

## 12. St. John's A

This station was updated in CRA (2015). In addition, a new IDF curve was produced for Ruby Line. The updated IDF curves from CRA (2015) are reproduced below, with the addition of the 20-year return period.

### 12.1 St. John's A

This IDF curve was updated using 5-min data from Windsor Lake (City of St. John's station). The IDF curve decreased for short durations and increased for long durations during the update (Table 12.1). Where there are decreases greater than 5 percent, users should exercise caution when using the updated IDF curve, or use the EC IDF curve.

**Table 12.1 Differences Between IDF Curves for St. John's A**

| Percent Difference in Precipitation Amount (%)<br>(Difference in Precipitation Amount (mm)) |                       |                |                |                |                |                |
|---------------------------------------------------------------------------------------------|-----------------------|----------------|----------------|----------------|----------------|----------------|
| Duration                                                                                    | Return Period (years) |                |                |                |                |                |
|                                                                                             | 2                     | 5              | 10             | 25             | 50             | 100            |
| 5-min                                                                                       | -1.7<br>(-0.1)        | -4.3<br>(-0.3) | -5.3<br>(-0.4) | -6.2<br>(-0.6) | -6.8<br>(-0.7) | -7.2<br>(-0.8) |
| 10-min                                                                                      | 1.0<br>(0.1)          | -1.7<br>(-0.2) | -2.8<br>(-0.3) | -3.8<br>(-0.5) | -4.4<br>(-0.6) | -4.9<br>(-0.8) |
| 15-min                                                                                      | 2.6<br>(0.2)          | 0.1<br>(0.0)   | -1.0<br>(-0.1) | -2.0<br>(-0.3) | -2.5<br>(-0.5) | -2.9<br>(-0.6) |
| 30-min                                                                                      | 5.0<br>(0.6)          | 5.0<br>(0.8)   | 5.0<br>(1.0)   | 5.0<br>(1.1)   | 5.1<br>(1.3)   | 5.1<br>(1.4)   |
| 1-hr                                                                                        | 7.8<br>(1.4)          | 11.0<br>(2.5)  | 12.5<br>(3.2)  | 13.8<br>(4.1)  | 14.6<br>(4.8)  | 15.3<br>(5.4)  |
| 2-hr                                                                                        | 9.1<br>(2.2)          | 10.9<br>(3.4)  | 11.6<br>(4.3)  | 12.3<br>(5.3)  | 12.7<br>(6.1)  | 13.0<br>(6.9)  |
| 6-hr                                                                                        | 7.7<br>(3.1)          | 12.5<br>(6.4)  | 14.8<br>(8.5)  | 17.0<br>(11.3) | 18.4<br>(13.3) | 19.5<br>(15.3) |
| 12-hr                                                                                       | 7.5<br>(3.9)          | 15.5<br>(9.9)  | 19.4<br>(13.8) | 23.3<br>(18.8) | 25.7<br>(22.5) | 27.7<br>(26.2) |
| 24-hr                                                                                       | 8.1<br>(5.1)          | 13.9<br>(10.5) | 16.8<br>(14.0) | 19.6<br>(18.6) | 21.4<br>(21.9) | 22.8<br>(25.3) |

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.

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

ST JOHN'S A NL 8403506  
Updated with 5-min data measured at Windsor Lake (City of St. John's Station) :  
1999 - 2014  
Latitude: 47 37'N Longitude: 52 44'W Elevation/Altitude: 140 m  
Years/Années : 1949 - 2014 # Years/Années : 48

