

Design Rainfall Intensity Diagrams

for locations in Cooma-Monaro Shire

Location	South	East
COOMA	36·225	149·125
NIMMITABEL	36·500	149·275
BREDBO	35·950	149·150
NUMERALLA	36·175	149·350

LOCATION 36.225 S 149.125 E * NEAR.. COOMA

ISSUED 10TH AUGUST 1992 REF.-FN3691

PREPARED BY -- HYDROMETEOROLOGICAL ADVISORY SERVICE -- MELBOURNE

* ENSURE THE COORDINATES ARE THOSE REQUIRED,
SINCE DATA IS BASED ON THESE AND NOT THE LOCATION NAME.

(C) COMMONWEALTH OF AUSTRALIA, BUREAU OF METEOROLOGY 1987

LIST OF COEFFICIENTS TO EQUATIONS OF THE FORM

$$\ln(I) = a + b*(\ln(T)) + c*(\ln(T))^{**2} + d*(\ln(T))^{**3} + e*(\ln(T))^{**4} + f*(\ln(T))^{**5} + g*(\ln(T))^{**6}$$

T = TIME IN HOURS

I = INTENSITY IN MILLIMETRES PER HOUR

RETURN PERIOD (YEARS)	a	b	c	d	e	f	g
1	2.7507	-0.6038	-0.0380	0.00931	0.000512	-0.0001709	0.0000240
2	3.0073	-0.6126	-0.0347	0.01007	-0.000032	-0.0005324	0.0000514
5	3.2546	-0.6307	-0.0302	0.00941	-0.000250	-0.0004008	0.0000318
10	3.3815	-0.6412	-0.0274	0.00940	-0.000487	-0.0003707	0.0000326
20	3.5311	-0.6503	-0.0250	0.00951	-0.000738	-0.0003622	0.0000390
50	3.7050	-0.6601	-0.0225	0.00902	-0.000854	-0.0002765	0.0000263
100	3.8232	-0.6671	-0.0210	0.00903	-0.000943	-0.0002607	0.0000248

RAINFALL INTENSITY IN MM/HR FOR VARIOUS DURATIONS AND RETURN PERIODS

DURATION (HOURS)	RETURN PERIOD						
	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
0.083	51.6	68.2	92.5	108.	129.	159.	183.
0.100	48.2	63.6	86.1	101.	120.	147.	169.
0.167	39.3	51.8	69.4	80.8	95.8	117.	134.
0.333	28.7	37.6	49.3	56.9	66.8	80.7	91.6
0.500	23.3	30.3	39.4	45.1	52.8	63.3	71.7
1.000	15.7	20.2	25.9	29.4	34.2	40.6	45.8
2.000	10.1	13.1	16.5	18.7	21.6	25.5	28.6
3.000	7.80	10.0	12.6	14.2	16.4	19.4	21.7
6.000	4.94	6.35	7.95	8.92	10.3	12.0	13.4
12.000	3.12	4.00	4.98	5.57	6.38	7.47	8.33
24.000	1.96	2.49	3.08	3.43	3.92	4.57	5.08
48.000	1.19	1.50	1.84	2.04	2.32	2.69	2.99
72.000	.857	1.09	1.32	1.46	1.67	1.92	2.13

DESIGN RAINFALL INTENSITY DIAGRAM

LOCATION 36.225 S 149.125 E * NEAR.. COOMA

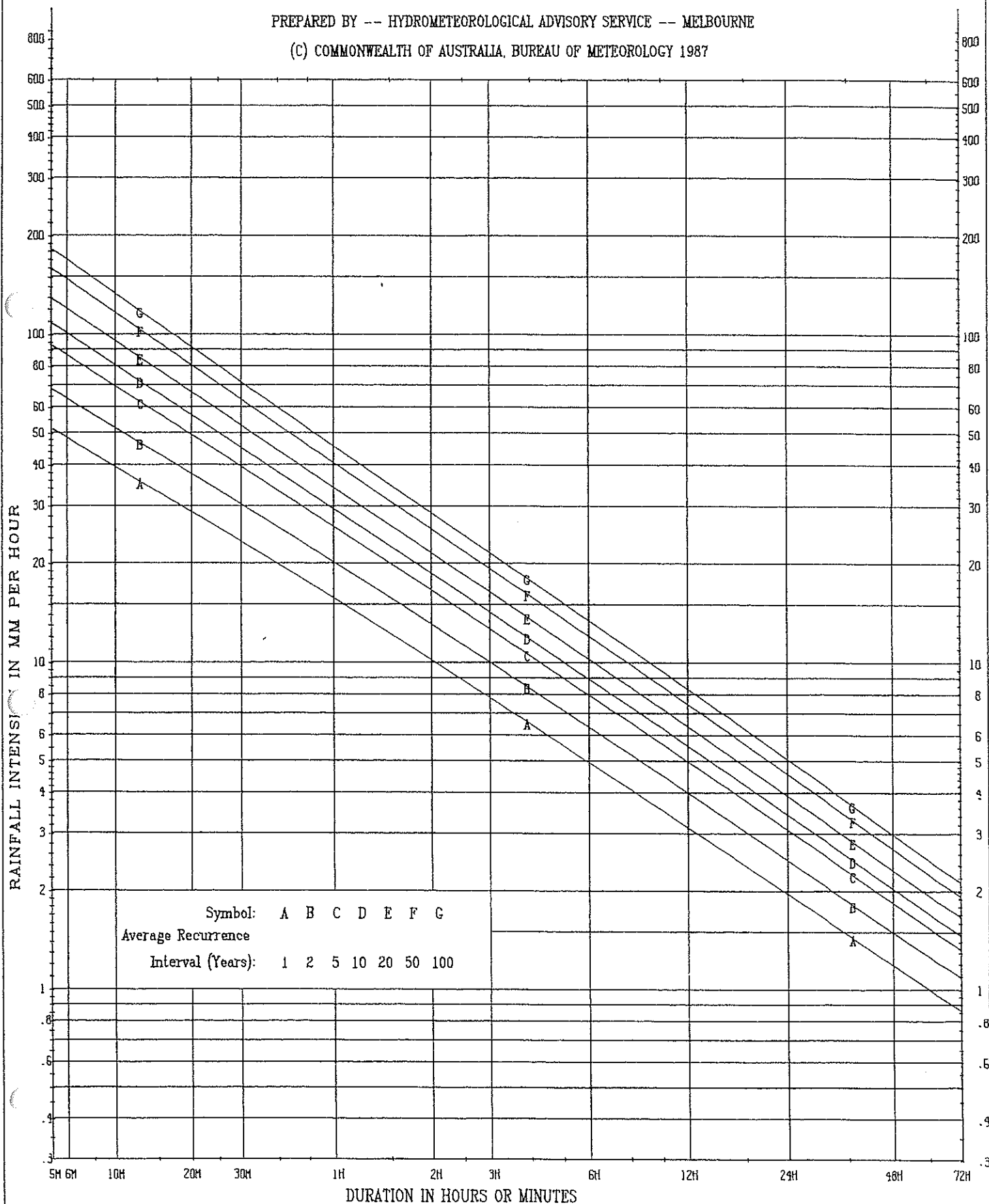
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SINCE DATA IS BASED ON THESE AND NOT THE LOCATION NAME.

