

4. Comfort Cove

This station was updated in CRA (2015) by creating a partial IDF curve for Twillingate (AUT). There were insufficient data to create a full IDF curve at Twillingate (AUT). For short durations (5, 10-, 15-, and 30-min) users must consult the original Comfort Cove curve. For long durations, the Twillingate (AUT) curve may be used. Both IDF curves are reproduced below

In general, the IDF curve increased during the update (Table 4.1), but some combinations of duration and return period decreased. Where there are decreases greater than 5 percent, users should exercise caution when using the updated IDF curve, or use the EC IDF curve. Therefore, the curves are reproduced below, with the addition of the 20-year return period.

Table 4.1 Differences Between IDF Curves for Twillingate (AUT) and Comfort Cove

Duration	Percent Difference in Precipitation Amount (%) (Difference in Precipitation Amount (mm))					
	Return Period (years)					
	2	5	10	25	50	100
5-min	N/A	N/A	N/A	N/A	N/A	N/A
10-min	N/A	N/A	N/A	N/A	N/A	N/A
15-min	N/A	N/A	N/A	N/A	N/A	N/A
30-min	N/A	N/A	N/A	N/A	N/A	N/A
1-hr	30.3 (4.1)	11.9 (2.3)	4.8 (1.1)	-1.2 (-0.3)	-4.5 (-1.4)	-7.0 (-2.5)
2-hr	42.2 (7.5)	22.4 (5.5)	14.3 (4.1)	7.1 (2.4)	3.1 (1.2)	-0.2 (-0.1)
6-hr	21.5 (6.3)	7.0 (2.7)	0.8 (0.3)	-5.0 (-2.7)	-8.3 (-4.9)	-11.0 (-7.1)
12-hr	16.8 (6.2)	9.2 (4.5)	5.9 (3.3)	2.7 (1.8)	0.9 (0.6)	-0.6 (-0.5)
24-hr	15.7 (7.0)	13.7 (7.9)	12.8 (8.4)	12.0 (9.1)	11.5 (9.6)	11.1 (10.1)

Notes:

Red numbers indicate that the updated IDF curve is lower than the EC-IDF V2.3 IDF curve for that duration and return period.

Bold numbers indicate changes greater than 5 percent.

Section 4.1 presents the IDF curves for Comfort Cove – EC-IDF V2.3. Section 4.2 presents the partial IDF curves for Twillingate (AUT) – Updated.

4.1 Comfort Cove

Office of Climate Change and Energy Efficiency

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes
de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2015/10/30

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COMFORT COVE

NL

8401259

Latitude: 49 16'N Longitude: 54 53'W Elevation/Altitude: 99 m

Years/Années : 1967 - 1995 # Years/Années : 27

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Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

	Year Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
EC-IDF	1967	5.8	10.4	13.0	15.5	20.6	25.1	28.4	33.3	34.0
EC-IDF	1968	3.6	6.1	6.6	6.6	9.1	13.0	20.1	30.5	38.9
EC-IDF	1969	5.3	8.4	11.7	16.8	24.1	35.3	62.2	81.3	91.7
EC-IDF	1970	18.3	27.9	33.8	37.1	39.6	39.6	39.6	39.6	45.2
EC-IDF	1971	2.5	4.1	6.1	11.4	12.7	12.7	31.2	43.4	45.2
EC-IDF	1972	6.1	9.1	9.1	11.9	14.0	18.5	37.1	45.7	46.0
EC-IDF	1973	7.6	11.4	14.5	18.8	19.6	25.1	37.3	48.8	59.4
EC-IDF	1974	3.6	5.1	6.9	10.4	13.7	16.0	21.6	29.0	38.9
EC-IDF	1975	5.1	8.1	10.2	16.0	17.0	17.3	34.3	35.1	35.6
EC-IDF	1976	3.3	5.8	7.4	10.9	13.7	16.3	19.0	31.5	35.3
EC-IDF	1978	5.1	5.3	5.5	7.0	8.6	11.0	16.3	21.0	24.2
EC-IDF	1979	3.0	5.1	7.1	7.1	7.1	10.1	16.2	26.1	31.9
EC-IDF	1980	2.9	5.7	6.5	9.9	11.4	15.6	22.9	35.0	42.1
EC-IDF	1981	-99.9	-99.9	-99.9	-99.9	8.3	16.4	26.0	31.5	46.2
EC-IDF	1982	2.5	3.5	5.0	6.5	10.8	14.6	25.9	34.0	39.7
EC-IDF	1983	3.1	6.2	9.3	10.3	14.6	25.4	47.5	54.2	57.1
EC-IDF	1984	4.1	5.5	7.6	10.4	15.1	18.2	24.4	30.0	40.4
EC-IDF	1985	4.8	6.2	8.7	13.5	14.7	19.0	41.7	46.2	47.1
EC-IDF	1986	2.6	3.3	4.0	5.8	10.2	16.4	35.0	44.4	60.3
EC-IDF	1987	3.6	5.8	6.3	9.3	11.8	12.4	19.0	27.9	30.7
EC-IDF	1988	3.2	4.9	6.0	7.3	13.0	16.2	21.4	27.2	40.0
EC-IDF	1989	4.2	8.0	9.8	17.8	25.4	34.8	40.6	56.6	59.0
EC-IDF	1990	3.9	4.9	5.6	7.6	9.8	14.1	26.4	31.1	51.5
EC-IDF	1991	4.0	4.7	5.1	5.7	8.6	12.3	29.6	33.3	40.5
EC-IDF	1992	4.6	6.0	6.5	7.4	8.2	13.2	32.3	50.5	58.5
EC-IDF	1993	7.2	12.1	17.4	19.2	19.2	19.2	35.3	37.8	47.6
EC-IDF	1994	3.8	5.1	6.6	9.5	11.2	19.7	37.2	43.9	63.5
EC-IDF	1995	3.5	6.1	6.5	9.4	17.2	23.5	42.4	53.3	70.4

