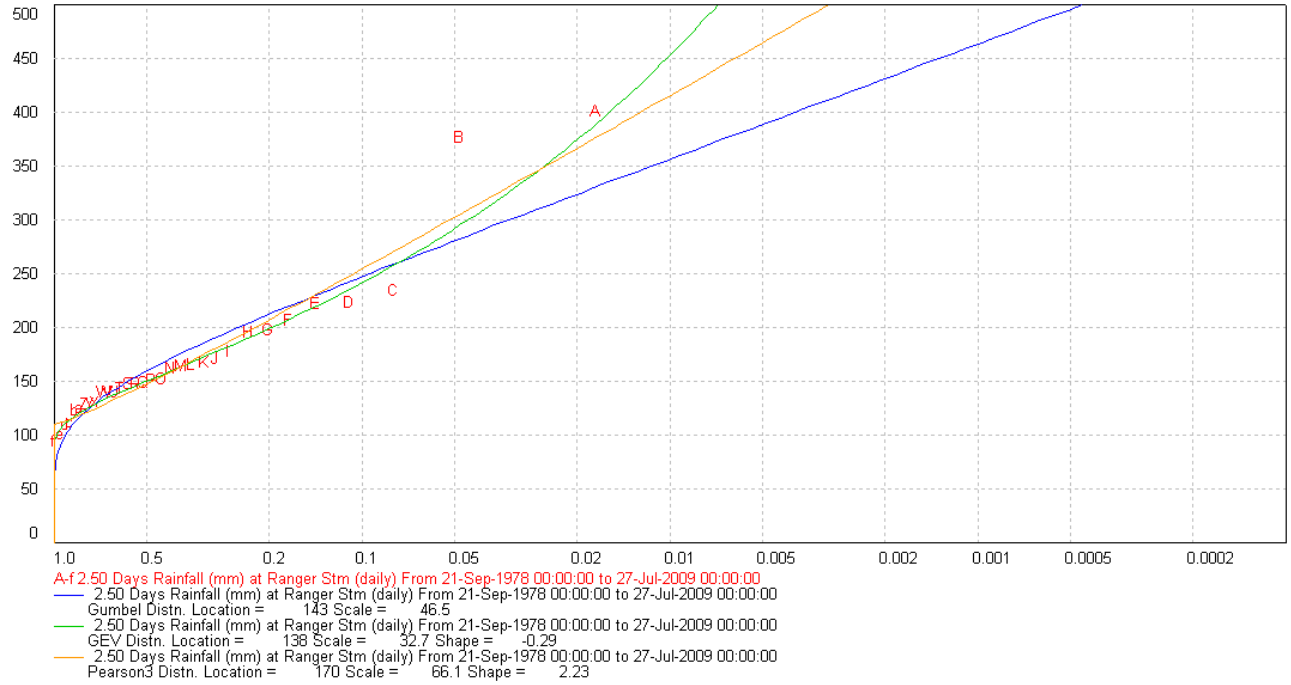

Figure A.33 Ranger Stream 60-hour rainfall frequency analysis.