ISSUED 10TH AUGUST 1992 REF.-FN3691

RAW DATA 20.68, 9.07, 1.09, 38.86, 7.20, 1.84, 0.230, 100

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LOCATION 36.500 S 149.275 E * NEAR.. NUMMITABEL

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LIST OF COEFFICIENTS TO EQUATIONS OF THE FORM

$$\ln(I) = a + b(\ln(T)) + c(\ln(T))^{**2} + d(\ln(T))^{**3} + e(\ln(T))^{**4} + f(\ln(T))^{**5} + g(\ln(T))^{**6}$$

T = TIME IN HOURS

I = INTENSITY IN MILLIMETRES PER HOUR

RETURN PERIOD (YEARS)	a	b	c	d	e	f	g
1	2.9210	-0.5778	-0.0266	0.00779	-0.000068	-0.0002444	0.0000078
2	3.1769	-0.5845	-0.0268	0.00793	0.000003	-0.0002416	0.0000035
5	3.4221	-0.6010	-0.0266	0.00744	0.000170	-0.0001329	-0.0000199
10	3.5476	-0.6095	-0.0263	0.00698	0.000267	-0.0000529	-0.0000363
20	3.6956	-0.6174	-0.0260	0.00712	0.000242	-0.0000483	-0.0000360
50	3.8671	-0.6263	-0.0259	0.00685	0.000316	0.0000102	-0.0000479
100	3.9840	-0.6324	-0.0257	0.00674	0.000347	0.0000397	-0.0000543

RAINFALL INTENSITY IN MM/HR FOR VARIOUS DURATIONS AND RETURN PERIODS

DURATION (HOURS)	RETURN PERIOD						
	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
0.083	60.0	78.7	105.	121.	143.	174.	198.
0.100	56.3	73.7	97.9	113.	134.	162.	185.
0.167	46.1	60.2	79.4	91.6	108.	130.	148.
0.333	33.6	43.7	56.9	65.1	76.2	91.4	103.
0.500	27.3	35.4	45.8	52.2	60.9	72.7	82.1
1.000	18.6	24.0	30.6	34.7	40.3	47.8	53.7
2.000	12.3	15.8	20.0	22.5	26.0	30.7	34.3
3.000	9.62	12.3	15.5	17.4	20.0	23.5	26.3
6.000	6.30	8.04	9.99	11.2	12.8	14.9	16.6
12.000	4.12	5.25	6.47	7.20	8.22	9.56	10.6
24.000	2.69	3.42	4.20	4.67	5.32	6.18	6.85
48.000	1.71	2.17	2.67	2.97	3.39	3.94	4.36
72.000	1.28	1.62	2.00	2.22	2.53	2.94	3.25