	# Yrs. Années	27	27	27	27	28	28	28	28	28
	Mean Moyenne	4.7	7.2	9.0	11.8	14.6	19.0	31.1	39.4	47.2
	Std. Dev. Écart-type	3.0	4.7	5.8	6.5	6.8	7.5	10.6	12.5	14.1
	Skew. Dissymétrie	3.73	3.54	3.25	2.44	2.03	1.44	0.84	1.45	1.22
	Kurtosis	19.11	17.72	15.46	11.08	8.71	4.83	4.38	6.40	5.56

*-99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité
pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
1969	12 h	81.3	78.6
1969	24 h	91.7	91.3
1970	5 min	18.3	14.2
1970	10 min	27.9	22.0
1970	15 min	33.8	27.3
1970	30 min	37.1	32.2
1970	1 h	39.6	36.1

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

Duration/Durée	2	5	10	20	25	50	100	#Years
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	Années
EC-IDF 5 min	4.2	6.9	8.7	10.4	10.9	12.6	14.2	27
EC-IDF 10 min	6.4	10.6	13.3	16.0	16.8	19.4	22.0	27
EC-IDF 15 min	8.0	13.2	16.6	19.9	20.9	24.2	27.3	27
EC-IDF 30 min	10.8	16.5	20.3	23.9	25.1	28.7	32.2	27
EC-IDF 1 h	13.5	19.5	23.5	27.4	28.6	32.3	36.1	28
EC-IDF 2 h	17.7	24.4	28.7	32.9	34.3	38.4	42.4	28
EC-IDF 6 h	29.4	38.7	44.9	50.9	52.8	58.6	64.3	28
EC-IDF 12 h	37.3	48.4	55.7	62.7	65.0	71.8	78.6	28
EC-IDF 24 h	44.9	57.3	65.5	73.4	75.9	83.7	91.3	28

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

Duration/Durée	2	5	10	20	25	50	100	#Years
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	Années
EC-IDF 5 min	50.6	82.7	104.0	124.3	130.8	150.7	170.5	27
	+/- 12.6	+/- 21.2	+/- 28.6	+/- 36.1	+/- 38.6	+/- 46.1	+/- 53.8	27
EC-IDF 10 min	38.7	63.6	80.1	95.9	100.9	116.4	131.7	27
	+/- 9.8	+/- 16.4	+/- 22.2	+/- 28.0	+/- 29.9	+/- 35.8	+/- 41.7	27
EC-IDF 15 min	32.1	52.8	66.5	79.6	83.8	96.6	109.3	27
	+/- 8.1	+/- 13.6	+/- 18.4	+/- 23.3	+/- 24.8	+/- 29.7	+/- 34.6	27
EC-IDF 30 min	21.5	33.0	40.6	47.9	50.2	57.3	64.4	27
	+/- 4.5	+/- 7.6	+/- 10.2	+/- 12.9	+/- 13.8	+/- 16.5	+/- 19.2	27
EC-IDF 1 h	13.5	19.5	23.5	27.4	28.6	32.3	36.1	28
	+/- 2.3	+/- 3.9	+/- 5.3	+/- 6.7	+/- 7.1	+/- 8.5	+/- 9.9	28
EC-IDF 2 h	8.9	12.2	14.4	16.5	17.1	19.2	21.2	28
	+/- 1.3	+/- 2.1	+/- 2.9	+/- 3.7	+/- 3.9	+/- 4.7	+/- 5.4	28
EC-IDF 6 h	4.9	6.5	7.5	8.5	8.8	9.8	10.7	28
	+/- 0.6	+/- 1.0	+/- 1.4	+/- 1.7	+/- 1.8	+/- 2.2	+/- 2.6	28
EC-IDF 12 h	3.1	4.0	4.6	5.2	5.4	6.0	6.6	28
	+/- 0.4	+/- 0.6	+/- 0.8	+/- 1.0	+/- 1.1	+/- 1.3	+/- 1.5	28
EC-IDF 24 h	1.9	2.4	2.7	3.1	3.2	3.5	3.8	28
	+/- 0.2	+/- 0.3	+/- 0.5	+/- 0.6	+/- 0.6	+/- 0.7	+/- 0.9	28

Table 3 : Interpolation Equation / Équation d'interpolation: $R = A \cdot T^B$

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)

RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)

T = Rainfall duration (h) / Durée de la pluie (h)

Statistics/Statistiques	2	5	10	20	25	50	100
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans
Mean of RR/Moyenne de RR	19.5	30.7	38.2	45.4	47.6	54.6	61.6
Std. Dev. /Écart-type (RR)	17.5	29.3	37.1	44.6	46.9	54.3	61.5
Std. Error/Erreur-type	2.8	5.7	7.7	9.7	10.3	12.3	14.3
Coefficient (A)	13.3	19.6	23.7	27.6	28.8	32.6	36.4
Exponent/Exposant (B)	-0.589	-0.641	-0.661	-0.675	-0.678	-0.687	-0.695
Mean % Error/% erreur moyenne	5.0	5.8	6.1	6.4	6.5	6.6	6.8

Short Duration Rainfall Intensity-Duration-Frequency Data Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

