Covered Area Rainfall Events (08/02/2024 to 09/02/2024)

Excess Rainfall

Event Briefing

Saint Kitts and Nevis

**16 February 2024**

1   INTRODUCTION

This event briefing describes the impact of rainfall on Saint Kitts and Nevis, which was associated with a Covered Area Rainfall Event (CARE) starting on 8 February and ending on 9 February 2024. The Rainfall Index Loss (RIL) for the Covered Area Rainfall Event in Saint Kitts and Nevis was below the attachment point of the country's Excess Rainfall policy, and therefore no payout is due to the Government of Saint Kitts and Nevis.

The Wet Season Trigger (WST) component of the XSR3.0 model did not identify this CARE as a "Wet Event" and thus, the WST component was not activated by this CARE[1]. Therefore, no payout is due under the Wet Season Trigger endorsement of Saint Kitts and Nevis' Excess Rainfall policy.

2   EVENT DESCRIPTION

On 8 February at 0600UTC, a dissipating cold front was located over the eastern Caribbean Sea along the northeast-southwest axis, from the Anegada Passage to the coast of NE Colombia, moving eastward (Figure 1). Ahead of the cold front, a squall line (i.e. a linear structure including multiple thunderstorms) extended from latitude 17°North longitude 62°West to latitude 13°North longitude 65°West (Figure 1 and Figure 2). The strong convection occurring along the squall line