



Covered Area Rainfall Event (09/11/2022 - 11/11/2022)

Excess Rainfall

Event Briefing

Trinidad and Tobago - Trinidad

18 November 2022

1 INTRODUCTION

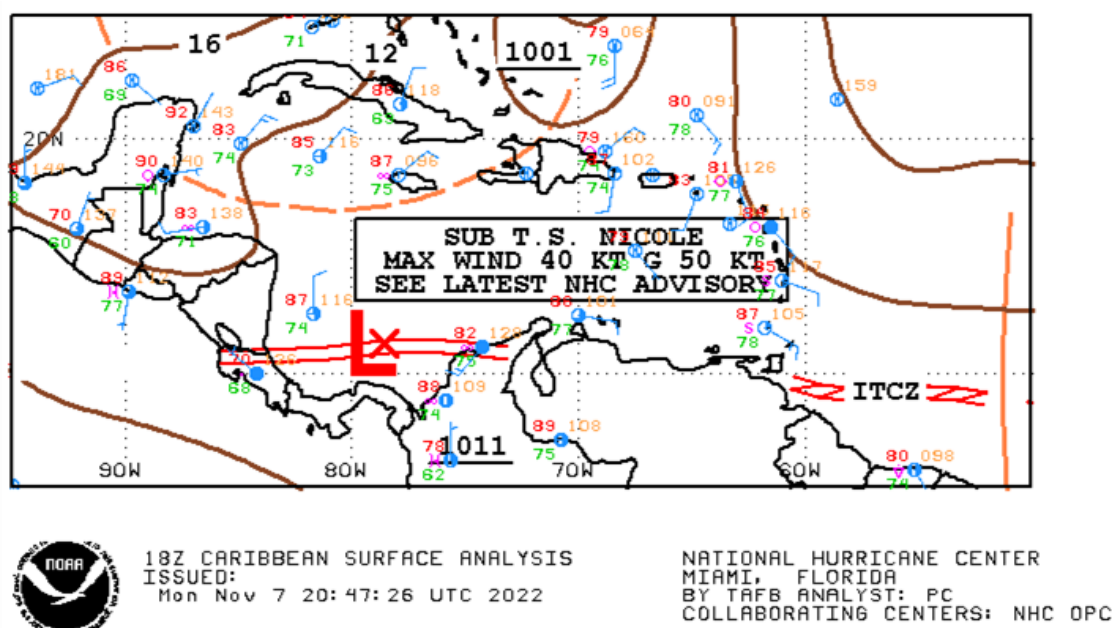
This event briefing describes the impact of rainfall in Trinidad, which was associated with a Covered Area Rainfall Event (CARE), starting on 9 November and ending on 11 November 2022. The Rainfall Index Loss (RIL) was below the attachment point of Trinidad and Tobago's excess rainfall policy for Trinidad¹ and therefore no payout is due.