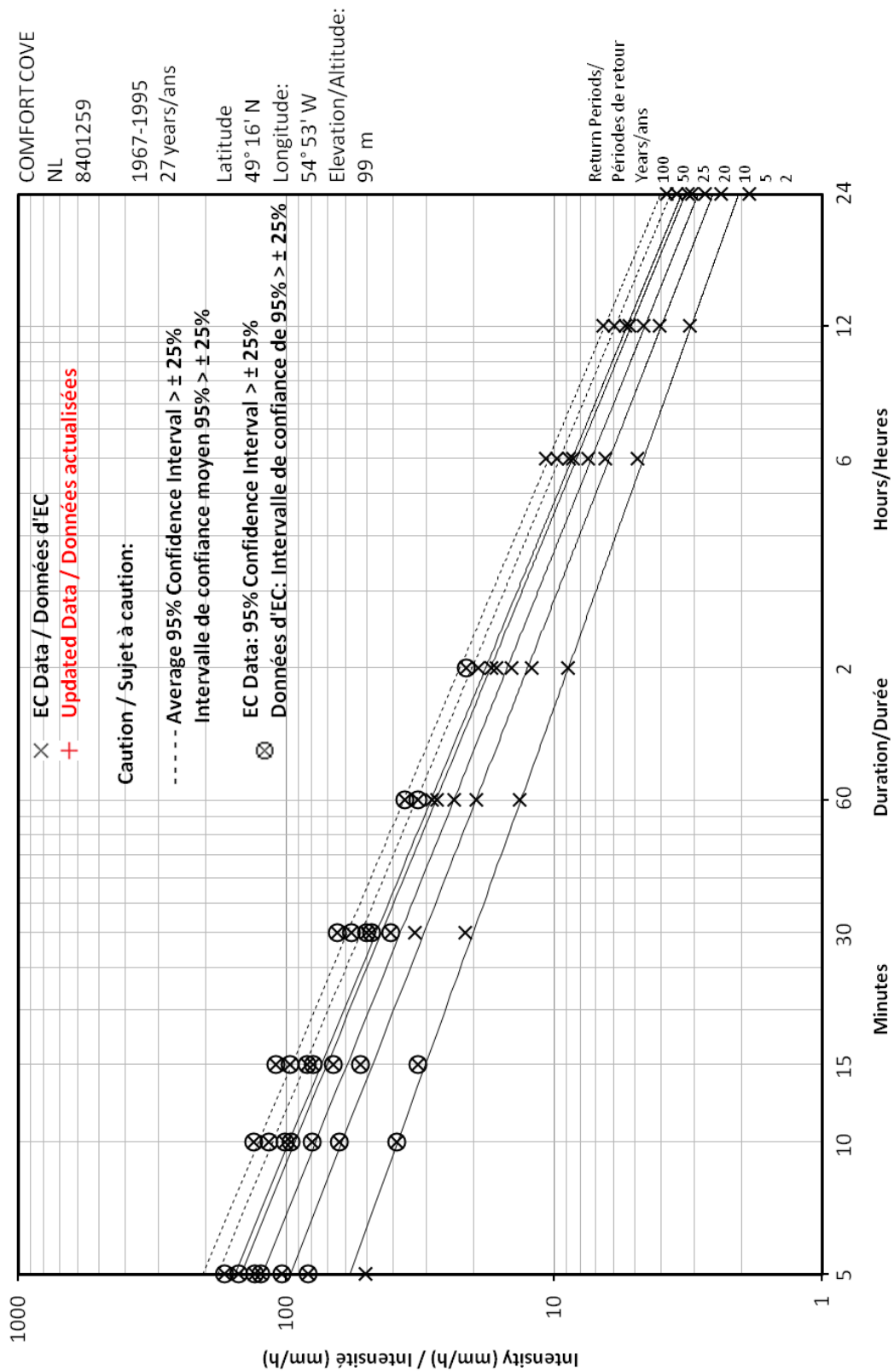


Figure 4.1 Comfort Cove IDF Curve – EC IDF V2.3

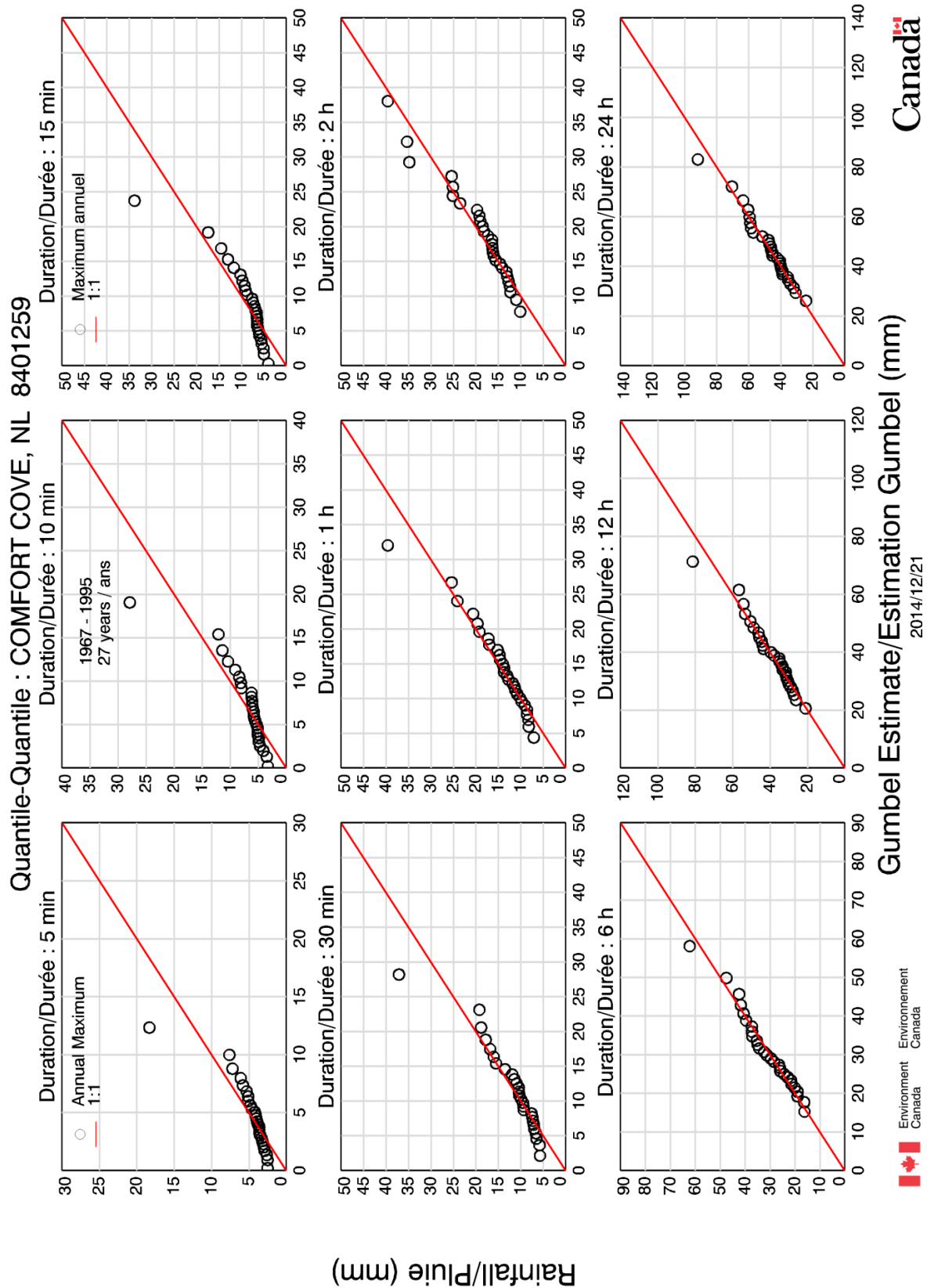


Figure 4.2 Comfort Cove Quantile-Quantile Plot – EC IDF V2.3

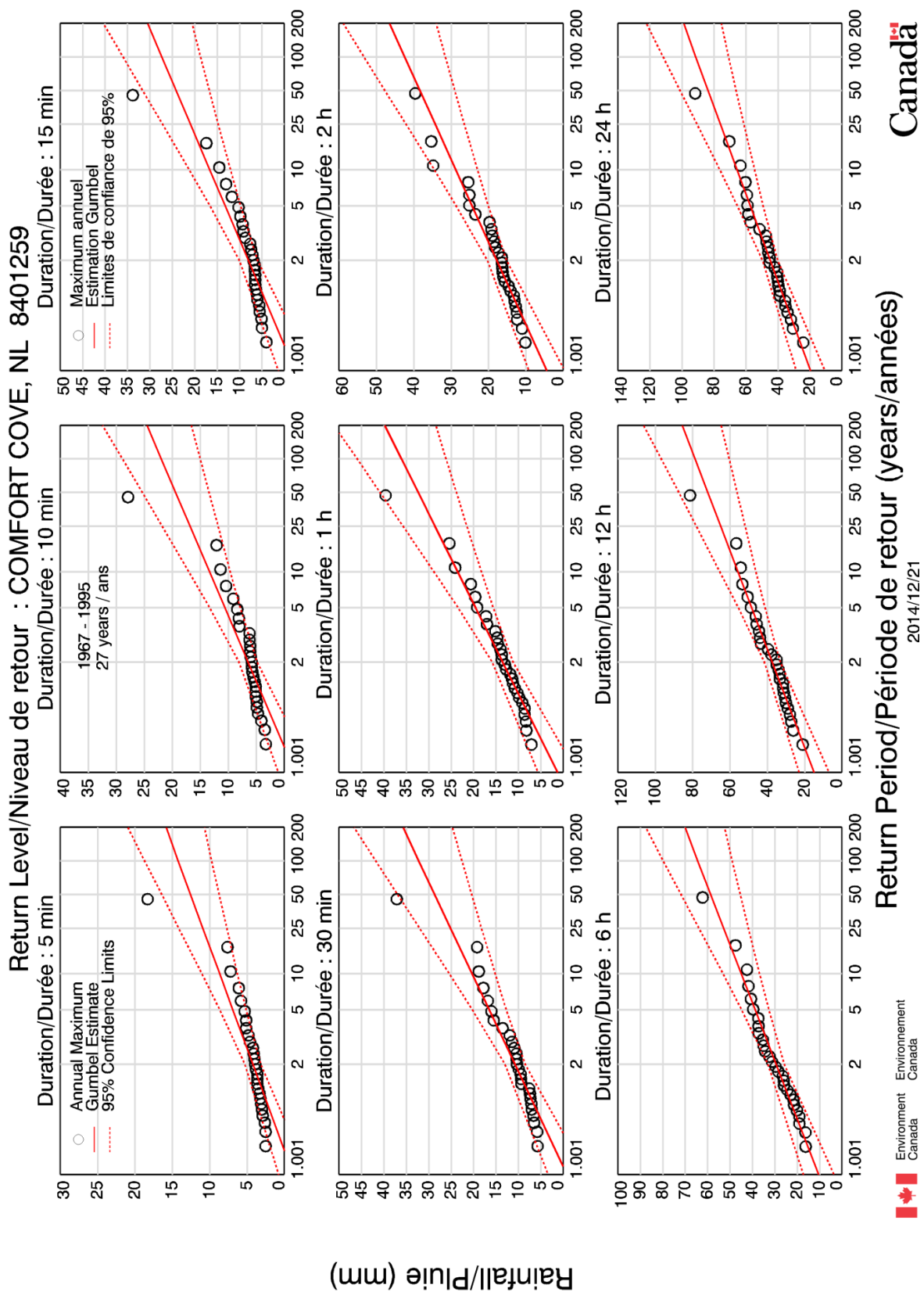


Figure 4.3 Comfort Cove Return Level Plot – EC IDF V2.3

Trend/Tendance : COMFORT COVE, NL 8401259

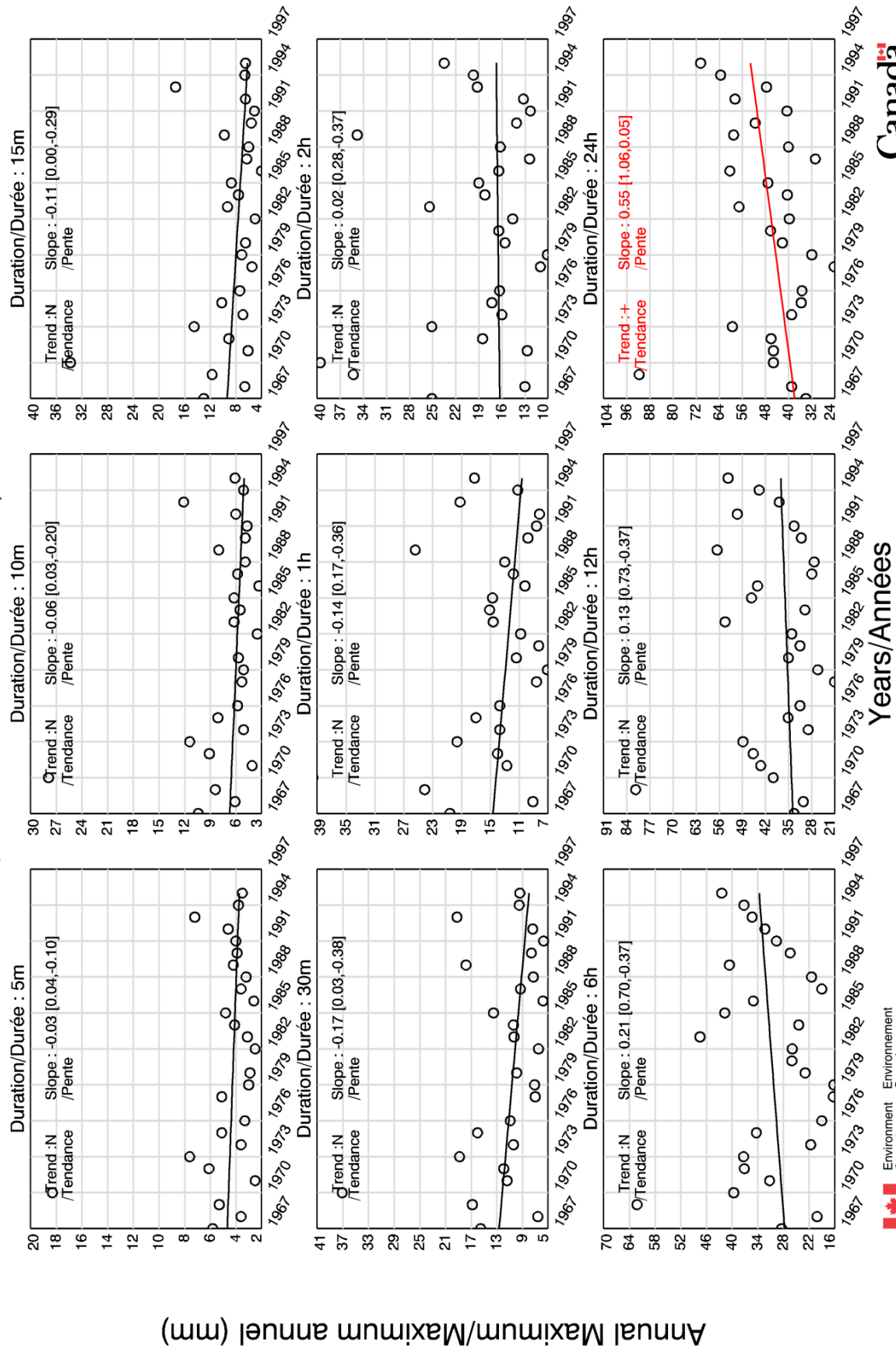


Figure 4.4 Comfort Cove Trend Plot – EC IDF V2.3

4.2 Twillingate (AUT)

Office of Climate Change and Energy Efficiency

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes
de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2015/10/30

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TWILLINGATE                               NL      8404025
Generated with 5-min and 1-hr data measured at Twillingate (AUT) (8402520):
2004-2014
Latitude: 49 41'N Longitude: 54 48'W Elevation/Altitude: 92.3 m
Years/Années : 2004 - 2014 # Years/Années : 7