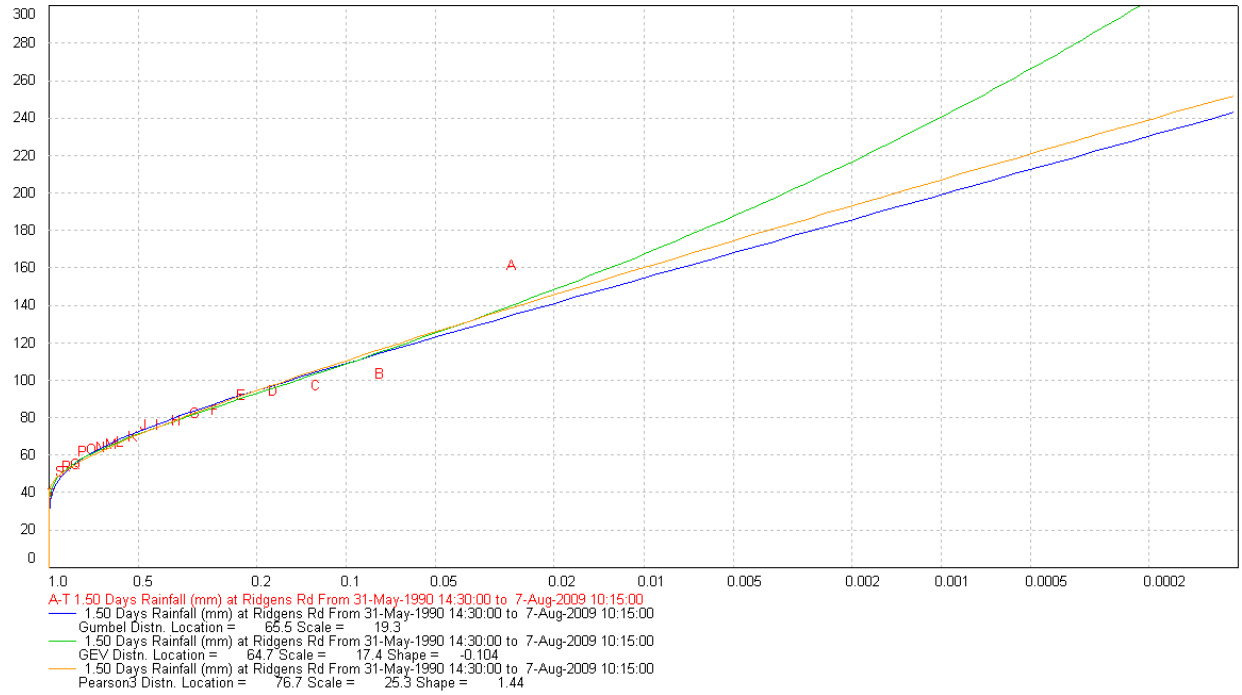

Figure A.34 Ridgens Road 36-hour rainfall frequency analysis.