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

|          | Year<br>Année    | 5 min | 10 min | 15 min | 30 min | 1 h  | 2 h  | 6 h   | 12 h  | 24 h  |
|----------|------------------|-------|--------|--------|--------|------|------|-------|-------|-------|
| *EC-IDF* | 1949             | 8.9   | 8.9    | 10.2   | 17.5   | 28.2 | 52.6 | 61.7  | 62.0  | 63.5  |
| *EC-IDF* | 1961             | 3.0   | 4.3    | 5.3    | 6.9    | 8.6  | 13.5 | 25.7  | 35.6  | 38.6  |
| *EC-IDF* | 1962             | 2.8   | 4.6    | 4.6    | 8.1    | 13.0 | 20.6 | 33.8  | 54.9  | 59.7  |
| *EC-IDF* | 1963             | 10.2  | 11.2   | 11.7   | 13.7   | 18.5 | 23.6 | 40.9  | 52.3  | 57.9  |
| *EC-IDF* | 1964             | 4.3   | 6.9    | 7.9    | 11.2   | 19.3 | 28.2 | 54.9  | 72.6  | 77.5  |
| *EC-IDF* | 1965             | 5.3   | 7.4    | 9.9    | 13.0   | 17.8 | 19.6 | 32.3  | 51.8  | 59.7  |
| *EC-IDF* | 1966             | 8.4   | 13.2   | 17.0   | 25.4   | 29.7 | 43.7 | 48.5  | 64.5  | 85.3  |
| *EC-IDF* | 1967             | 2.3   | 3.8    | 5.3    | 9.9    | 10.9 | 16.3 | 29.5  | 44.4  | 58.4  |
| *EC-IDF* | 1968             | 6.3   | 12.7   | 13.7   | 14.7   | 17.5 | 22.4 | 41.9  | 55.1  | 61.7  |
| *EC-IDF* | 1969             | 5.6   | 7.1    | 8.4    | 8.6    | 11.7 | 19.0 | 30.7  | 34.5  | 48.3  |
| *EC-IDF* | 1970             | 5.6   | 7.1    | 10.7   | 15.2   | 16.3 | 19.6 | 42.4  | 62.5  | 87.4  |
| *EC-IDF* | 1971             | 6.3   | 10.4   | 14.5   | 16.0   | 19.0 | 22.1 | 34.3  | 41.1  | 77.7  |
| *EC-IDF* | 1972             | 4.8   | 5.3    | 6.6    | 10.9   | 15.0 | 20.6 | 47.8  | 72.6  | 89.2  |
| *EC-IDF* | 1973             | 5.3   | 6.9    | 7.9    | 10.4   | 16.5 | 30.0 | 49.5  | 65.8  | 67.1  |
| *EC-IDF* | 1974             | 3.6   | 5.6    | 6.3    | 9.9    | 16.3 | 22.4 | 42.4  | 53.3  | 72.9  |
| *EC-IDF* | 1975             | 8.1   | 10.4   | 12.2   | 17.8   | 19.0 | 19.6 | 46.5  | 71.9  | 82.3  |
| *EC-IDF* | 1976             | 3.6   | 4.8    | 6.1    | 8.4    | 12.7 | 19.0 | 33.8  | 42.2  | 53.6  |
| *EC-IDF* | 1977             | 3.8   | 5.6    | 7.6    | 11.7   | 17.5 | 23.4 | 38.6  | 40.4  | 41.4  |
| *EC-IDF* | 1978             | 4.0   | 5.9    | 7.4    | 7.6    | 12.9 | 13.1 | 27.1  | 37.6  | 43.0  |
| *EC-IDF* | 1979             | 3.2   | 4.2    | 5.9    | 10.2   | 16.2 | 18.1 | 29.3  | 41.9  | 49.2  |
| *EC-IDF* | 1980             | 3.2   | 6.1    | 7.4    | 12.2   | 17.4 | 23.9 | 33.6  | 41.6  | 69.8  |
| *EC-IDF* | 1981             | -99.9 | -99.9  | -99.9  | -99.9  | 15.0 | 22.4 | 46.7  | 72.5  | 82.6  |
| *EC-IDF* | 1982             | 5.1   | 9.0    | 12.9   | 17.1   | 24.5 | 35.9 | 80.3  | 82.4  | 84.0  |
| *EC-IDF* | 1983             | 1.6   | 3.2    | 4.8    | 9.6    | 19.2 | 26.5 | 47.3  | 52.8  | 54.7  |
| *EC-IDF* | 1984             | 5.0   | 9.9    | 13.0   | 21.5   | 27.1 | 36.6 | 61.0  | 74.0  | 75.3  |