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Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

	Year Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
UPDATE	2004	4.2	6.2	6.6	8.4	16.4	23.8	35.2	56.0	59.2
UPDATE	2005	4.4	7.8	10.0	14.6	24.0	32.6	33.2	33.2	37.4
UPDATE	2006	4.6	4.8	5.6	9.2	15.6	25.8	32.2	39.6	45.8
UPDATE	2007	4.6	7.2	8.6	11.6	13.6	20.6	40.2	45.0	45.4
UPDATE	2008	7.8	15.6	21.4	22.4	23.4	28.4	34.8	35.2	50.8
UPDATE	2009	3.6	6.0	6.8	8.8	15.6	21.0	26.4	35.8	46.6
UPDATE	2010	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	44.8	82.4
UPDATE	2011	-99.9	-99.9	-99.9	-99.9	25.0	28.4	31.2	-99.9	-99.9
UPDATE	2012	8.2	13.6	14.6	14.6	17.0	25.8	46.4	48.8	49.0
UPDATE	2013	-99.9	-99.9	-99.9	-99.9	11.2	19.2	44.0	67.4	79.4
UPDATE	2014	NM	NM	NM	NM	22.0	35.1	43.8	47.0	47.6
# Yrs.		7	7	7	7	10	10	10	10	10
Années										
Mean		5.3	8.7	10.5	12.8	18.4	26.1	36.7	45.3	54.4
Moyenne										
Std. Dev.		1.9	4.2	5.7	5.0	4.8	5.2	6.5	10.5	15.0
Écart-type										
Skew.		1.09	1.09	1.44	1.33	0.13	0.41	0.13	1.00	1.26
Dissymétrie										
Kurtosis		4.02	4.28	6.09	6.22	2.58	3.35	2.94	4.82	4.36

*-99.9 Indicates Missing Data/Données manquantes

* NM Indicates No Measurements/Aucunes mesures

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

Duration/Durée	2	5	10	20	25	50	100	#Years Années
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	
EC-IDF 5 min	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7
EC-IDF 10 min	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7
EC-IDF 15 min	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7
EC-IDF 30 min	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7
UPDATE 1 h	17.6	21.9	24.7	27.4	28.2	30.9	33.5	10
UPDATE 2 h	25.2	29.8	32.9	35.8	36.7	39.5	42.4	10
UPDATE 6 h	35.7	41.4	45.3	48.9	50.1	53.7	57.2	10
UPDATE 12 h	43.6	52.8	59.0	64.8	66.7	72.5	78.2	10
UPDATE 24 h	51.9	65.2	73.9	82.3	85.0	93.2	101.4	10

* There were insufficient data to generate the IDF curve for 5-, 10-, 15-, 30-min