DESIGN RAINFALL INTENSITY DIAGRAM

LOCATION 36.500 S 149.275 E * NEAR.. NUMMITABEL

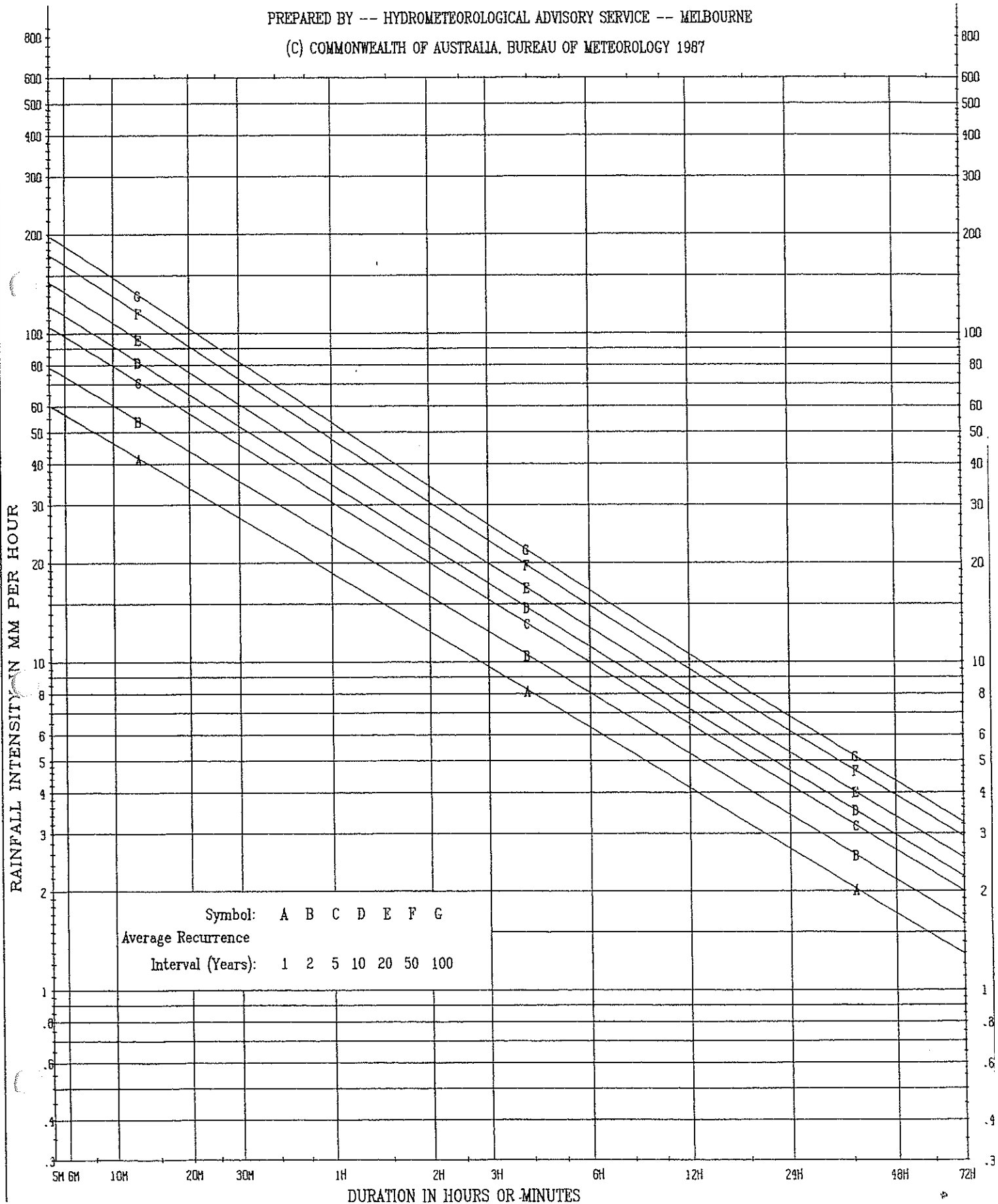
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(RAW DATA 24.35, 5.32, 1.63, 45.73, 9.18, 2.81, 0.220, 100)

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LOCATION 35.950 S 149.150 E * NEAR.. BREDBO

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LIST OF COEFFICIENTS TO EQUATIONS OF THE FORM

$$\ln(I) = a + b \cdot (\ln(T)) + c \cdot (\ln(T))^2 + d \cdot (\ln(T))^3 + e \cdot (\ln(T))^4 + f \cdot (\ln(T))^5 + g \cdot (\ln(T))^6$$

T = TIME IN HOURS I = INTENSITY IN MILLIMETRES PER HOUR

RETURN PERIOD (YEARS)	a	b	c	d	e	f	g
1	2.7849	-0.6007	-0.0332	0.01042	-0.000242	-0.0006121	0.0000647
2	3.0415	-0.6063	-0.0296	0.01032	-0.000692	-0.0005868	0.0000767
5	3.2872	-0.6209	-0.0230	0.01017	-0.001195	-0.0005171	0.0000757
10	3.4131	-0.6285	-0.0196	0.00979	-0.001465	-0.0004437	0.0000720
20	3.5617	-0.6358	-0.0164	0.00998	-0.001779	-0.0004493	0.0000819
50	3.7343	-0.6434	-0.0133	0.00984	-0.001972	-0.0004033	0.0000765
100	3.8518	-0.6492	-0.0103	0.00992	-0.002301	-0.0003962	0.0000863