2 EVENT DESCRIPTION

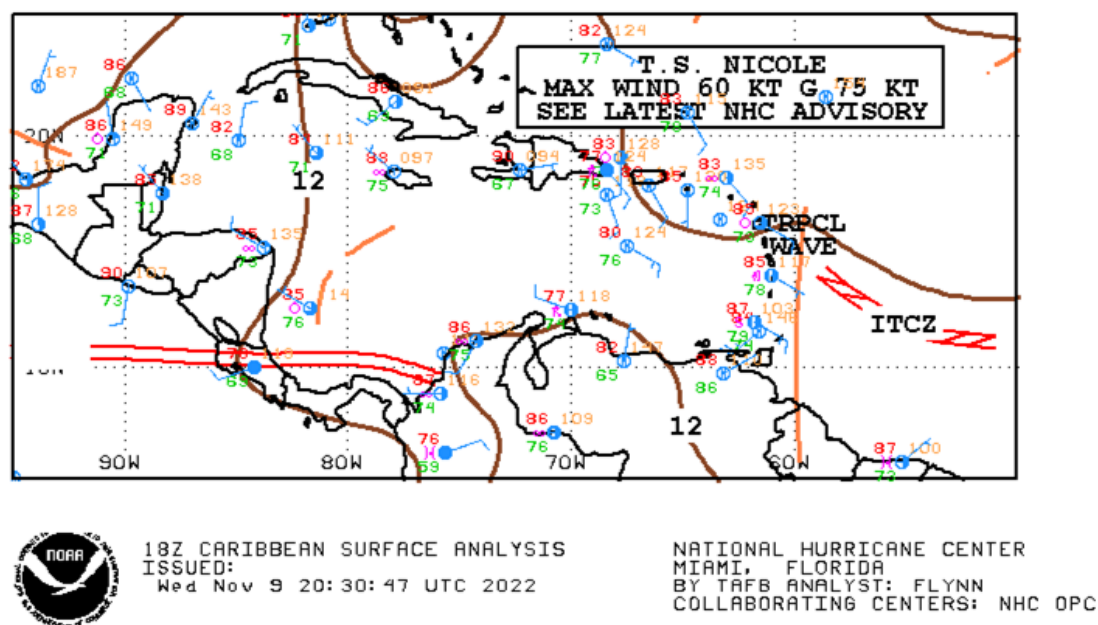
On 7 November at 1800UTC, a monsoon trough extended along latitude 9° North from longitude 52° to 61° West (Figure 1a). It brought atmospheric instability and upper level humidity over the waters to the east of Trinidad and Tobago (Figure 2). Moreover, a broad area of low pressure was over the eastern Caribbean Basin, due to presence of the subtropical storm Nicole located NE of The Bahamas (Figure 2). The combination of these factors lasted for the next 18 to 24 hours and yielded to scattered moderate to isolated strong convection over Trinidad and Tobago and the surrounding waters to the east of the country. In particular, moderate to locally intense precipitation was observed on 8 November from 0600UTC to 1200UTC over Trinidad (Figure 3a).

On 9 November, the monsoon trough shifted northeastward, moving away from the southeastern Caribbean Sea. Therefore, the associated convection activity over the region gradually ceased. At 1800UTC, a western Atlantic tropical wave approached the southeastern Caribbean Basin. It extended along longitude 61° West, from latitude 6° to 17° North, moving west at approximately 6 mph (10 km/h). It produced scattered moderate convection over a large area, from 8° to 15° North, between 59° and 65° West (Figure 1b). The associated moderate to locally intense precipitation started to affect Trinidad and Tobago on the next day, 10 November, at 0600UTC and lasted until 1800UTC (Figure 3b). After the passage of the tropical wave, the rainfall activity over the region gradually ceased.

¹ The Government of Trinidad and Tobago has also XSR policy for Tobago area. In tThis rainfall event Tobago was not affected



a) 7 November at 1800UTC



b) 9 November at 1800UTC

Figure 1 Surface analysis over the Caribbean Sea on 7 and 9 November 2022 at 1800UTC as indicated in the label. Source: US National Hurricane Center²

² National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, available on 7-9 November 2022 at: https://www.nhc.noaa.gov/tafb/CAR_18Z.gif