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

Duration/Durée	2	5	10	20	25	50	100	#Years Années
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	
EC-IDF 5 min	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7
	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	7
EC-IDF 10 min	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7
	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	7
EC-IDF 15 min	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7
	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	7
EC-IDF 30 min	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	7
	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	+/-99.9	7
UPDATE 1 h	17.6	21.9	24.7	27.4	28.2	30.9	33.5	10
	+/- 2.7	+/- 4.6	+/- 6.2	+/- 7.9	+/- 8.4	+/- 10.1	+/- 11.7	10
UPDATE 2 h	12.6	14.9	16.4	17.9	18.3	19.8	21.2	10
	+/- 1.5	+/- 2.5	+/- 3.4	+/- 4.2	+/- 4.5	+/- 5.4	+/- 6.3	10
UPDATE 6 h	5.9	6.9	7.5	8.2	8.4	8.9	9.5	10
	+/- 0.6	+/- 1.0	+/- 1.4	+/- 1.8	+/- 1.9	+/- 2.3	+/- 2.7	10
UPDATE 12 h	3.6	4.4	4.9	5.4	5.6	6.0	6.5	10
	+/- 0.5	+/- 0.8	+/- 1.1	+/- 1.4	+/- 1.5	+/- 1.8	+/- 2.1	10
UPDATE 24 h	2.2	2.7	3.1	3.4	3.5	3.9	4.2	10
	+/- 0.4	+/- 0.6	+/- 0.8	+/- 1.0	+/- 1.1	+/- 1.3	+/- 1.5	10

* There were insufficient data to generate the IDF curve for 5-, 10-, 15-, 30-min

Table 3 : Interpolation Equation / Équation d'interpolation: $R = A \cdot T^B$

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)

RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)

T = Rainfall duration (h) / Durée de la pluie (h)

Statistics/Statistiques	2	5	10	20	25	50	100
	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans	yr/ans
Mean of RR/Moyenne de RR	8.4	10.2	11.3	12.5	12.8	13.9	15.0
Std. Dev. /Écart-type (RR)	6.5	8.0	9.0	10.0	10.3	11.3	12.2
Std. Error/Erreur-type	0.9	0.6	0.4	0.3	0.3	0.4	0.5
Coefficient (A)	18.8	22.6	25.1	27.5	28.3	30.6	32.9
Exponent/Exposant (B)	-0.667	-0.662	-0.660	-0.658	-0.658	-0.656	-0.655
Mean % Error/% erreur moyenne	4.6	2.0	1.6	1.7	1.7	2.2	2.6

Short Duration Rainfall Intensity-Duration-Frequency Data Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

