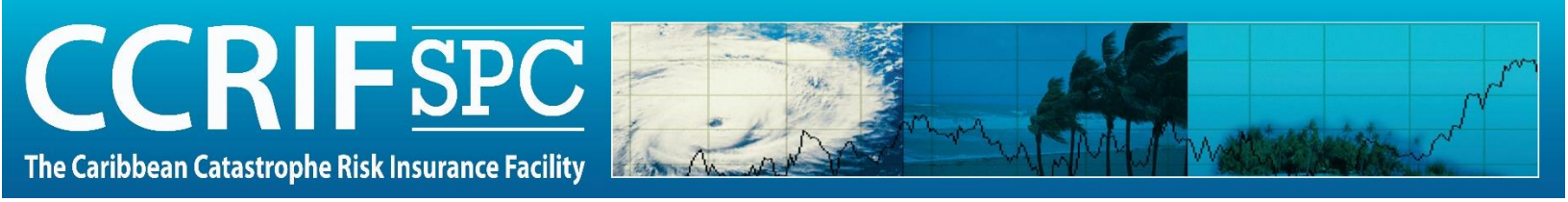

Covered Area Rainfall Event (18/09/2022 to 20/09/2022)

Excess Rainfall

Event Briefing

British Virgin Islands

28 September 2022

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1 INTRODUCTION

This event briefing describes the impact of rainfall in the British Virgin Islands, which was associated with a Covered Area Rainfall Event (CARE), starting on 18 September and ending on 20 September 2022. The Rainfall Index Loss (RIL) was below the attachment point of the British Virgin Islands' excess rainfall policy and therefore no payout is due.

2 EVENT DESCRIPTION

On 18 September at 0300UTC, the centre of tropical storm Fiona was sited near latitude 16.6° North, longitude 64.9° West, about 124 mi (200 km) S of the British Virgin Islands. The minimum central pressure was 997 mb and the maximum sustained winds were estimated at 60 mph (95 km/h). The system moved towards the west-northwest with the estimated forward velocity of 8 mph (13 km/h), Figure 1. Since its formation the storm was affected by wind shear, which caused the misalignment of the low-level circulation centre with the main convective mass, mostly displaced east of the centre (Figure 2a). At that time, the inner rainband of Tropical Storm Fiona reached the British Virgin Islands, spreading moderate to locally intense precipitation (Figure 3).

Over the Caribbean Sea, the warm sea surface temperature and sufficient mid-level moisture favoured the intensification of the system and on 18 September at 1500UTC it became a hurricane, with its centre located near latitude 17.3°N, longitude 66.5°W, approximately 145 mi (234 km) SW of the British Virgin Islands. Moderate to locally heavy precipitation persisted over the British Virgin Islands (Figure 3) and a few hours later, at 1920UTC, Fiona made landfall along the extreme southwestern coast of Puerto Rico as a category 1 hurricane, spreading hurricane conditions over this country.

Fiona continued to move over the northern Caribbean Sea, proceeding toward the northwest at almost 9 mph (15km/h), with unvaried intensity. Its eastern outer rainband was very active and extended 270 mi (435 km) from the centre (Figure 2b). For this reason, the associated precipitation affected the British Virgin Islands until 19 September at 0600UTC (Figure 3), when Fiona's centre was near latitude 18.2°N, longitude 68.4°W, approximately 248 mi (400 km) W of the British Virgin Islands. At this time, its eye was approaching the Dominican Republic, where it made landfall at 0730UTC.

On 19 September at 1800UTC, Hurricane Fiona left the northern coast of the Dominican Republic and moved into the northern Atlantic Ocean, moving towards the Turks and Caicos Islands.