RAINFALL INTENSITY IN MM/HR FOR VARIOUS DURATIONS AND RETURN PERIODS

DURATION (HOURS)	RETURN PERIOD						
	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
0.083	53.3	70.4	94.9	111.	132.	161.	185.
0.100	49.8	65.6	88.4	103.	122.	150.	172.
0.167	40.7	53.5	71.3	82.7	97.6	119.	136.
0.333	29.7	38.8	50.8	56.3	68.4	82.3	93.4
0.500	24.1	31.3	40.6	46.3	54.1	64.7	73.2
1.000	16.2	20.9	26.8	30.4	35.2	41.9	47.1
2.000	10.5	13.6	17.3	19.5	22.6	26.7	30.0
3.000	8.15	10.5	13.3	15.0	17.3	20.5	23.0
6.000	5.21	6.71	8.50	9.58	11.1	13.1	14.6
12.000	3.30	4.25	5.37	6.05	6.98	8.24	9.23
24.000	2.05	2.62	3.31	3.72	4.28	5.04	5.63
48.000	1.22	1.55	1.94	2.18	2.51	2.94	3.28
72.000	.871	1.12	1.39	1.56	1.80	2.10	2.35

DESIGN RAINFALL INTENSITY DIAGRAM

LOCATION 35.950 S 149.150 E * NEAR.. BREDBO

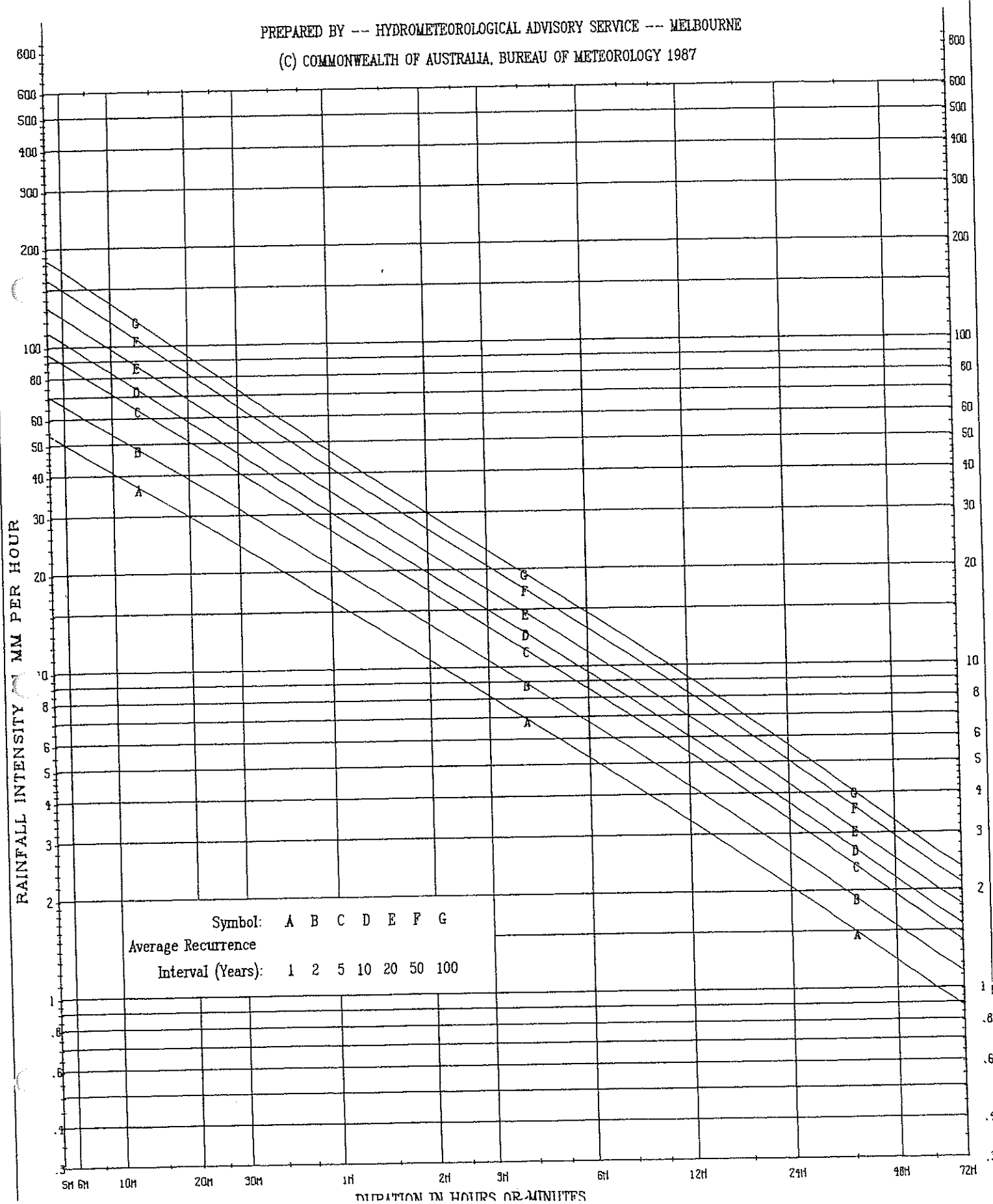
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ISSUED 10TH AUGUST 1992 REF. -FN3691

REG DATA 21.38, 4.34, 1.12, 39.94, 7.94, 2.00, 0.230, 100

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LOCATION 36.175 S 149.350 E * NEAR.. NUMERALLA

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LIST OF COEFFICIENTS TO EQUATIONS OF THE FORM

$$\ln(I) = a + b \cdot (\ln(T)) + c \cdot (\ln(T))^{**2} + d \cdot (\ln(T))^{**3} + e \cdot (\ln(T))^{**4} + f \cdot (\ln(T))^{**5} + g \cdot (\ln(T))^{**6}$$