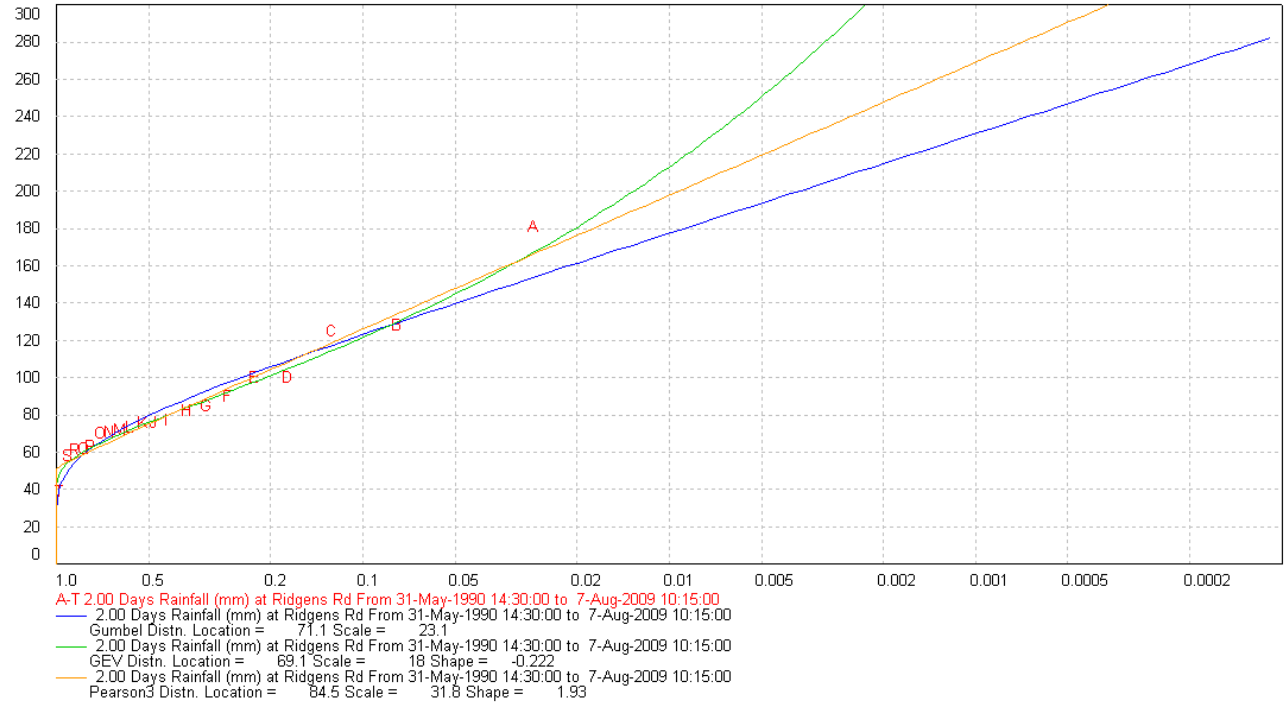

Figure A.35 Ridgens Road 48-hour rainfall frequency analysis

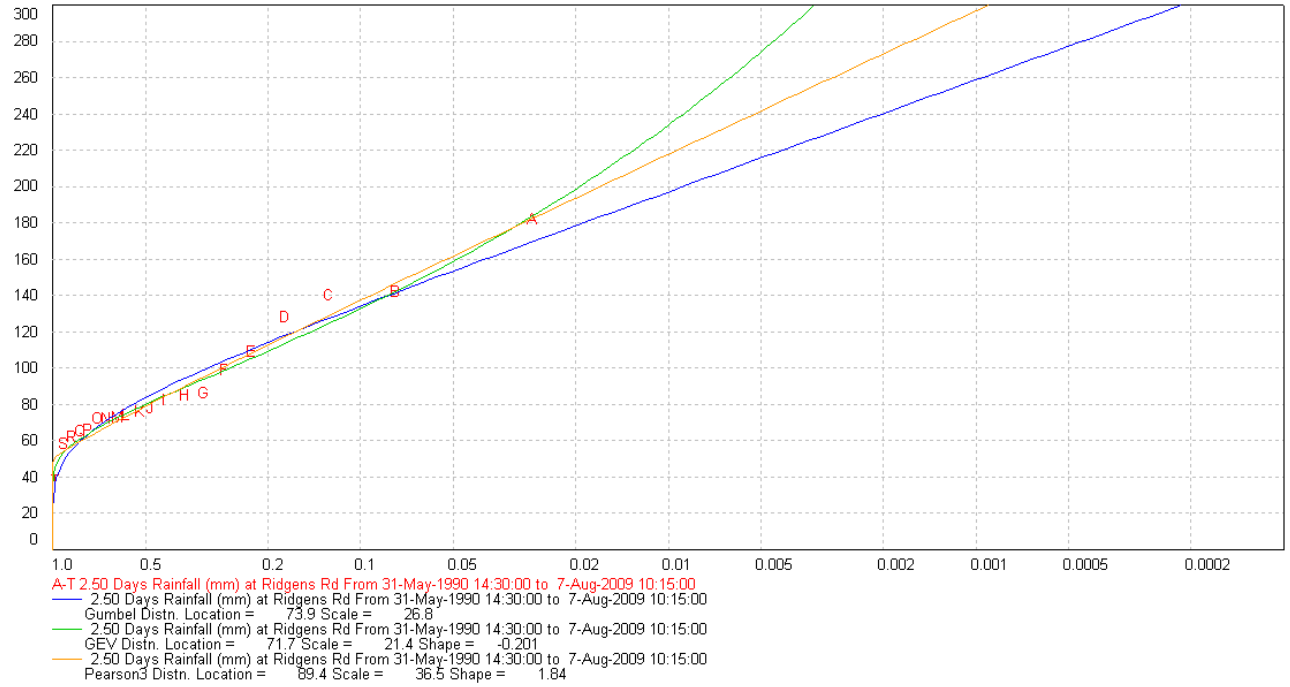

Figure A.36 Ridgens Road 60-hour rainfall frequency analysis