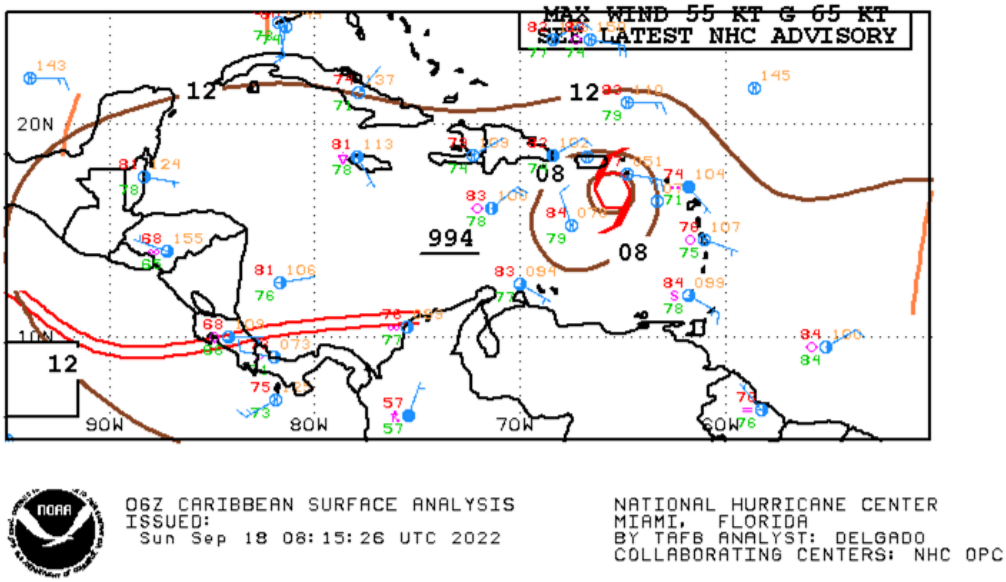
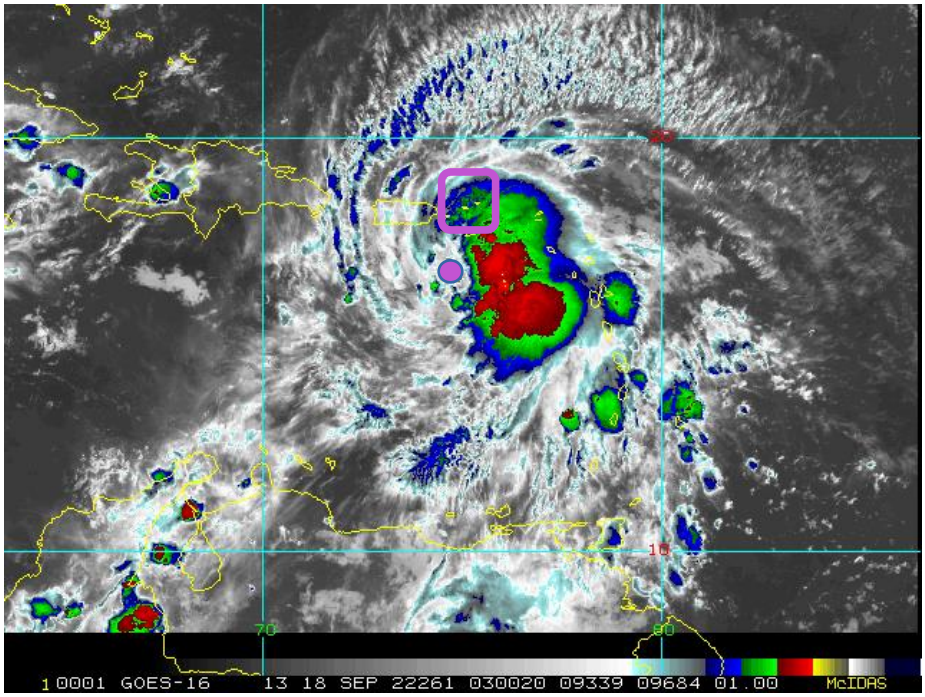
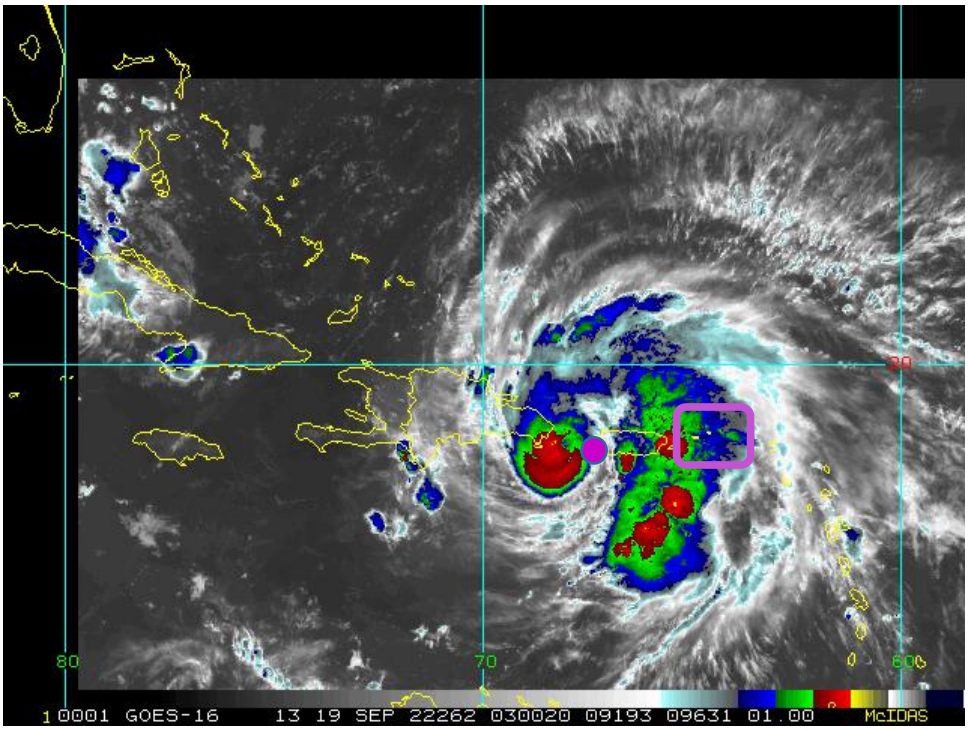