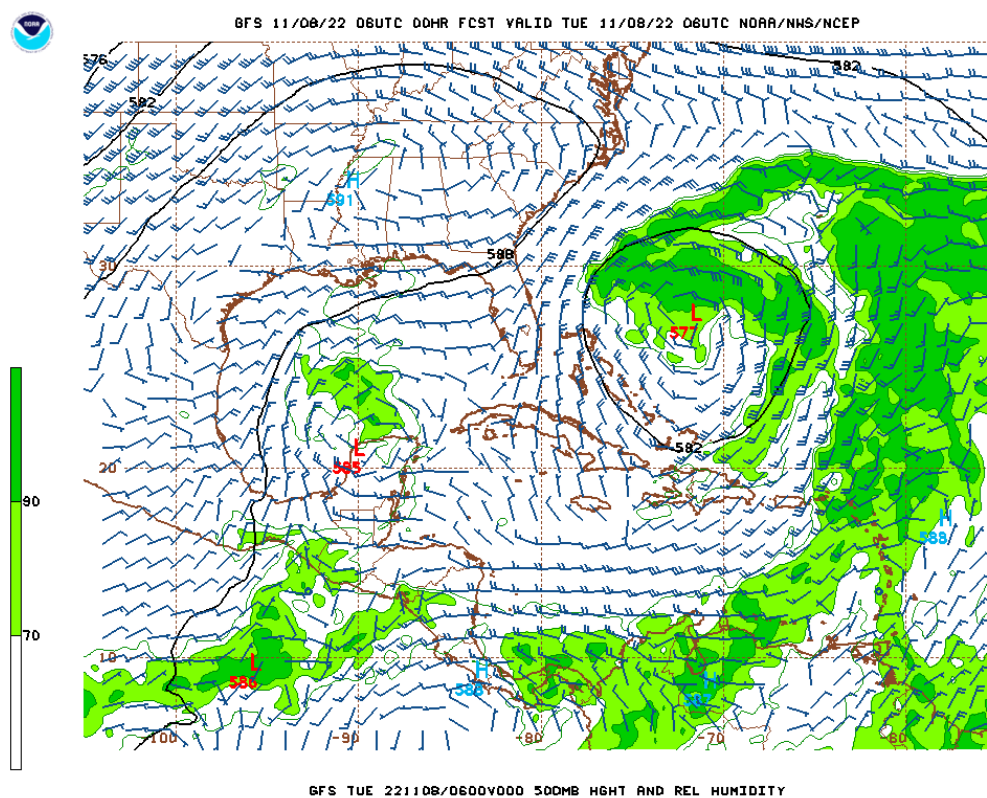


Figure 2 Upper analysis over the Caribbean Sea on 8 November 2022 at 0600UTC as indicated in the label.
Source: US National Hurricane Center³

³ National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, available on 8 November 2022 at: https://mag.ncep.noaa.gov/data/gfs/06/west-atl/500_rh_ht/gfs_west-atl_000_500_rh_ht.gif