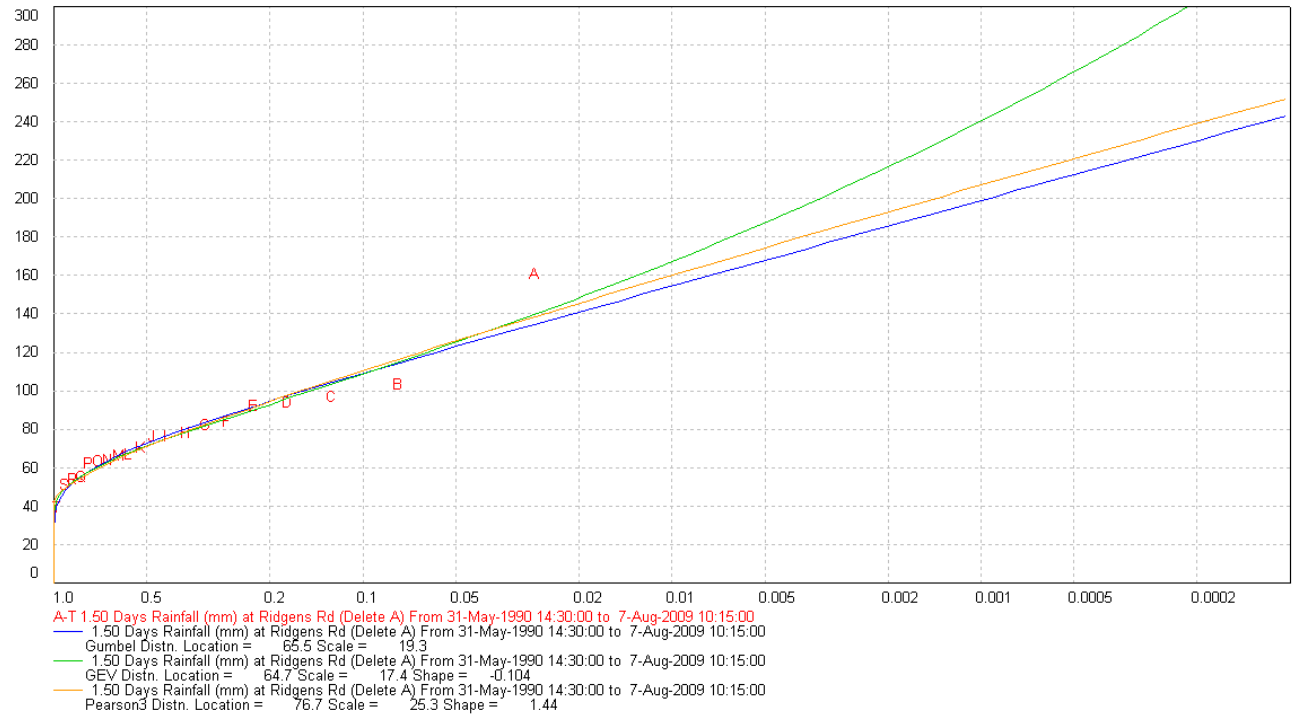

Figure A.37 Ridgens Road (Delete A) 36-hour rainfall frequency analysis

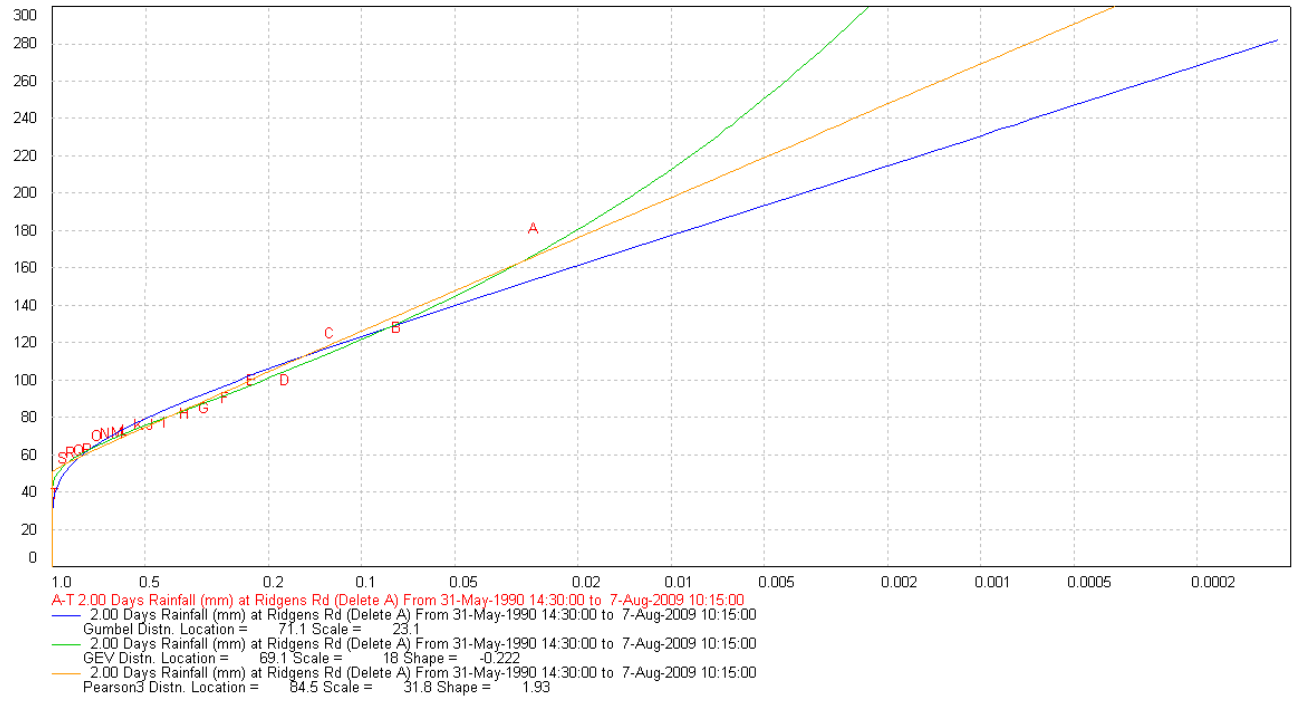