produced moderate to locally heavy precipitation across the eastern Caribbean basin, east of longitude 65°West, and particularly over the northern Leeward Islands between 0000UTC and 1200UTC (Figure 3). In the following hours, the cold front and the associated squall line gradually shifted northeastward into the central Atlantic Ocean, leaving the Leeward Islands.

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[1] The WST endorsement provides a fixed payout for rainfall events that happen when the soil is already saturated and has limited absorption ability. The WST endorsement is activated based on two factors: the Wet Index (the average 1-month Standardized Precipitation Index for all grid cells in the country) and Wet Periods (the period of time where the Wet Index exceeds 1, which indicates that the soil is wetter than its long-term average and serves as an indicator of soil saturation). A CARE qualifies as a "Wet Event" if during any period of consecutive days, the Wet Index (WI) is equal or greater than 1. The WST policy endorsement provides a payment when one or more CAREs with a modelled loss greater than zero occur within a Wet Period and the corresponding value of the Wet Index during the Wet Period exceeds a predetermined threshold.
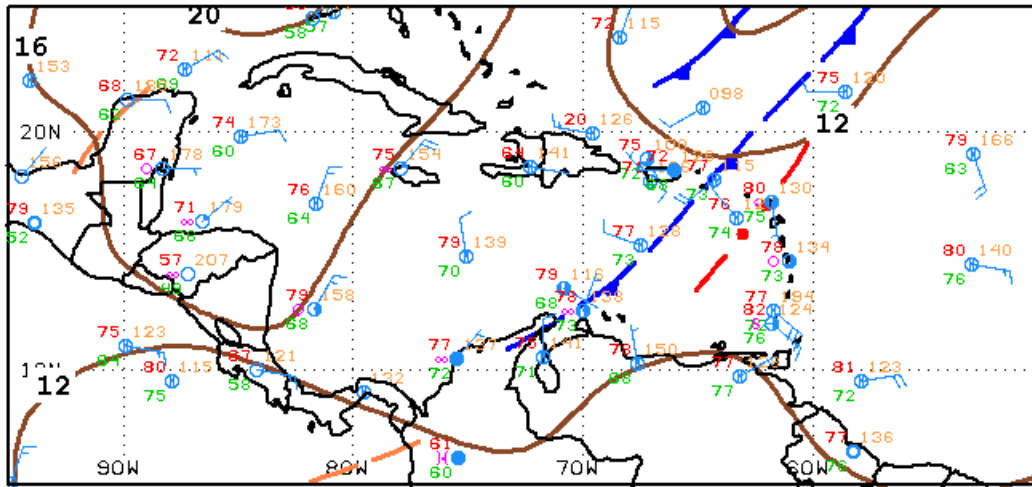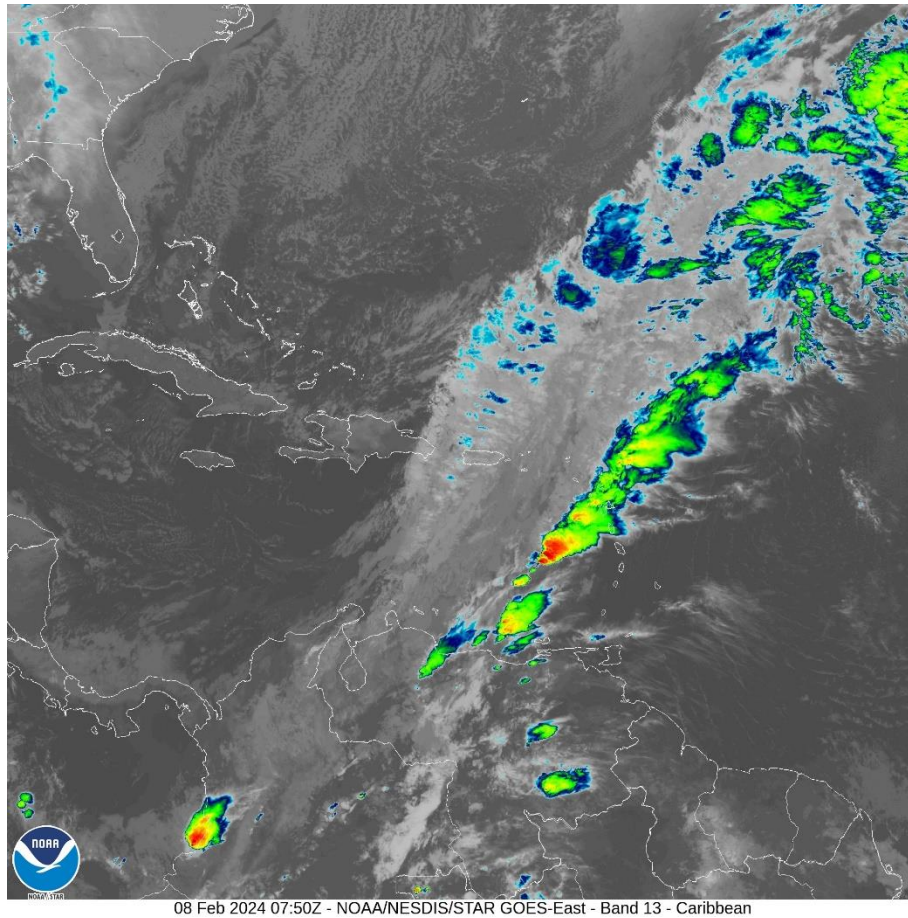
08 February at 0600UTC