Figure 1 Surface analysis over the Caribbean area on 18 September at 0600UTC. Tropical Cyclone Fiona was located over the Northern Leeward Islands. Source: US National Hurricane Center[1]



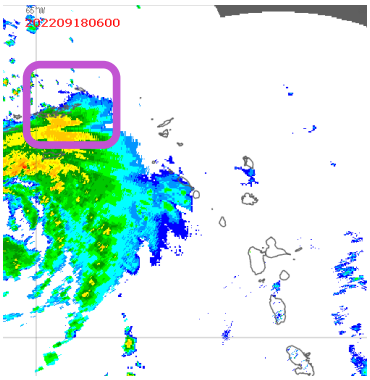
a) 18 September at 0300UTC

[1]National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review date: 18 September 2022, available at: *https://www.nhc.noaa.gov/tafb/CAR_06Z.gif*

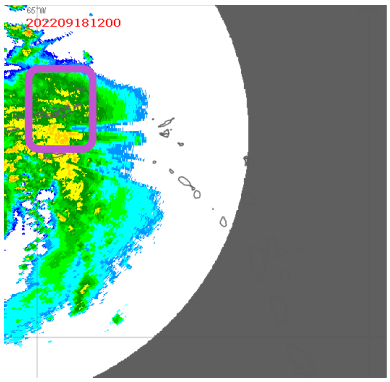


b) 19 September at 0300UTC

Figure 2 Satellite imagery on 18 September at 0300UTC (a) and on 19 September at 0300UTC (b)from thermal infrared channel enhanced with colour. 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. The circulation centre is indicated by the violet point, while the British Virgin Islands is surrounded by a violet square. Source: NOAA, National Environmental Satellite, Data and Information Service2.

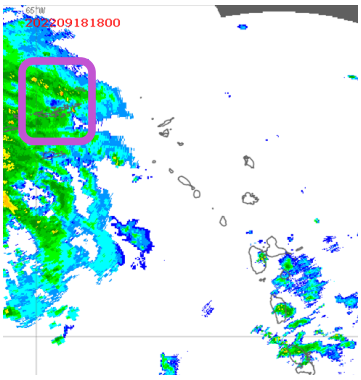


a) 18 September at 0600 UTC

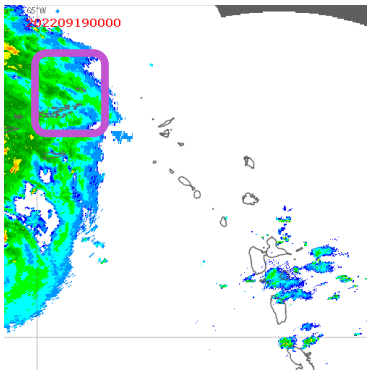


b) 18 September at 1200 UTC

[2]RAMSDIS Online Archive, NOAA Satellite and Information Service, available at: https://rammb-data.cira.colostate.edu/tc_realtime/storm.asp?storm_identifier=al072022



c) 18 September at 1800 UTC



d) 19 September at 0000 UTC

Figure 3 Radar imagery on 18 September at 0600 UTC (a), 1200 UTC (b) at 1800 UTC (c) and on 19 September at 0000 UTC (d) as indicated in the labels, from the radar composite over the Caribbean and Central America region. Blue/green colours represent low to moderate rainfall, while the yellow/red colours represent intense and very intense precipitation. The violet square highlights the location of the British Virgin Islands. Source: Barbados Radar Composite[3].

3 IMPACTS

At the time of writing this event brief, no information was available related to damage or loss in the British Virgin Islands due to this Covered Area Rainfall Event.

4 RAINFALL MODEL OUTPUTS

All three data sources used by the XSR 2.5 model, CMORPH[4], WRF5 and WRF7[5], detected the occurrence of precipitation over the British Virgin Islands and the surrounding waters during the period 16-20 September 2022. However, each data source reported a specific distribution and accumulation of rainfall, as discussed below. The CARE for the British Virgin Islands was activated on 18 September and lasted for the period 18-20 September. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation[6], thus the period considered by the XSR 2.5 model for the loss estimate based on the accumulated precipitation in the British Virgin Islands was 16-20 September.

[3] Barbados Radar Composite, available on 18 September at: https://www.barbadosweather.org/BMS_Radar_Composite_Resp.php#

[4] 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.