| *EC-IDF* | 1985             | 5.2   | 7.1    | 9.8    | 11.3   | 14.1 | 18.5 | 36.0  | 54.9  | 82.9  |
| *EC-IDF* | 1986             | 3.1   | 4.8    | 7.2    | 14.3   | 23.3 | 27.9 | 40.2  | 58.9  | 70.6  |
| *EC-IDF* | 1987             | 5.1   | 7.3    | 8.6    | 16.2   | 23.5 | 24.2 | 30.6  | 36.6  | 46.8  |
| *EC-IDF* | 1988             | 6.6   | 10.6   | 13.2   | 17.4   | 23.4 | 25.9 | 44.8  | 45.8  | 49.0  |
| *EC-IDF* | 1989             | 2.9   | 4.5    | 6.2    | 8.0    | 10.9 | 19.7 | 43.4  | 51.6  | 51.6  |
| *EC-IDF* | 1990             | 3.7   | 5.9    | 6.5    | 12.6   | 19.2 | 28.5 | 48.1  | 68.7  | 85.2  |
| *EC-IDF* | 1991             | 7.8   | 11.4   | 15.9   | 23.3   | 28.8 | 29.5 | 51.2  | 52.2  | 59.7  |
| *EC-IDF* | 1993             | 4.4   | 7.0    | 7.6    | 11.5   | 20.0 | 31.3 | 47.6  | 49.4  | 55.3  |
| *EC-IDF* | 1994             | 6.2   | 9.1    | 10.3   | 12.6   | 12.8 | 14.9 | -99.9 | -99.9 | 67.5  |
| *EC-IDF* | 1995             | 5.2   | 9.8    | 14.5   | 16.6   | 27.6 | 46.7 | 55.9  | 58.8  | 61.6  |
| *EC-IDF* | 1996             | 4.8   | 6.2    | 7.4    | 10.2   | 15.4 | 27.2 | 40.2  | 44.0  | 48.4  |
| *UPDATE* | 1999             | 3.2   | 5.0    | 6.6    | 9.0    | 15.3 | 25.1 | 42.4  | 63.4  | 99.3  |
| *UPDATE* | 2000             | 3.8   | 6.7    | 8.6    | 13.0   | 21.5 | 29.9 | 43.4  | 58.9  | 70.5  |
| *UPDATE* | 2001             | 4.8   | 8.8    | 11.5   | 19.5   | 33.7 | 62.0 | 107.1 | 147.7 | 149.6 |
| *UPDATE* | 2003             | 5.5   | 8.6    | 11.3   | 19.3   | 32.4 | 42.2 | 50.4  | 76.1  | 92.4  |
| *UPDATE* | 2004             | 3.9   | 7.4    | 10.6   | 17.2   | 23.6 | 26.1 | 59.0  | 71.5  | 76.6  |
| *UPDATE* | 2005             | 5.0   | 7.1    | 8.4    | 13.1   | 21.2 | 28.6 | 65.4  | 82.3  | 98.9  |
| *UPDATE* | 2006             | 4.8   | 8.1    | 11.1   | 17.5   | 30.4 | 36.4 | 51.9  | 53.7  | 58.5  |
| *UPDATE* | 2007             | 6.3   | 10.3   | 14.6   | 27.2   | 41.1 | 48.1 | 79.2  | 104.2 | 104.9 |
| *UPDATE* | 2009             | 5.0   | 6.6    | 7.4    | 10.6   | 16.9 | 24.7 | 46.7  | 58.2  | 65.0  |
| *UPDATE* | 2010             | 4.1   | 7.5    | 10.2   | 14.2   | 21.2 | 36.2 | 62.7  | 75.0  | 113.8 |
| *UPDATE* | 2011             | 3.2   | 4.8    | 7.3    | 12.0   | 15.7 | 20.6 | 33.3  | 38.1  | 54.9  |
| *UPDATE* | 2013             | 4.4   | 6.6    | 8.5    | 11.3   | 15.9 | 27.2 | 46.3  | 56.1  | 76.3  |
| *UPDATE* | 2014             | 5.5   | 9.6    | 13.3   | 19.4   | 25.8 | 37.9 | 48.7  | 61.0  | 73.7  |
| <hr/>    |                  |       |        |        |        |      |      |       |       |       |
|          | # Yrs.<br>Années | 48    | 48     | 48     | 48     | 49   | 49   | 48    | 48    | 49    |
|          | Mean<br>Moyenne  | 4.9   | 7.4    | 9.5    | 13.9   | 19.9 | 27.6 | 46.6  | 59.3  | 70.5  |
|          | Std. Dev.        | 1.7   | 2.4    | 3.2    | 4.7    | 6.7  | 10.3 | 15.0  | 19.6  | 20.8  |