Figure A.38 Ridgens Road (Delete A) 48-hour rainfall frequency analysis

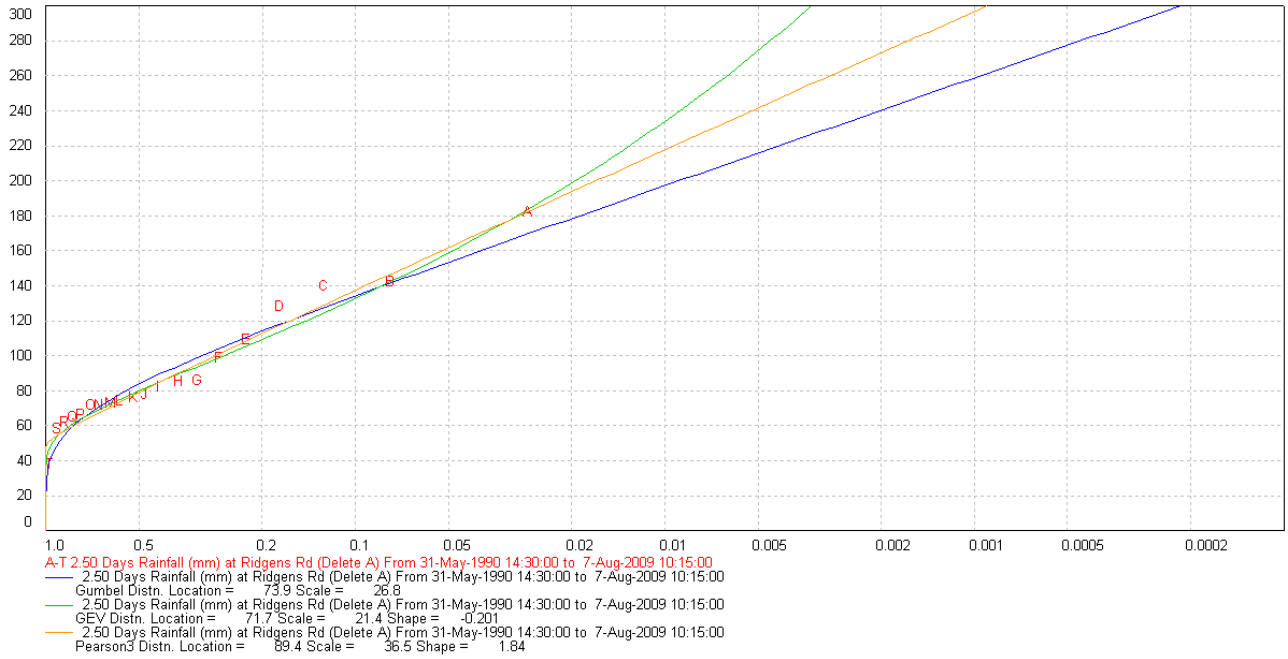

Figure A.38 Ridgens Road (Delete A) 60-hour rainfall frequency analysis

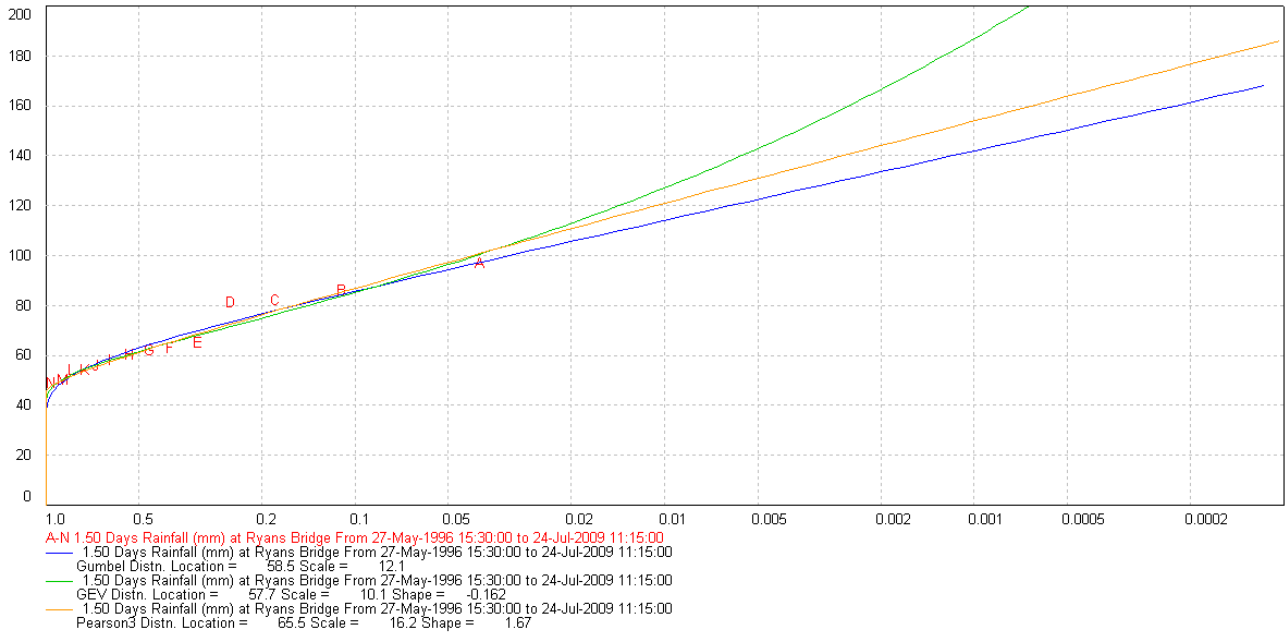