Figure 1 Surface analysis over the Caribbean area on 08 February 2024 at 0600UTC. Source: US National Hurricane Center[2]

2 National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review date: 08 February 2024, available at: *https://www.nhc.noaa.gov/tafb/CAR_06Z.gif*

08 February at 0800UTC

Figure 2 Satellite imagery on 08 February 2024 at 0800 UTC. Blue/green colours represent high altitude clouds (top cloud temperature between -50°C and -70°C), while the red/yellow colours represent very high altitude clouds (top cloud lower than -70°C). High altitude clouds indicate strong convection associated with intense precipitation. Source: NOAA, National Environmental Satellite, Data and Information Service[3].

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3   RAMSDIS Online Archive, NOAA Satellite and Information Service, available at: https://cdn.star.nesdis.noaa.gov/GOES16/ABI/SECTOR/car/13/20240390750_GOES16-ABI-car-13-2000x2000.jpg

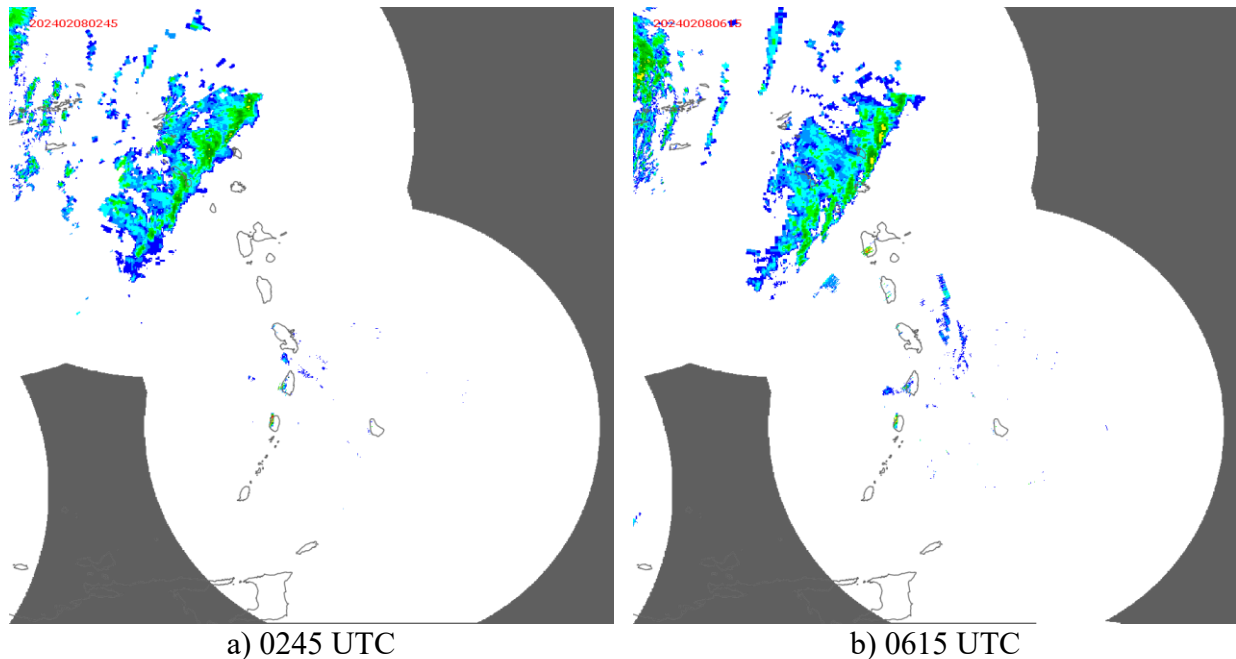| a) 0245 UTC | b) 0615 UTC |

Figure 3 Radar imagery on 08 February at different times as indicated by 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. Source: Barbados Radar Composite[4]

3   IMPACTS

At the time of writing this report, no information was available related to damage or loss in Saint Kitts and Nevis due to this Covered Area Rainfall Event during the indicated period. However, a flash flood watch was put into effect from 7 February to 8 February.[5]

4   RAINFALL MODEL OUTPUTS

All data sources used by the XSR 3.0 model, CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15[6], detected the occurrence of precipitation over Saint Kitts and Nevis and the

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4   Barbados   Radar   Composite,   available   on   08   February   2024   at: https://www.barbadosweather.org/BMS_Radar_Composite_Resp.php#

[5] Caribbean Loop News: Flash flood watch issued for the Leeward Islands and Anguilla | Loop Caribbean News (loopnews.com)

6 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 are provided in the Definitions section of this report

IMERG Model: The satellite-based rainfall estimation model developed by NASA, expressed in mm, derived by aggregating the IMERG 30-minute Rainfall Data at 10km spatial resolution and available at https://jsimpsonhttps.pps.eosdis.nasa.gov/imerg/late. Further details in the Definitions section of this reportWRF5,

surrounding waters during the period 6 to 9 February 2024.Each data source reported a specific distribution and accumulation of rainfall, as discussed below and shown in Figure 4. The CARE for Saint Kitts and Nevis was activated on 8 February and lasted until 9 February. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation[7] and thus the period considered by the XSR 3.0 model for the loss estimate based on the accumulated precipitation in Saint Kitts and Nevis was 6 – 9 February.

CMORPH reported total accumulated values of precipitation higher than 100 mm over Saint Kitts and Nevis, with increasing values moving from south to north. The maximum values of accumulated rainfall, between 160 mm and 180 mm, were shown over the northern and central portions of Saint Kitts. Lower values, between 100 mm and 120 mm, were reported over the southern area of Nevis.

IMERG reported values of accumulated rainfall in the range between 100 mm and 140 mm over the country. The highest values, between 120 mm and 140 mm, were shown over Nevis and the southern area of Saint Kitts.

WRF5 showed total accumulated values of precipitation between 40 mm and 100 mm over the entire country. The maximum values, between 80 mm and 100 mm, were shown over a small area located on the northwestern part of Saint Kitts.