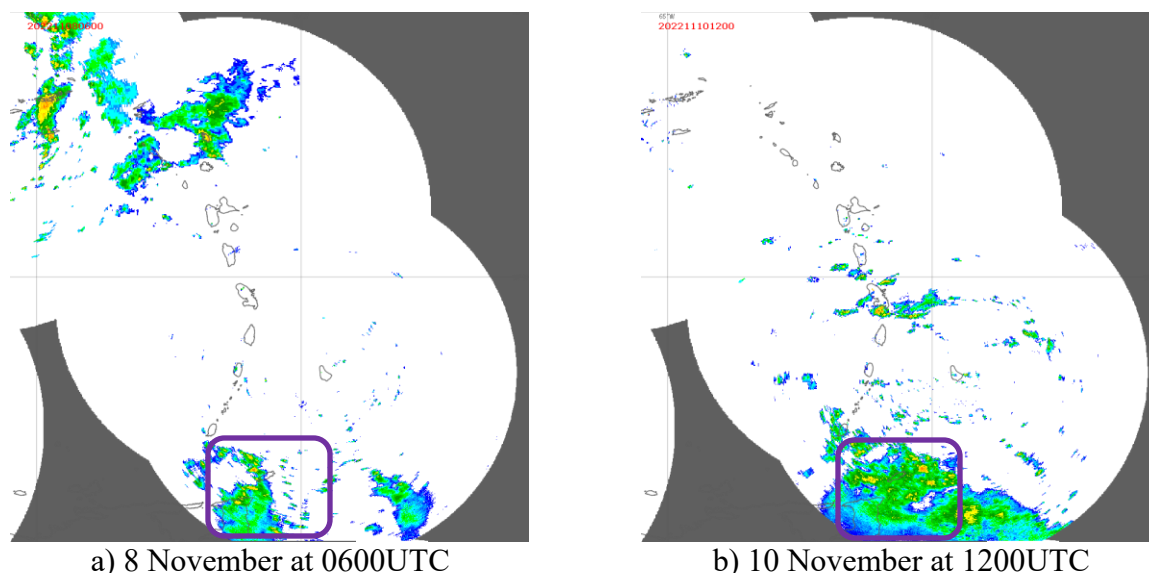


Figure 3 Radar imagery on 8 and 10 November at different times as indicated in the labels, from the radar composite over the Caribbean region. Blue/green colours represent low to moderate rainfall, while the yellow/red colours represent intense and very intense precipitation. The purple square highlights the location of Trinidad and Tobago. Source: Barbados Radar Composite⁴.

3 IMPACTS

At the time of writing this event briefing, and according to local news⁵, the heavy rains caused the collapse of the Carolina Bridge in Carolina, Couva, Trinidad⁶. The greatest impact due to the heavy rainfall was flooding in different areas of the island, mainly in the communities of Woodland, Fyzabad, Penal, La Fortune and Debe⁷. Also due to the heavy rains a landslide blocked the Wilson Road in Penal, which was attended by the emergency crews⁸.



Carolina Bridge damage, in Carolina, Couva



Flood in Penal Rock Rd.

⁴ Barbados Radar Composite, available on 8 and 10 November at:
https://www.barbadosweather.org/BMS_Radar_Composite_Resp.php#

⁵ [Trinidad & Tobago Guardian](#)

⁶ [Carolina Bridge collapses, hundreds impacted](#)

⁷ [Woodland residents evacuate as waters rise - Trinidad Guardian](#)

⁸ [Landslide blocks access between Penal and Barrackpore - Trinidad Guardian](#)



Floods in Fyzabad



Floods in Woodland

Figure 4 Damage in Trinidad due to heavy rainfall. Source: local media.

4 RAINFALL MODEL OUTPUTS

All three data sources used by the XSR 2.5 model, CMORPH⁹, WRF5 and WRF7¹⁰, detected the occurrence of precipitation over Trinidad and Tobago and the surrounding waters during the period of 7 to 11 November 2022. However, each data source reported a specific distribution and accumulation of rainfall, as discussed below. The CARE for Trinidad was activated on 9 November and lasted for the period 9 to 11 November. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation¹¹ and thus the period considered by the XSR 2.5 model for the loss estimate based on the accumulated precipitation in Trinidad was 7 to 11 November.

CMORPH reported total accumulated amounts of precipitation higher than 80 mm in most of Trinidad. The maximum values, between 120 mm and 140 mm, were shown in the vicinity of Arima and over the regions of Couva-Tabaquite-Talparo and Rio Claro-Mayaro.

WRF5 showed total accumulated values of precipitation higher than 100 mm over the eastern portion of Trinidad, with a maximum between 220 mm and 240 mm along the northeastern coast. Over the remainder of the island, the accumulated rainfall values ranged between 20 mm and 100 mm.

WRF7 simulated total accumulated values of rainfall higher than 80 mm over the northwest portion of Trinidad, with maximum values, between 120 mm and 140 mm, in the vicinity of

⁹ CMORPH Model: the satellite-based rainfall precipitation estimates provided by the NOAA Climate Prediction Center (CPC) using the so-called Morphing Technique http://www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html. Further details in the Definitions section of this report.

¹⁰ WRF5 and WRF7 Models: the Weather Research and Forecasting Model weather model-based Configuration #1 and #2 data <https://www.mmm.ucar.edu/weather-research-and-forecasting-model>. These data are initialised by the NCEP FNL dataset. (NCEP FNL Operational Model Global Tropospheric Analyses [<http://rda.ucar.edu/datasets/ds083.2/>]). Further details in the Definitions section of this report.