|             |      |      |      |      |      |      |      |       |      |
|-------------|------|------|------|------|------|------|------|-------|------|
| Écart-type  |      |      |      |      |      |      |      |       |      |
| Skew.       | 0.92 | 0.48 | 0.54 | 0.90 | 0.94 | 1.32 | 1.73 | 2.15  | 1.29 |
| Dissymétrie |      |      |      |      |      |      |      |       |      |
| Kurtosis    | 4.29 | 2.76 | 2.54 | 3.67 | 3.99 | 4.95 | 7.87 | 10.98 | 6.15 |

\*-99.9 Indicates Missing Data/Données manquantes  
 \* NM Indicates No Measurements/Aucunes mesures

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 |
|------------|----------------|--------------|------------|
| 2000       | 6 h            | 107.1        | 93.8       |
| 2000       | 12 h           | 147.7        | 120.7      |
| 2001       | 2 h            | 62.0         | 60.0       |
| 2001       | 24 h           | 149.6        | 135.8      |
| 2007       | 1 h            | 41.1         | 41.0       |

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

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| 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 |
| *UPDATE* 5 min  | 4.6    | 6.1    | 7.2    | 8.1    | 8.5    | 9.4    | 10.4   | 48     |
| *UPDATE* 10 min | 7.0    | 9.1    | 10.5   | 11.9   | 12.3   | 13.6   | 14.9   | 48     |
| *UPDATE* 15 min | 8.9    | 11.7   | 13.6   | 15.3   | 15.9   | 17.6   | 19.3   | 48     |
| *UPDATE* 30 min | 13.1   | 17.2   | 20.0   | 22.6   | 23.4   | 26.0   | 28.6   | 48     |
| *UPDATE* 1 h    | 18.8   | 24.7   | 28.6   | 32.4   | 33.6   | 37.3   | 41.0   | 49     |
| *UPDATE* 2 h    | 25.9   | 35.0   | 41.1   | 46.9   | 48.7   | 54.4   | 60.0   | 49     |
| *UPDATE* 6 h    | 44.1   | 57.4   | 66.2   | 74.6   | 77.3   | 85.6   | 93.8   | 48     |
| *UPDATE* 12 h   | 56.1   | 73.4   | 84.9   | 95.8   | 99.3   | 110.1  | 120.7  | 48     |
| *UPDATE* 24 h   | 67.1   | 85.5   | 97.7   | 109.4  | 113.1  | 124.5  | 135.8  | 49     |

\* 5-min data were used for the update: all durations were updated

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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%

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| 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 |
| *UPDATE* 5 min  | 55.3        | 73.7    | 86.0     | 97.7     | 101.5    | 112.9    | 124.3  | 48     |
|                 | +/- 5.4 +/- | 9.1 +/- | 12.4 +/- | 15.6 +/- | 16.7 +/- | 19.9 +/- | 23.2   | 48     |
| *UPDATE* 10 min | 42.0        | 54.8    | 63.2     | 71.3     | 73.9     | 81.8     | 89.6   | 48     |
|                 | +/- 3.7 +/- | 6.3 +/- | 8.5 +/-  | 10.8 +/- | 11.5 +/- | 13.7 +/- | 16.0   | 48     |
| *UPDATE* 15 min | 35.8        | 46.9    | 54.3     | 61.4     | 63.6     | 70.5     | 77.4   | 48     |
|                 | +/- 3.3 +/- | 5.5 +/- | 7.4 +/-  | 9.4 +/-  | 10.0 +/- | 12.0 +/- | 14.0   | 48     |
| *UPDATE* 30 min | 26.2        | 34.4    | 39.9     | 45.2     | 46.9     | 52.0     | 57.1   | 48     |
|                 | +/- 2.4 +/- | 4.1 +/- | 5.5 +/-  | 7.0 +/-  | 7.5 +/-  | 8.9 +/-  | 10.4   | 48     |
| *UPDATE* 1 h    | 18.8        | 24.7    | 28.6     | 32.4     | 33.6     | 37.3     | 41.0   | 49     |
|                 | +/- 1.7 +/- | 2.9 +/- | 3.9 +/-  | 5.0 +/-  | 5.3 +/-  | 6.3 +/-  | 7.4    | 49     |
| *UPDATE* 2 h    | 12.9        | 17.5    | 20.5     | 23.4     | 24.3     | 27.2     | 30.0   | 49     |
|                 | +/- 1.3 +/- | 2.2 +/- | 3.0 +/-  | 3.8 +/-  | 4.1 +/-  | 4.9 +/-  | 5.7    | 49     |
| *UPDATE* 6 h    | 7.3         | 9.6     | 11.0     | 12.4     | 12.9     | 14.3     | 15.6   | 48     |
|                 | +/- 0.7 +/- | 1.1 +/- | 1.5 +/-  | 1.9 +/-  | 2.0 +/-  | 2.4 +/-  | 2.8    | 48     |
| *UPDATE* 12 h   | 4.7         | 6.1     | 7.1      | 8.0      | 8.3      | 9.2      | 10.1   | 48     |
|                 | +/- 0.4 +/- | 0.7 +/- | 1.0 +/-  | 1.2 +/-  | 1.3 +/-  | 1.6 +/-  | 1.8    | 48     |
| *UPDATE* 24 h   | 2.8         | 3.6     | 4.1      | 4.6      | 4.7      | 5.2      | 5.7    | 49     |
|                 | +/- 0.2 +/- | 0.4 +/- | 0.5 +/-  | 0.6 +/-  | 0.7 +/-  | 0.8 +/-  | 1.0    | 49     |