T = TIME IN HOURS

I = INTENSITY IN MILLIMETRES PER HOUR

RETURN PERIOD (YEARS)	a	b	c	d	e	f	g
1	2.8816	-0.5996	-0.0494	0.00481	0.003377	0.0002377	-0.0001646
2	3.1296	-0.6041	-0.0441	0.00562	0.002564	0.0001265	-0.0001235
5	3.3557	-0.6153	-0.0308	0.00740	0.000646	-0.0000957	-0.0000376
10	3.4704	-0.6205	-0.0240	0.00748	-0.000179	-0.0001139	-0.0000156
20	3.6088	-0.6266	-0.0177	0.00890	-0.001179	-0.0002087	0.0000403
50	3.7692	-0.6324	-0.0105	0.00958	-0.002178	-0.0003742	0.0000795
100	3.8783	-0.6361	-0.0057	0.00996	-0.002819	-0.0004243	0.0001038

RAINFALL INTENSITY IN MM/H FOR VARIOUS DURATIONS AND RETURN PERIODS

DURATION (HOURS)	RETURN PERIOD						
	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
0.083	58.0	75.9	100.	116.	136.	164.	186.
0.100	54.4	71.1	93.5	108.	127.	153.	173.
0.167	44.5	57.9	75.5	86.6	101.	122.	138.
0.333	32.4	41.9	53.8	61.1	71.0	84.5	95.0
0.500	26.4	34.0	43.2	48.7	56.3	66.6	74.6
1.000	17.8	22.9	28.7	32.2	36.9	43.3	48.3
2.000	11.5	14.8	18.5	20.7	23.8	27.9	31.1
3.000	8.80	11.3	14.2	15.9	18.3	21.6	24.1
6.000	5.53	7.12	9.03	10.2	11.8	13.9	15.5
12.000	3.57	4.59	5.79	6.51	7.51	8.85	9.89
24.000	2.42	3.07	3.75	4.16	4.72	5.47	6.05
48.000	1.67	2.07	2.40	2.59	2.87	3.23	3.51
72.000	1.29	1.59	1.80	1.91	2.10	2.33	2.50