¹¹ The two aggregation periods correspond to the Rainfall Aggregation Period #1 and Rainfall Aggregation Period #2, as indicated in the Schedule. Further details in the Definitions section of this report.

the coast in the regions of Chaguanas and Diego Martin. Lower values were reported over the rest of the island.

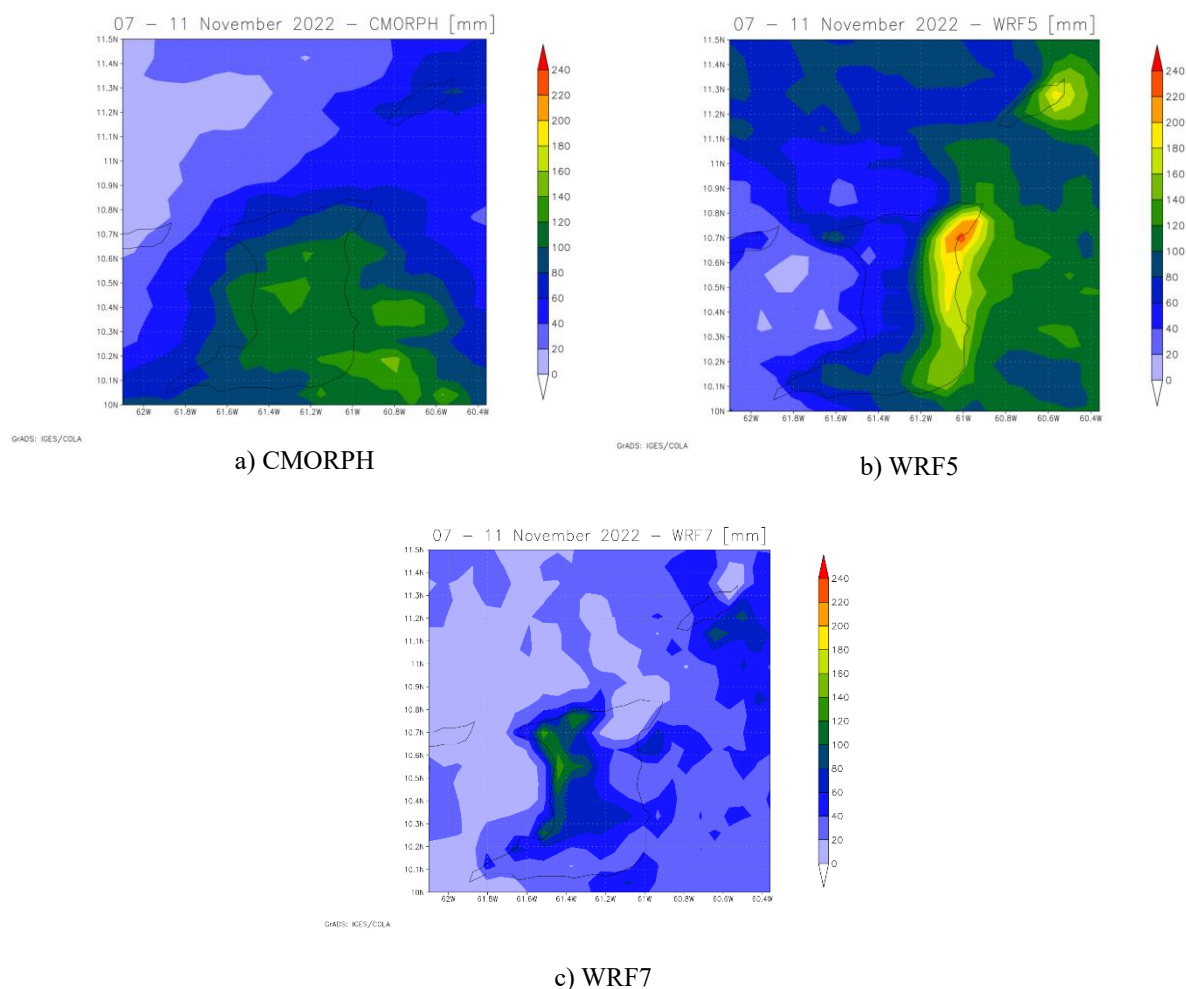


Figure 5 Total accumulated precipitation during the period 7-11 November, 2022 estimated by CMORPH (a), WRF5 (b) and WRF7 (c). Source: CCRIF SPC

Daily rainfall maps by CMORPH, WRF5 and WRF7 over the exposure map of XSR 2.5 are not included here and they can be downloaded at the following links for 12-hour aggregation and 48-hour aggregation respectively:

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/TTO/TTO_TRI/CARE_6_2022/daily_prec_short.mp4
https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/TTO/TTO_TRI/CARE_6_2022/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for Trinidad for two of data sources

used by XSR2.5: CMORPH and WRF5. The RIL was the highest for CMORPH, due to the larger amount of accumulated precipitation presented in the vicinity of the capital, Port of Spain, and over the western coast, the areas characterized by the highest exposure for Trinidad.

The final RIL (RIL_{FINAL}) was calculated as the average of the RILs from CMORPH and WRF5. The RIL_{FINAL} was greater than zero and therefore this CARE qualified as a loss event. However, the RIL_{FINAL} was below the attachment point of Trinidad and Tobago's excess rainfall policy for Trinidad and therefore it did not trigger a policy payout.

5 TRIGGER POTENTIAL

The Rainfall Index Loss calculated for this Covered Area Rainfall Event (CARE) for Trinidad, was below the attachment point of Trinidad and Tobago's Excess Rainfall policy for Trinidad and therefore no payout is due.

For additional information, please contact CCRIF SPC at: pr@ccrif.org

DEFINITIONS

<i>Active Exposure Cell Percentage Threshold</i>	The percentage of the total number of XSR Exposure Grid Cells within the Covered Area of the Insured, that must be exceeded to trigger a Covered Area Rainfall Event.