Figure A.39 Ryans Bridge 36-hour rainfall frequency analysis

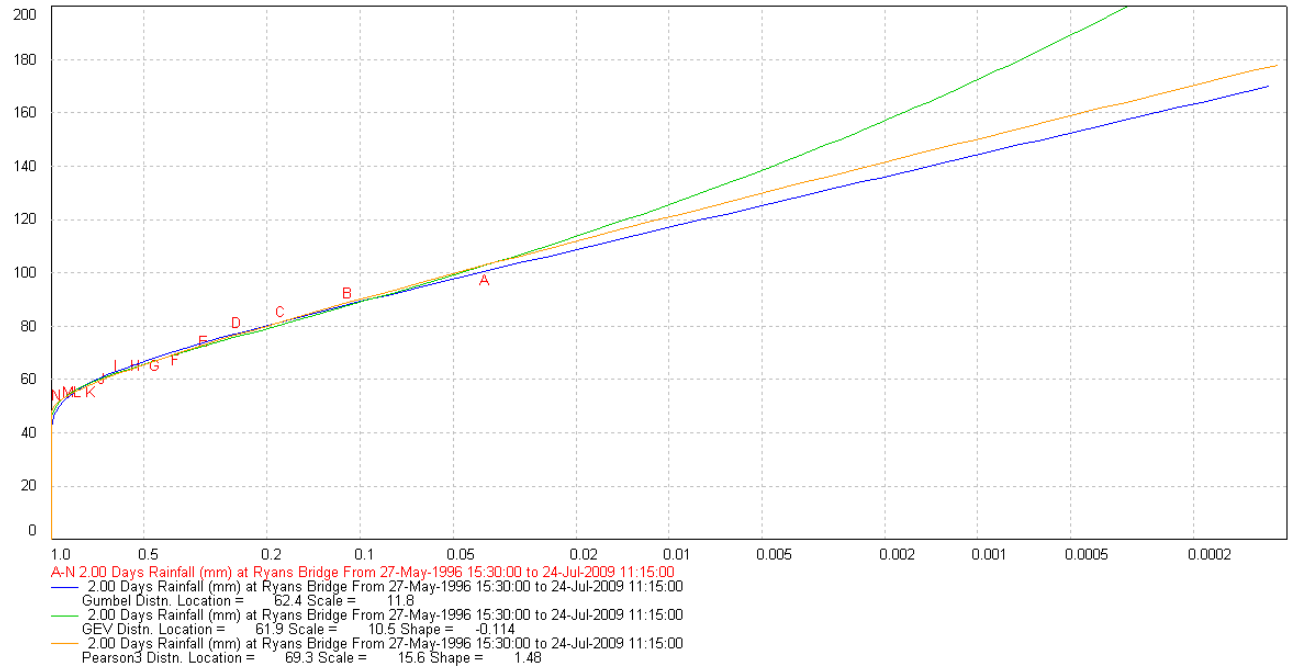

Figure A.40 Ryans Bridge 48-hour rainfall frequency analysis