DESIGN RAINFALL INTENSITY DIAGRAM

LOCATION 36.175 S 149.350 E * NEAR.. NUMERALLA

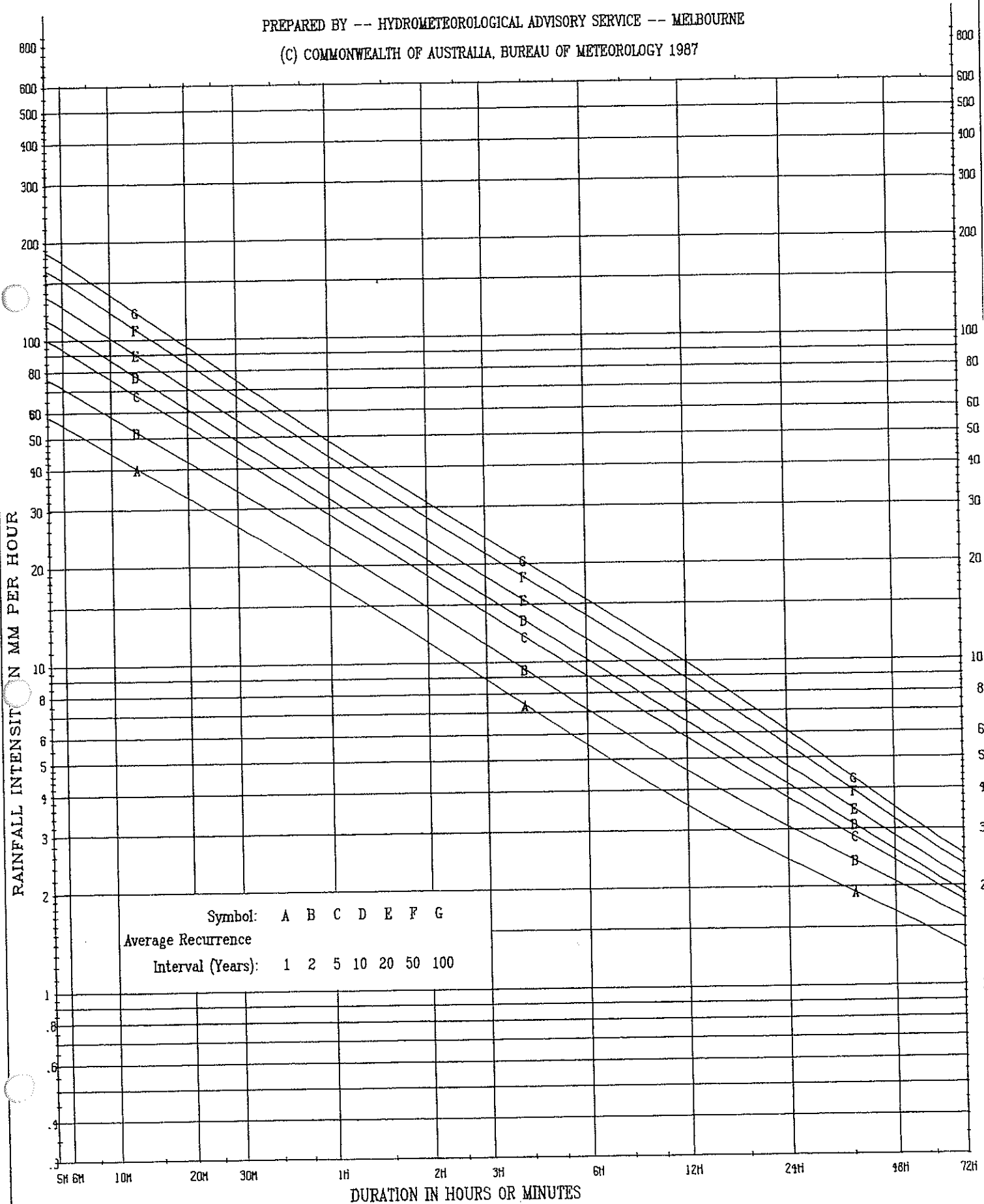
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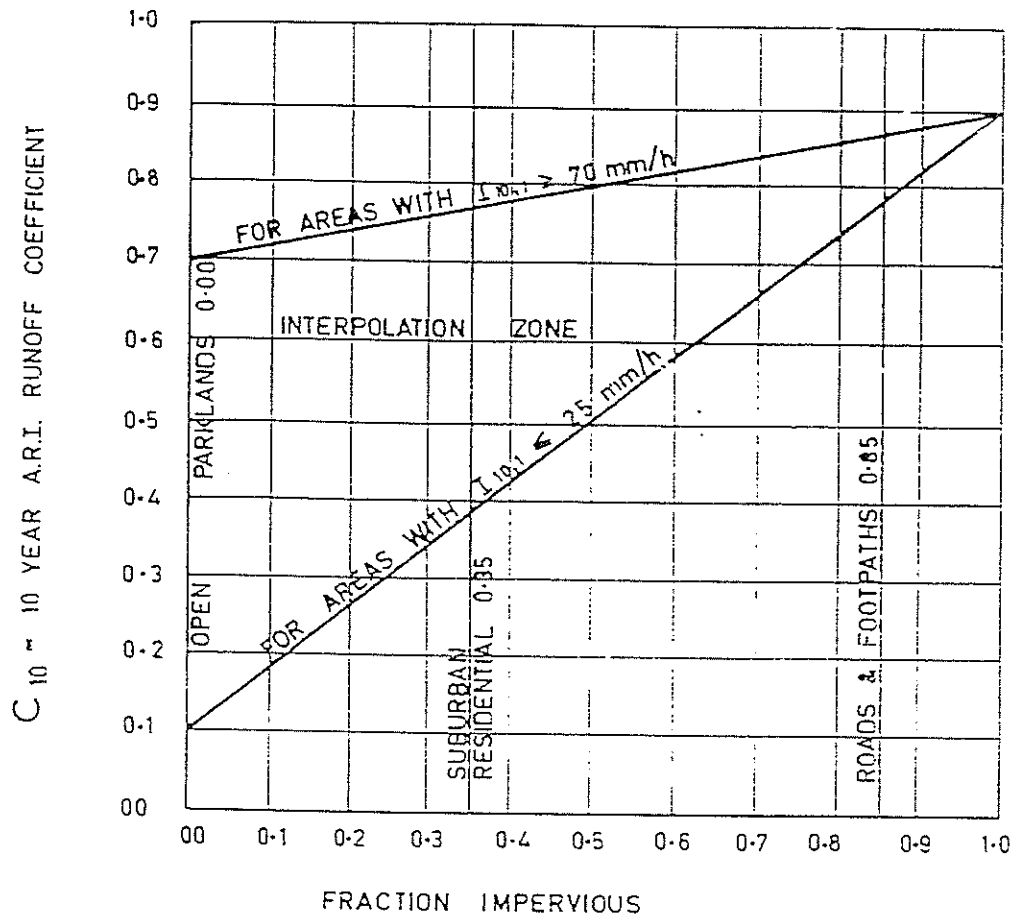
ISSUED 10TH AUGUST 1992 REF.-FN3691

IRRAW DATA 23.25, 4.61, 1.59, 41.57, 0.55, 2.25, 0.210, 1891

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RUNOFF COEFFICIENTS FOR 10 YEAR RECURRENCE INTERVAL.

$I_{10,1}$ IS 10 YEAR AVERAGE RECURRENCE INTERVAL, 1 HOUR DURATION RAINFALL INTENSITY. FOR VALUES OF $I_{10,1}$ BETWEEN 70 mm/h & 25 mm/h C_{10} SHALL BE INTERPOLATED.

FOR RECURRENCE INTERVALS OTHER THAN 10 YEARS THE C_{10} VALUE IS MULTIPLIED BY A FREQUENCY FACTOR GIVEN BELOW.