<i>Active Exposure Grid Cells</i>	The XSR Exposure Grid Cells for which in the same single day the Aggregate Rainfall #1 value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold #1 or the Aggregate Rainfall #2 value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold #2.
<i>Aggregate Rainfall #1</i>	The rainfall amount accumulated over the Rainfall Aggregation Period #1 (as defined in the Schedule) measured in millimeters (mm) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given day and a Rainfall Aggregation Period #1 of n hours, the Aggregate Rainfall #1 is the maximum amount of rainfall accumulated over any of the n-hour windows that intersect the day itself considering a time interval of 3 hours.
<i>Aggregate Rainfall #2</i>	The rainfall amount accumulated over the Rainfall Aggregation Period #2 (as defined in the Schedule) measured in millimeters (mm) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given day and a Rainfall Aggregation Period #2 of n hours, the Aggregate Rainfall #2 is the maximum amount of rainfall accumulated over any of the n-hour windows that intersect the day itself considering a time interval of 3 hours.
<i>Calculation Agent</i>	Entity charged with undertaking the primary calculation of the Rainfall Index Loss.
<i>CMORPH-based Maximum Aggregate Rainfall #1</i>	The maximum value during the Covered Area Rainfall Event of the Aggregate Rainfall #1 computed using the CMORPH-based Rainfall Estimates in any given XSR Exposure Grid Cell over the Covered Area of the Insured.
<i>CMORPH-based Maximum Aggregate Rainfall #2</i>	The maximum value during the Covered Area Rainfall Event of the Aggregate Rainfall #2 computed using the CMORPH-based Rainfall Estimates in any given XSR Exposure Grid Cell over the Covered Area of the Insured.
<i>CMORPH-based Covered Area Rainfall Parameters</i>	The CMORPH Model information provided on a continuous basis by the XSR Model Data Reporting Agency used by the Calculation Agent to obtain the CMORPH-based Rainfall