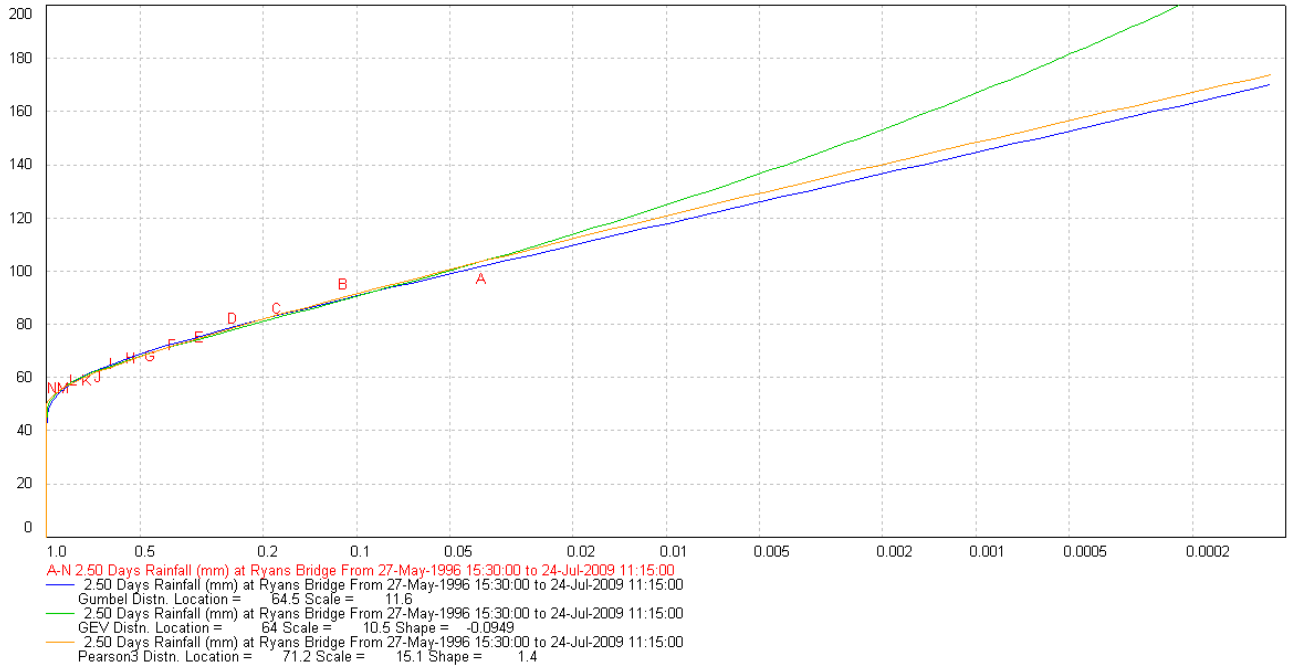

Figure A.41 Ryans Bridge 60-hour rainfall frequency analysis

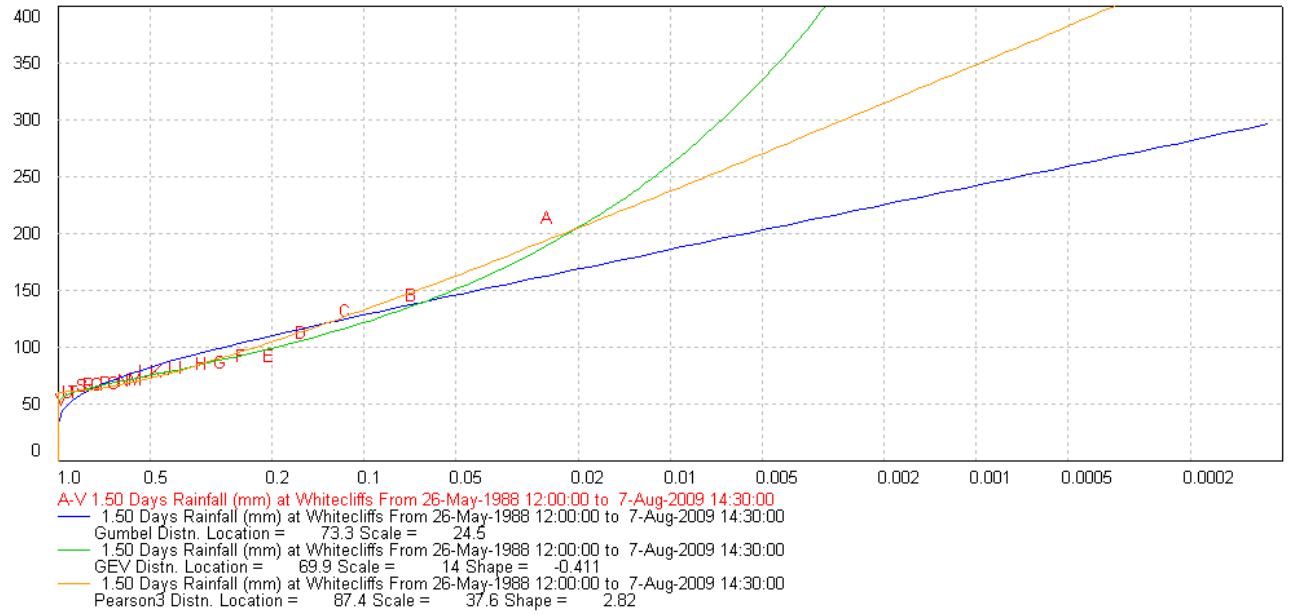

Figure A.42 Whitecliffs 36-hour rainfall frequency analysis