A.R.I. years	FREQUENCY FACTOR F_y
1	0.8
2	0.85
5	0.95
10	1.0
20	1.05
50	1.15
100	1.2

RUNOFF COEFFICIENT
(Source : Department of Housing Road Manual. 1987)

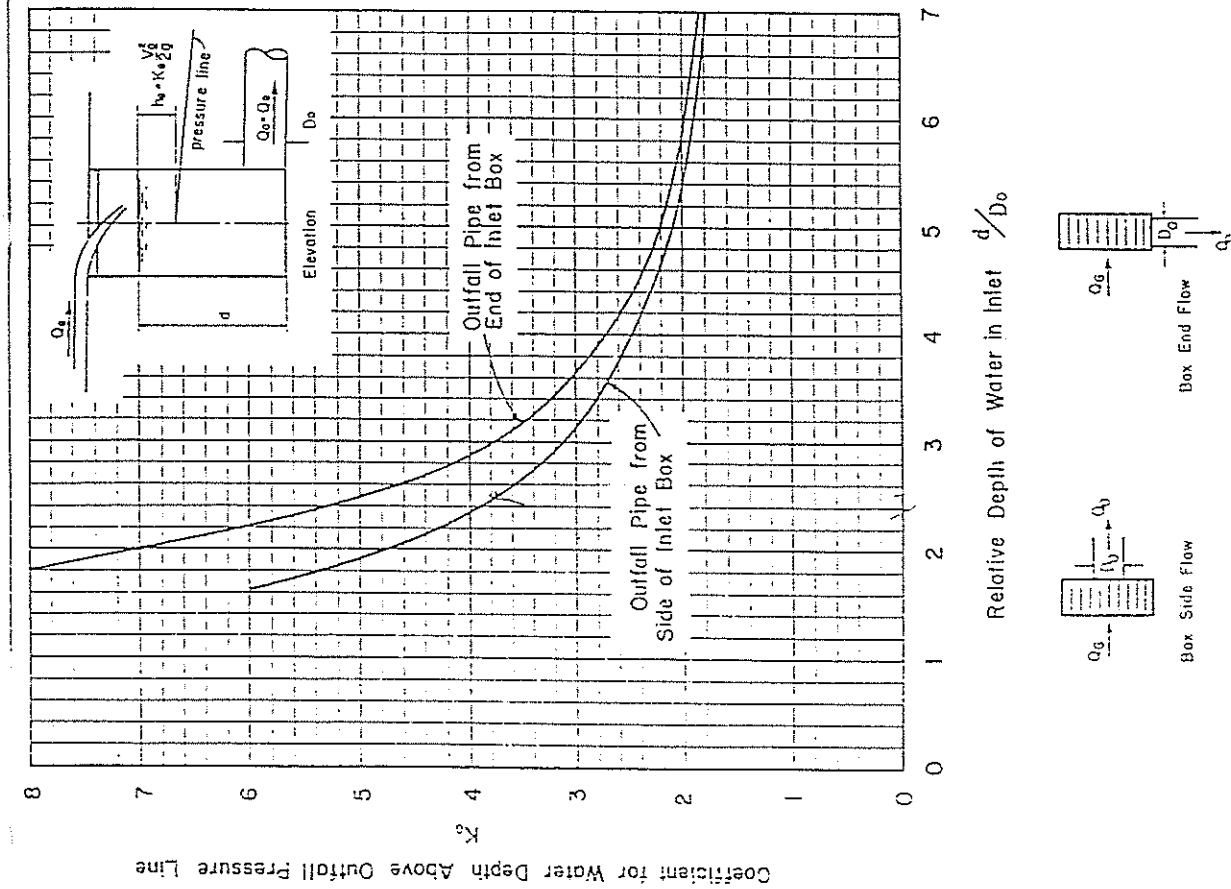


Chart 2. Rectangular inlet with grate flow only.

MISSOURI CHARTS NO. 2 AND NO. 4 FOR PRESSURE CHANGE COEFFICIENTS

(Source: Institution of Engineers, Australian Rainfall and Runoff, Volume 1, 1987)