WRF7 showed total accumulated values of rainfall with intensity similar to that of WRF5 but with a different geographical distribution. The maximum values, between 80 mm and 100 mm were shown over the southern area of Saint Kitts.

WRF11 showed total accumulated values of precipitation between 60 mm and 140 mm over the country. The maximum values, between 120 mm and 140 mm, were reported over the central area of Nevis.

WRF15 showed total accumulated values of precipitation up to 240 mm over Saint Kitts and Nevis. The highest values, between 220 mm and 240 mm, were shown over the area of Saint Kitts where the city of Basseterre is located. The lowest values, between 40 mm and 60 mm, were shown over almost the entire area of Nevis.

WRF7, WRF11 and WRF15 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 are provided in the Definitions section of this report.

7 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.

a)   CMORPH

a)   IMERG
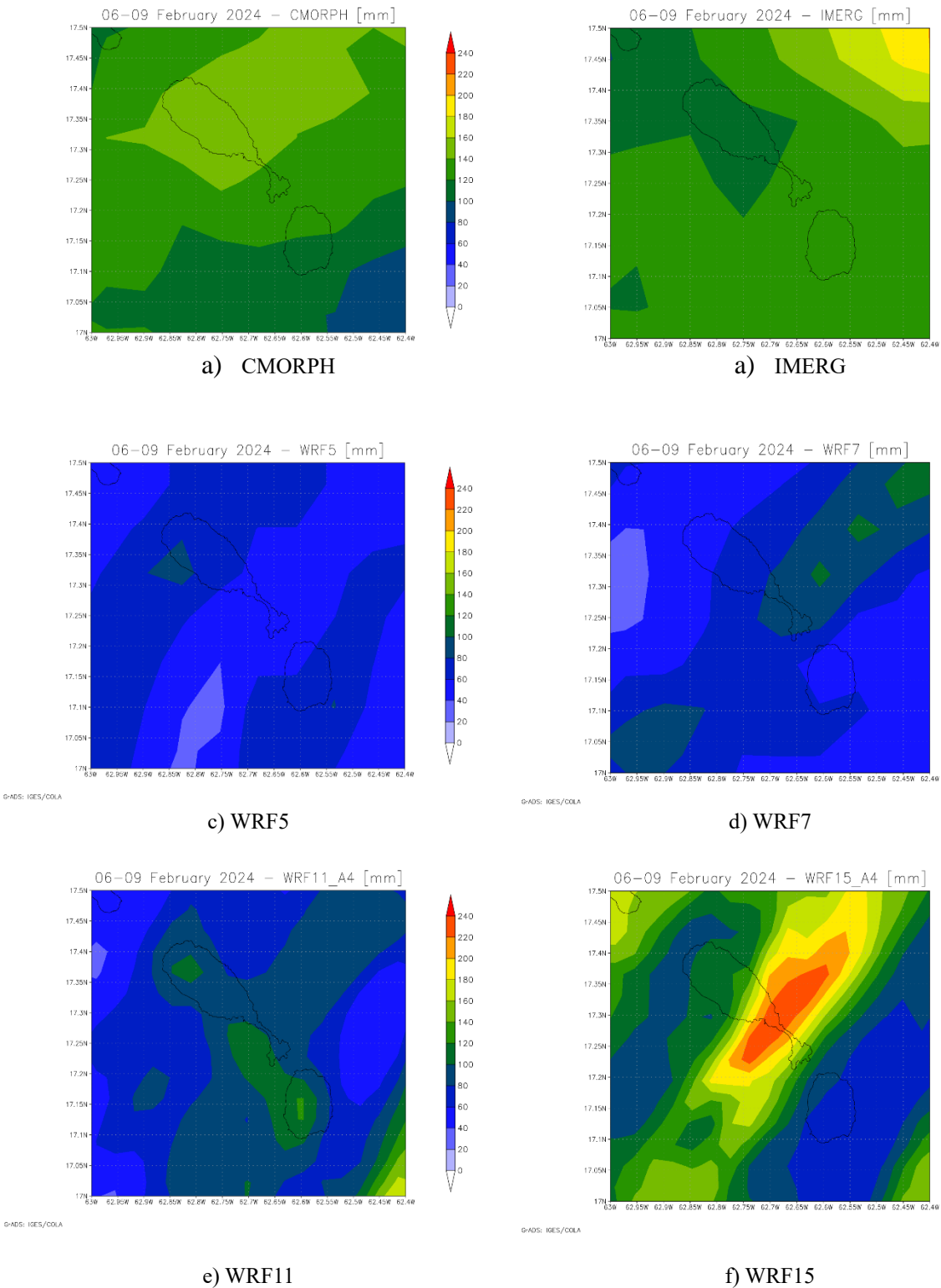
c) WRF5

d) WRF7

e) WRF11

f) WRF15

Figure 4 Total accumulated precipitation during the period 06-09 February, 2024
estimated by CMORPH (a), IMERG (b), WRF5 (c), WRF7 (d), WRF11 (e), WRF15 (f). Source: CCRIF SPC

Daily rainfall maps by CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15 over the exposure map of XSR 3.0 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/KNA/CARE_2_2023/daily_prec_short.mp4

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/KNA/CARE_2_2023/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for Saint Kitts and Nevis for all six data sources used by XSR3.0: CMORPH, IMERG, WRF5, WRF7, WRF11, and WRF15. The RIL was the highest for WRF5.

The final RIL (RIL_{FINAL}) was calculated as the average of the six RILs from CMORPH, IMERG, WRF5, WRF7, WRF11, and WRF15. 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 the Excess Rainfall policy for Saint Kitts and Nevis, and thus the policy was not triggered. Therefore, no payout is due under the Excess Rainfall policy to the Government of Saint Kitts and Nevis.

The Wet Season Trigger (WST) component of the XSR3.0 model did not identify this CARE as a "Wet Event and thus, the WST component was not activated by this CARE[8]. Therefore, no payout is due under the Wet Season Trigger endorsement of Saint Kitts and Nevis' Excess Rainfall policy.

5   TRIGGER POTENTIAL

The Rainfall Index Loss calculated for the Covered Area Rainfall Event (CARE) on 8-9 February, 2024 for Saint Kitts and Nevis was below the attachment point of the country's Excess Rainfall policy and therefore no payout is due.

Also, no payout is due under the Wet Season Trigger endorsement of Saint Kitts and Nevis' Excess Rainfall policy.

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