	Estimates using the XSR Rainfall Model. Parameters are drawn from XSR Exposure Grid Cells within the Covered Area of the Insured, by their respective latitude and longitude. Measurement units and precision of data ingested by the XSR Rainfall Model are identical to those provided by the XSR Model Data Reporting Agency and are further elaborated in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'.
<i>CMORPH Model</i>	The satellite-based rainfall estimation model provided by NOAA CPC as described in the Rainfall Estimation Models section of the Policy.
<i>Covered Area</i>	The territory of the Insured as represented in the XSR Rainfall Model.
<i>Covered Area Rainfall Event</i>	Any period of days, with an interruption less than or equals to the Event Tolerance Period, during which the number of Active Exposure Grid Cells is greater than or equal to the product of (a) Active Exposure Cell Percentage Threshold multiplied by (b) the total number of XSR Exposure Grid Cells within the Covered Area.
<i>Country Disaster Alert</i>	An official disaster alert issued by ReliefWeb (http://reliefweb.int/) for the country in question for one of the following types of events: tropical cyclone, flood, flash flood and severe local storm. Any disaster alert issued later than seven (7) days after the completion of the Covered Area Rainfall Event (CARE) event will not be considered. The Disaster Alert description issued by ReliefWeb and/or its attached documentation must include specific reference to the CARE dates with a tolerance period of 2 calendar days.
<i>Maximum Aggregate Rainfall #1</i>	The highest value during a Covered Area Rainfall Event of the Aggregate Rainfall #1 amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.
<i>Maximum Aggregate Rainfall #2</i>	The highest value during a Covered Area Rainfall Event of the Aggregate Rainfall #2 amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.
<i>Rainfall Event Threshold #1</i>	Aggregate Rainfall #1 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.
<i>Rainfall Event Threshold #2</i>	Aggregate Rainfall #2 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.

<i>Rainfall Aggregation Period #1</i>	The number of hours over which the Aggregate Rainfall #1 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
<i>Rainfall Aggregation Period #2</i>	The number of hours over which the Aggregate Rainfall #2 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
<i>Rainfall Index Loss</i>	For any Covered Area Rainfall Event affecting the Insured, the US Dollar loss calculated by the Calculation Agent using the XSR Rainfall Model, as described in the Attachment entitled ‘Calculation of Rainfall Index Loss and Policy Payment’. The Rainfall Index Loss can only be calculated once the Covered Area Rainfall Event is completed.
<i>WRF5 Model</i>	The weather research and forecasting rainfall model by NOAA with Configuration #5 data initialized with and assimilating the data provided by the National Center for Environmental Prediction as described in the Rainfall Estimation Models and in the Input Data to the Rainfall Estimation Models sections of this Attachment.
<i>WRF7 Model</i>	The weather research and forecasting rainfall model by NOAA with Configuration #7 data initialized with and assimilating the data provided by the National Center for Environmental Prediction as described in the Rainfall Estimation Models and in the Input Data to the Rainfall Estimation Models sections of this Attachment.
<i>XSR Rainfall Model</i>	The computer model used to calculate the Rainfall Index Loss, as described in the Attachment entitled ‘Calculation of Rainfall Index Loss and Policy Payment’.
<i>XSR Exposure Grid Cells</i>	The 30 arc-second by 30 arc-second grid of cells each of which is attributed with an XSR Grid Cell Exposure Value greater than zero.
<i>XSR Grid Cell Exposure Value</i>	The value, used to calculate the CMORPH-based Exposure Grid Cell Loss, the WRF5-based Exposure Grid Cell Loss, and the WRF7-based Exposure Grid Cell Loss.