\* 5-min data were used for the update: all durations were updated

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

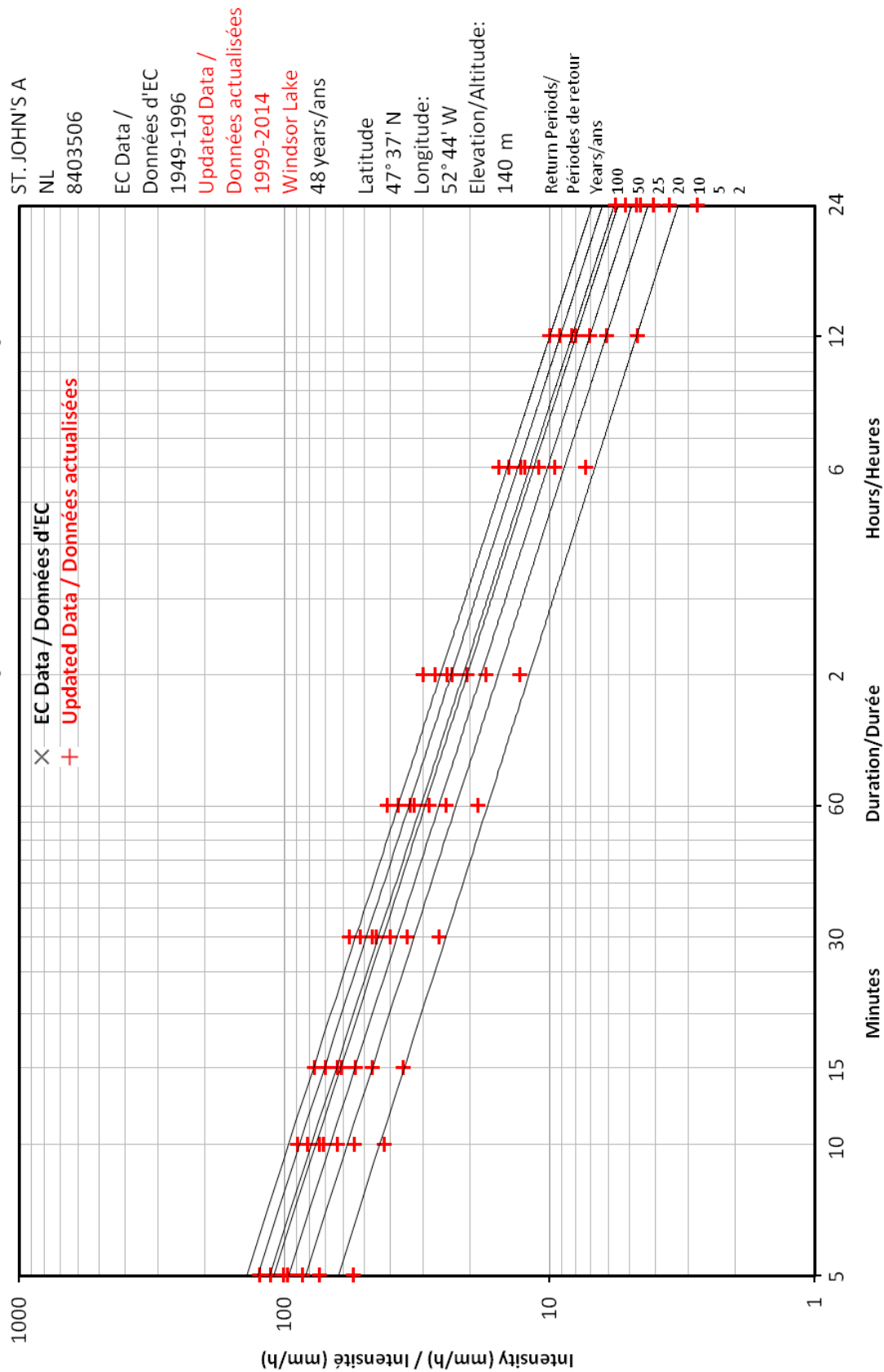
R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)