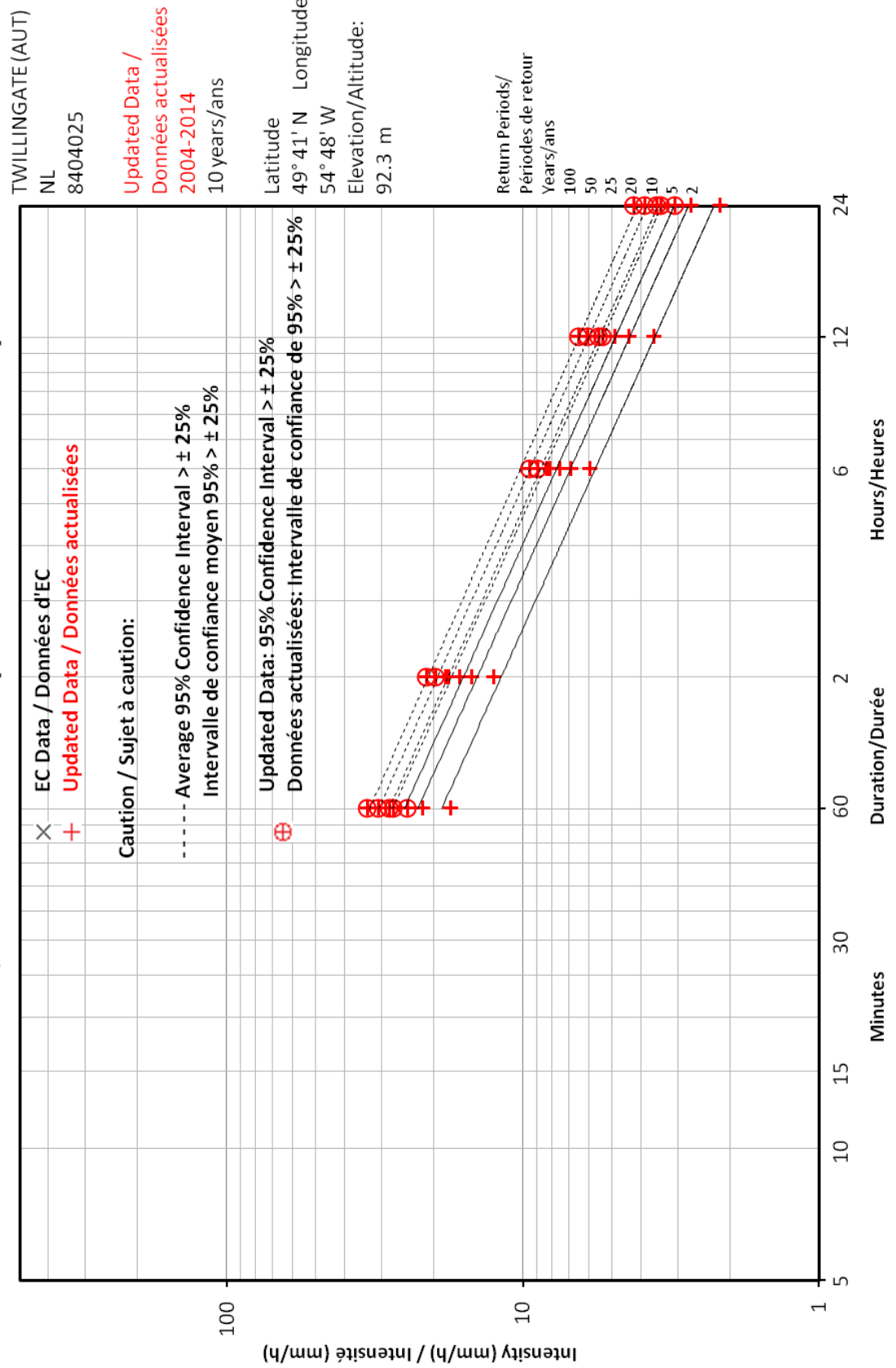
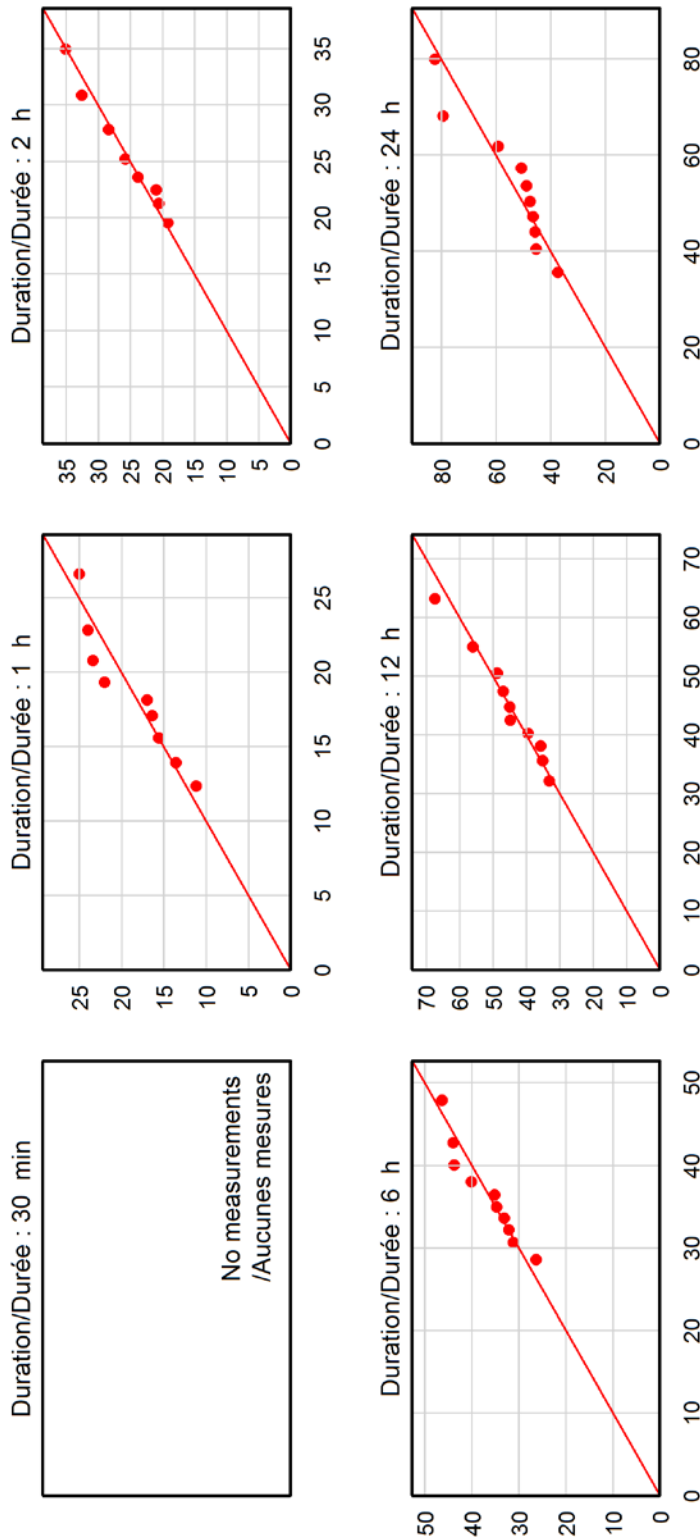


Figure 4.5 Twillingate (AUT) IDF Curve – Updated

Quantile-Quantile : TWILLINGATE (AUT), NL 8404025



Rainfall/Pluie (mm)



Gumbel Estimate/Estimation Gumbel (mm)