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[8] The WST endorsement provides a fixed payout for rainfall events that happen when the soil is already saturated and has limited absorption ability. The WST endorsement is activated based on two factors: the Wet Index (the average 1-month Standardized Precipitation Index for all grid cells in the country) and Wet Periods (the period of time where the Wet Index exceeds 1, which indicates that the soil is wetter than its long-term average and serves as an indicator of soil saturation). A CARE is identified as a "Wet Event" if during any period of consecutive days, the Wet Index (WI) is equal or greater than 1. The WST policy endorsement provides a payment when one or more CAREs with a modelled loss greater than zero occur within a Wet Period and the corresponding value of the Wet Index during the Wet Period exceeds a predetermined threshold.

DEFINITIONS

Active Exposure Cell Percentage Threshold	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.
Active Exposure Grid Cells	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.
Aggregate Rainfall #1	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.
Aggregate Rainfall #2	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.
Calculation Agent	Entity charged with undertaking the primary calculation of the Rainfall Index Loss.
CMORPH-based Maximum Aggregate Rainfall #1	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.
CMORPH-based Maximum Aggregate Rainfall #2	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.
CMORPH-based Covered Area Rainfall Parameters	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'.
CMORPH Model	The satellite-based rainfall estimation model provided by NOAA CPC as described in the Rainfall Estimation Models section of the Policy.
Covered Area	The territory of the Insured as represented in the XSR Rainfall Model.
Covered Area Rainfall Event	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.
Country Disaster Alert	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.
Maximum Aggregate Rainfall #1	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.
Maximum Aggregate Rainfall #2	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.
Rainfall Event Threshold #1	Aggregate Rainfall #1 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.

Rainfall Event Threshold #2	Aggregate Rainfall #2 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.
Rainfall Aggregation Period #1	The number of hours over which the Aggregate Rainfall #1 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
Rainfall Aggregation Period #2	The number of hours over which the Aggregate Rainfall #2 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
Rainfall Index Loss	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.
WRF5 Model	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.
WRF7 Model	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.
XSR Rainfall Model	The computer model used to calculate the Rainfall Index Loss, as described in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'.
XSR Exposure Grid Cells	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.
XSR Grid Cell Exposure Value	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.