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

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| 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      | 22.9   | 30.1   | 35.0   | 39.6   | 41.1   | 45.6   | 50.1   |
| Std. Dev. /Écart-type (RR)    | 18.3   | 24.2   | 28.2   | 32.0   | 33.1   | 36.8   | 40.5   |
| Std. Error/Erreur-type        | 3.0    | 3.9    | 4.6    | 5.2    | 5.4    | 6.0    | 6.6    |
| Coefficient (A)               | 17.2   | 22.5   | 26.1   | 29.5   | 30.6   | 34.0   | 37.3   |
| Exponent/Exposant (B)         | -0.521 | -0.525 | -0.527 | -0.528 | -0.528 | -0.529 | -0.530 |
| Mean % Error/% erreur moyenne | 7.4    | 7.9    | 8.2    | 8.4    | 8.4    | 8.6    | 8.8    |

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



**Figure 12.1 St. John's A IDF Curve – Updated**

## Quantile-Quantile : ST JOHN'S A, NL 8403506

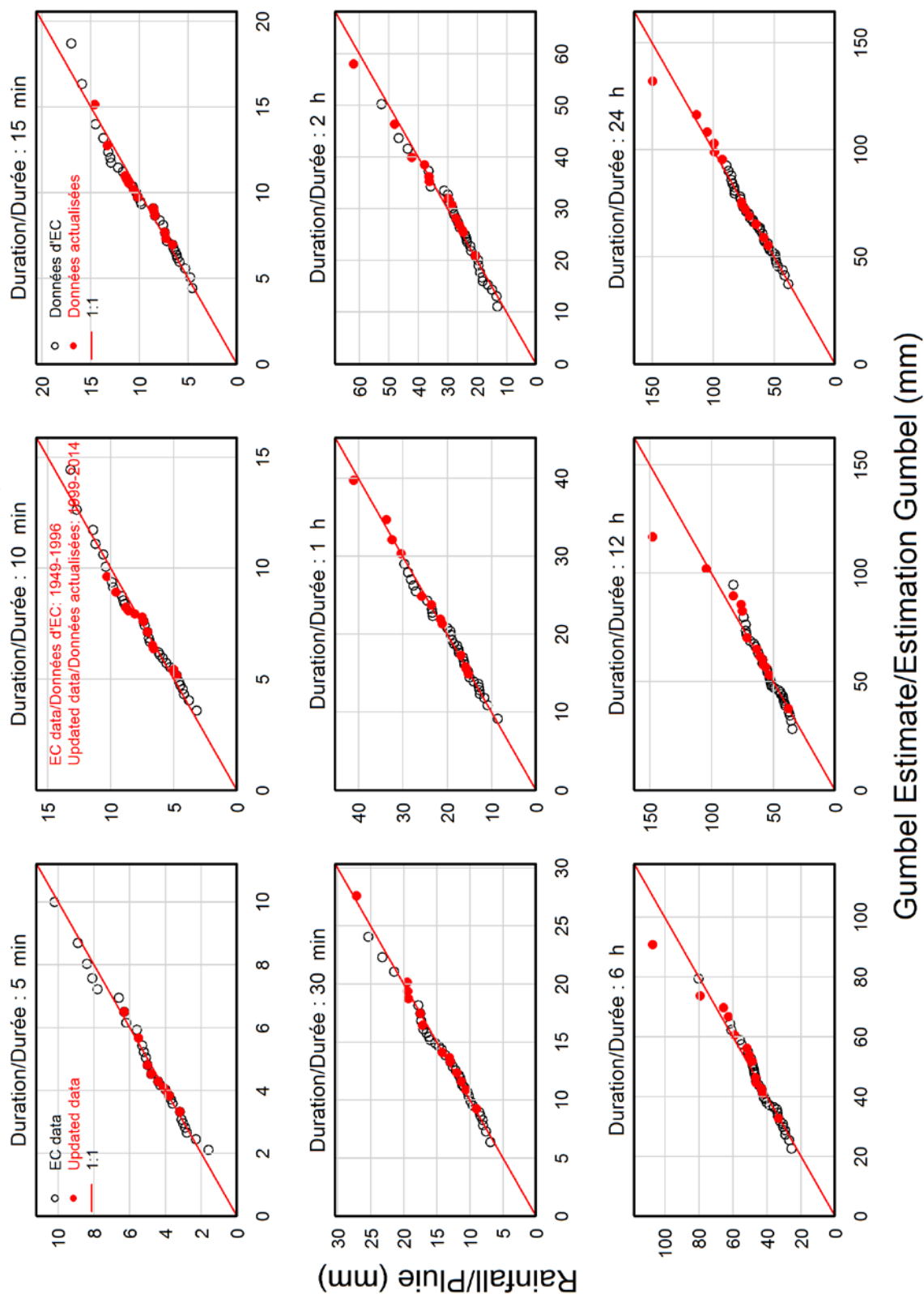
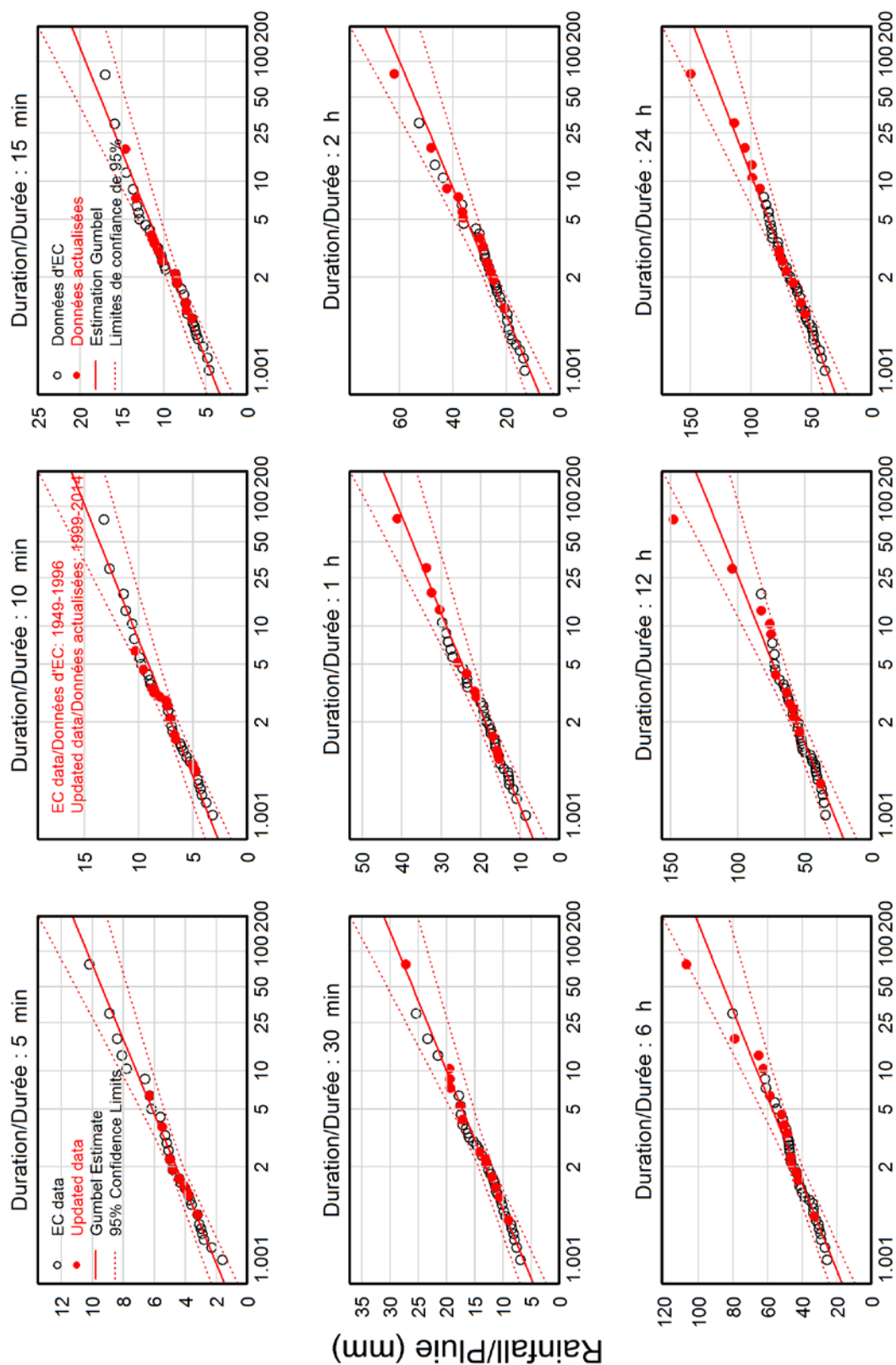