Figure 4.6 Twillingate (AUT) Quantile-Quantile Plot – Updated

Return Level/Niveau de retour : TWILLINGATE (AUT), NL 8404025

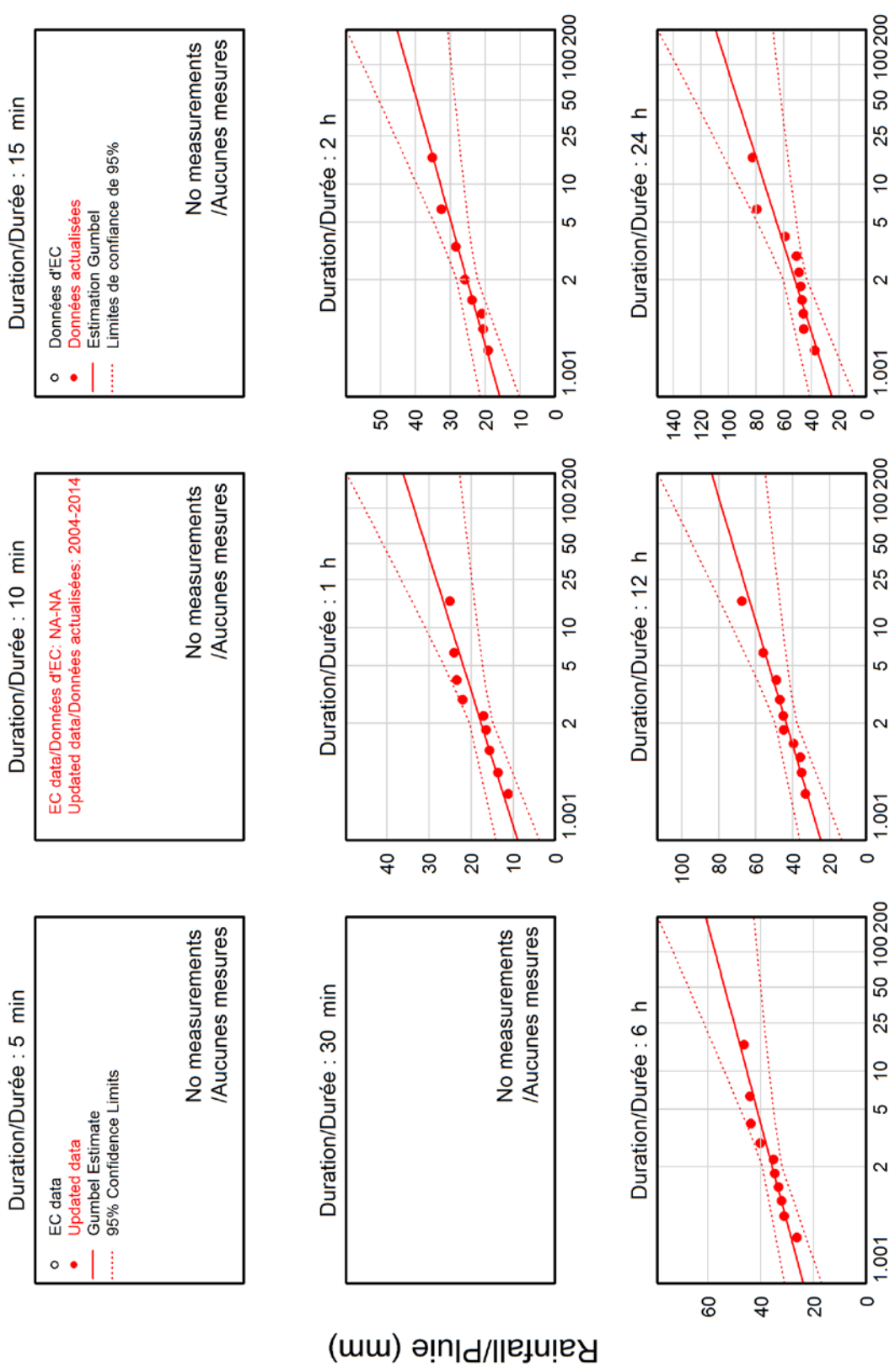


Figure 4.7 Twillingate (AUT) Return Level Plot – Updated

Trend/Tendance : TWILLINGATE (AUT), NL 8404025

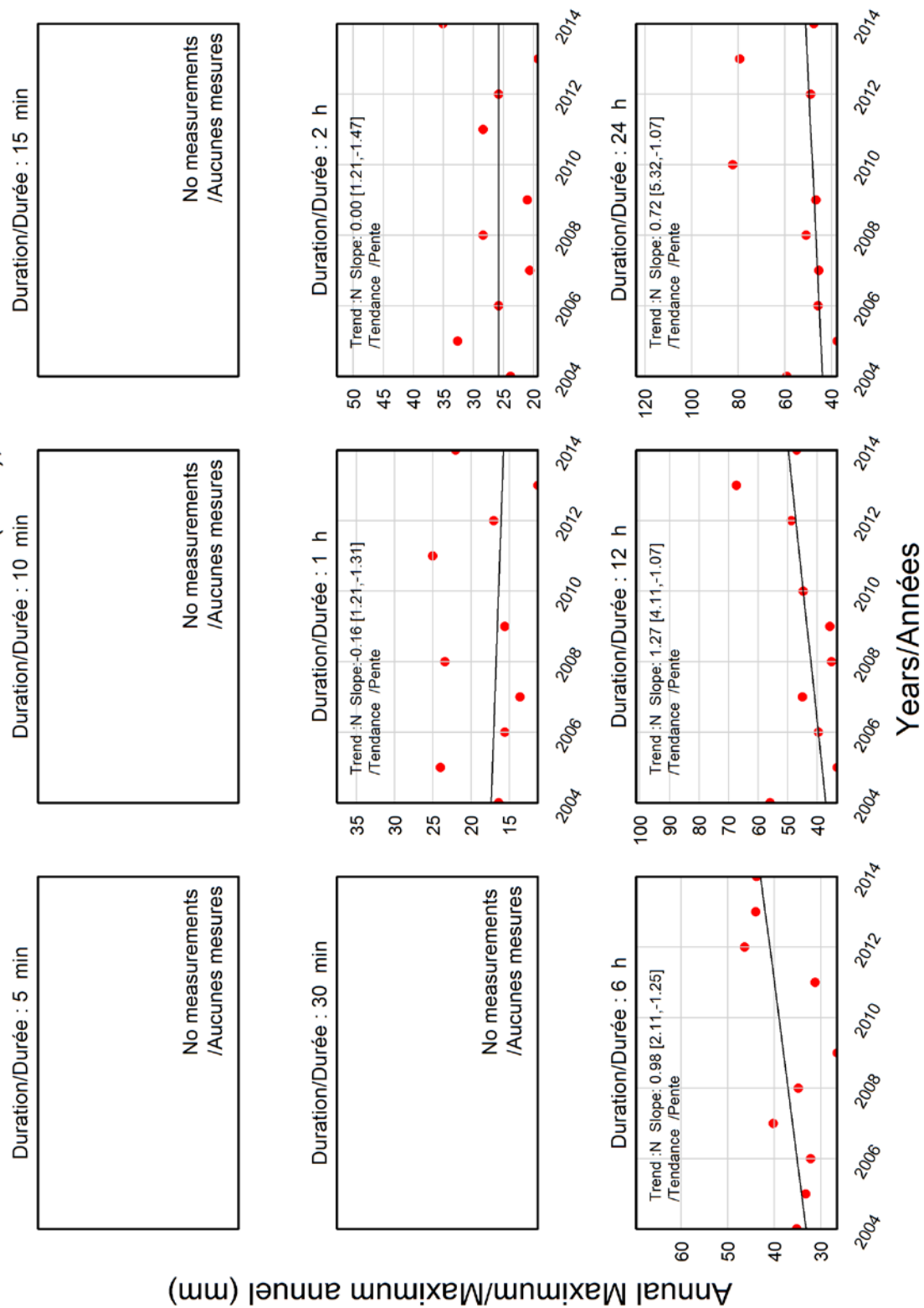


Figure 4.8 Twillingate (AUT) Trend Plot - Updated