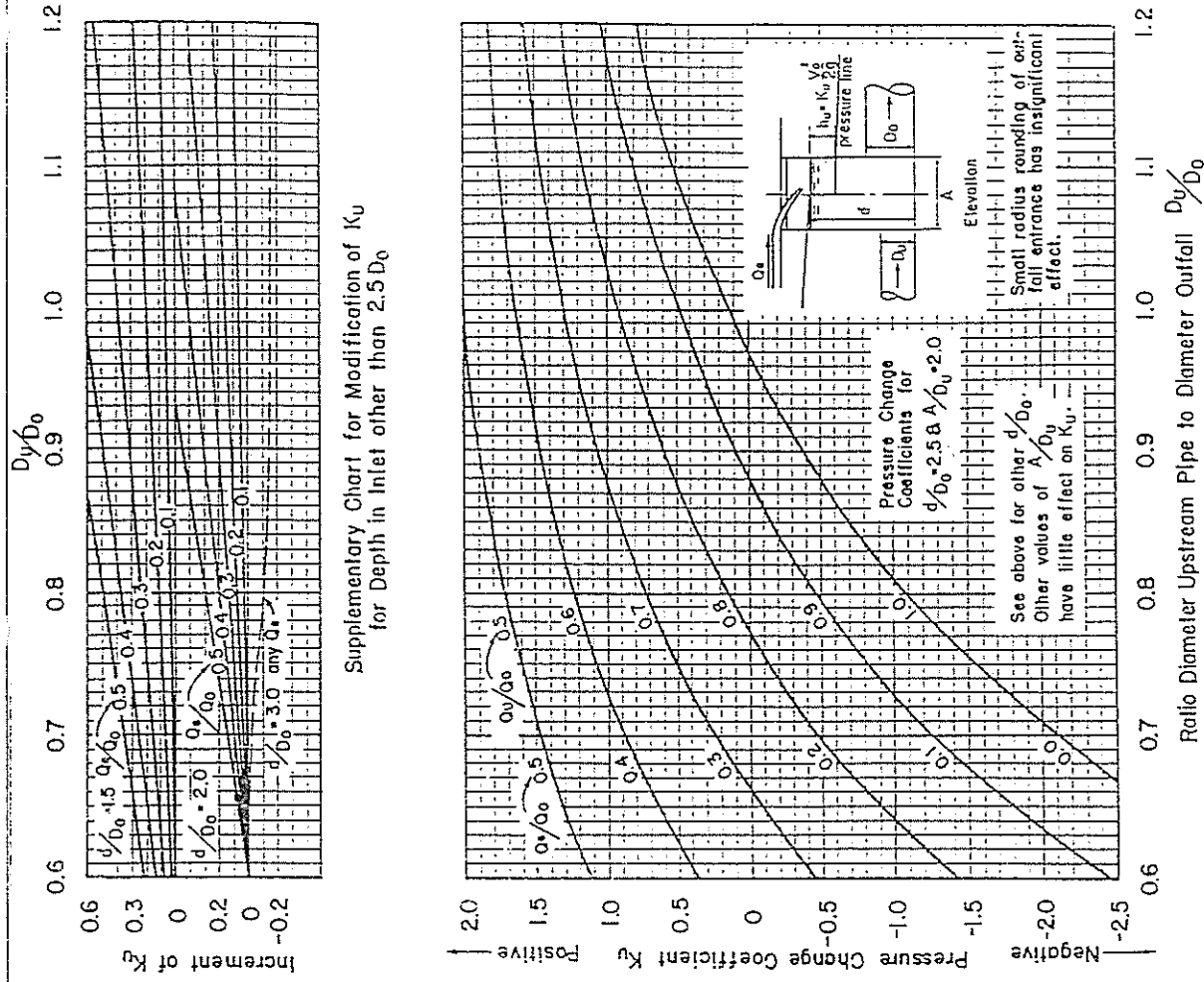


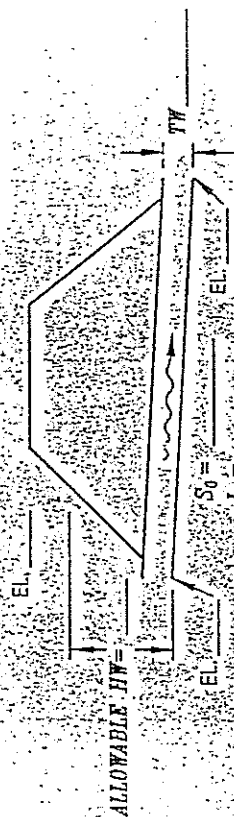
Chart 4. Rectangular inlet with through pipeline and grate flow.

ENGINEER:

DATE:

SKETCH

STATION:



11

$$Q_2$$

TH =

ALL =

Q_1 = Design Discharge.

Q_2 = Check Discharge.

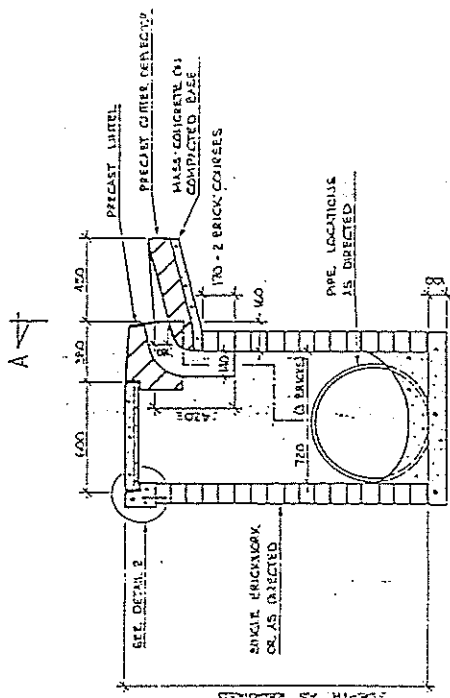
MEAN STREAM VELOCITY=

MAX. STREAM VELOCITY, m^3/s [illegible]

SUMMARY AND RECOMMENDATIONS:

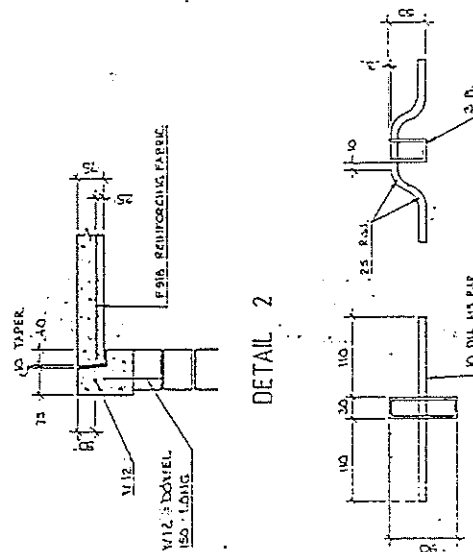
DESIGN FORM FOR CULVERT CALCULATIONS

(Source: AUSTRROADS Waterway Design, A Guide to the Hydraulic design of Bridges, Culverts, and Floodways, 1994)



A

SECTIONAL ELEVATION BB



DETAIL 1

MUNICIPALITY OF GOOMA	
STANDARD	DRAINAGE
INLET	PIT