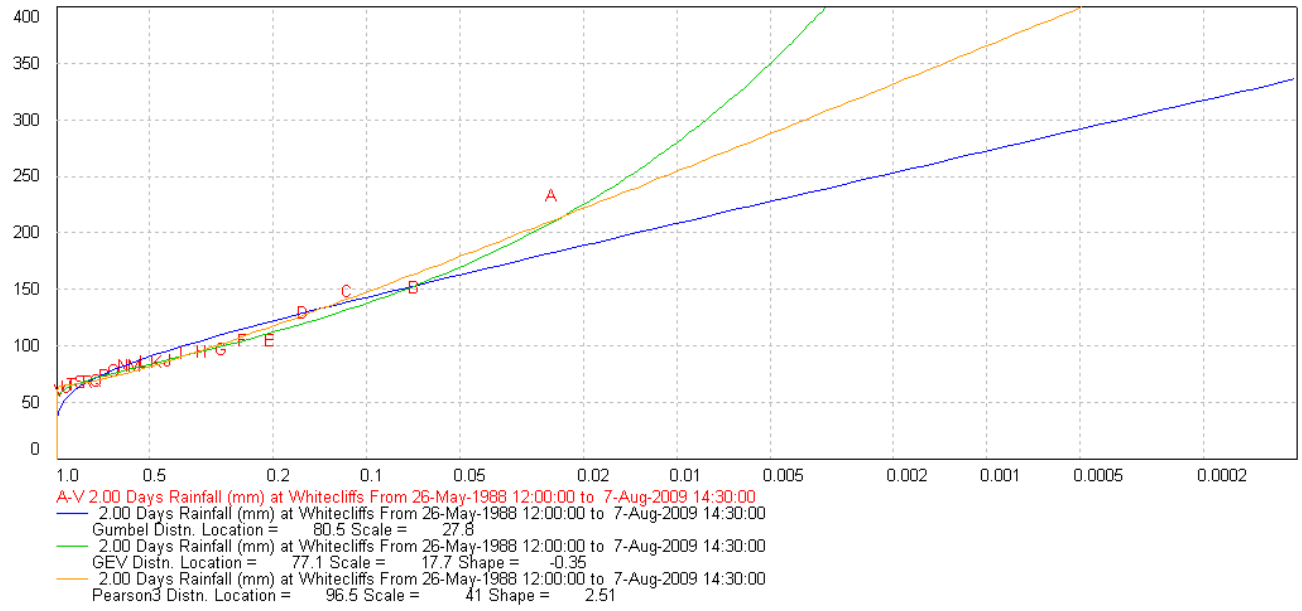

Figure A.43 Whitecliffs 48-hour rainfall frequency analysis

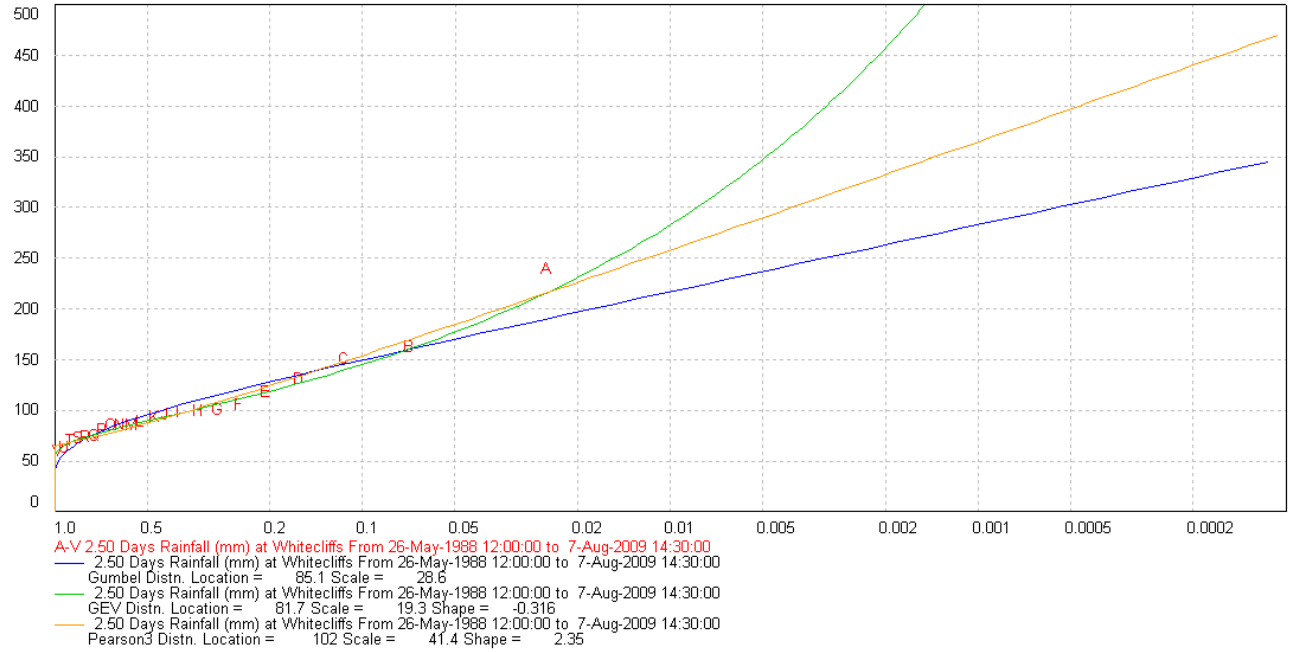

Figure A.44 Whitecliffs 60-hour rainfall frequency analysis