Figure 12.2 St. John's A Quantile-Quantile Plot – Updated

## Return Level/Niveau de retour : ST JOHN'S A, NL 8403506



Return Period/Période de retour (years/années)

Figure 12.3 St. John's A Return Level Plot – Updated

# Trend/Tendance : ST JOHN'S A, NL 8403506

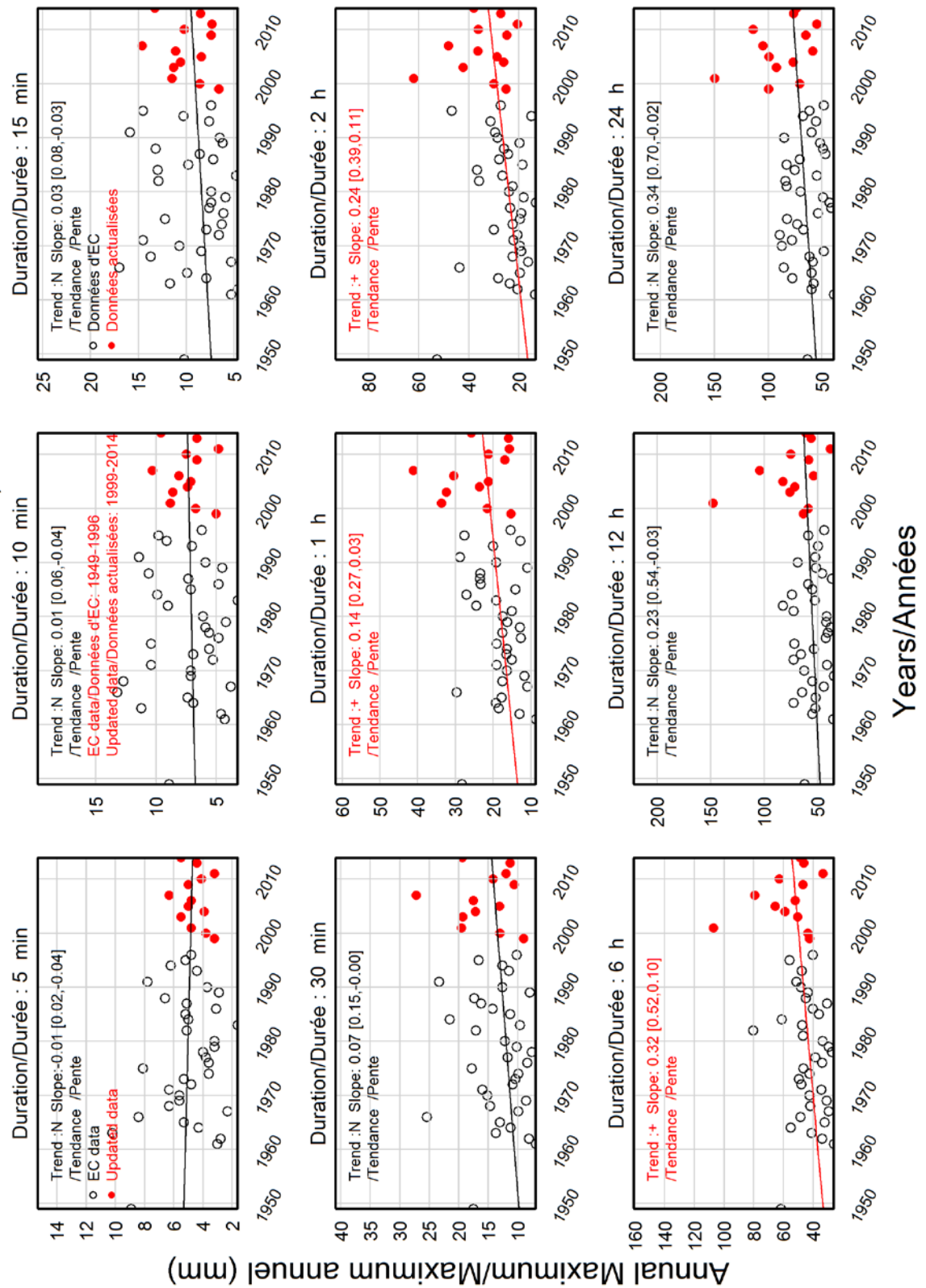


Figure 12.4 St. John's A Trend Plot - Updated