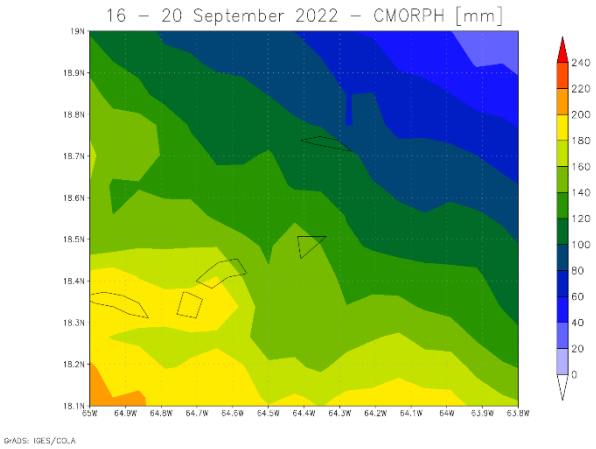
[5] WRF5 and WRF7 Models: the Weather Research and Forecasting Model weather model-based Configuration #1 and #2 data https://www.mmm.ucar.edu/weather-research-and-forecasting-model. These data are initialised by the NCEP FNL dataset. (NCEP FNL Operational Model Global Tropospheric Analyses [http://rda.ucar.edu/datasets/ds083.2/]).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

[6] 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.

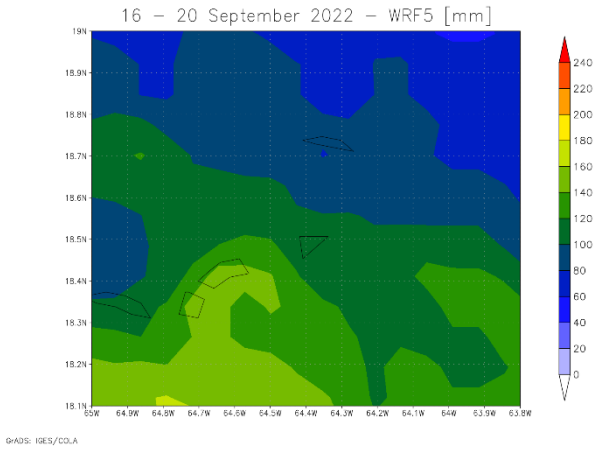
CMORPH reported total accumulated amounts of precipitation between 100 mm and 200 mm over the British Virgin Islands, with gradually increasing values from the north to the south of the country. The maximum amounts, ranging between 180 mm and 200 mm, were shown in the extreme south of the island of Tortola, the southernmost island among the British Virgin Islands.

WRF5 showed a similar pattern to CMORPH, but with slightly lower values of total accumulated precipitation. They ranged between 80 mm and 160 mm, with gradually increasing values from the north to the south of the British Virgin Islands. The highest values, between 140 mm and 160 mm, were simulated along the southern coast of Tortola.

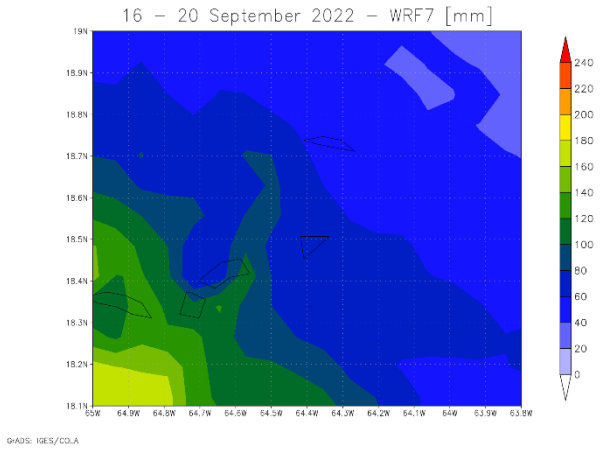
WRF7also presented a precipitation pattern similar to CMORPH and WRF5, with gradually increasing amounts of total accumulated rainfall from the north to the south of the British Virgin Islands. However, WRF7 showed slightly lower values of total accumulated precipitation than WRF5. They ranged between 40 mm and 120 mm, with the maximum values, between 100 mm and 120 mm, over the southwestern side of Tortola.



a) CMORPH



b) WRF5



c) WRF7

Figure 5 Total accumulated precipitation during the period 15-19 September, 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/VGBCARE_2_2022/daily_prec_short.mp4
https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/VGB/CARE_2_2022/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for the British Virgin Islands for all three data sources used by XSR2.5. The RIL was the highest for CMORPH, due to the larger amount of accumulated precipitation presented over the entire country and in particular in the vicinity of the capital, Road Town, the area characterized by the highest exposure for the British Virgin Islands.

The final RIL (RIL_{FINAL}) was calculated as the average of the RILs from CMORPH, WRF5 and WRF7. 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 British Virgin Islands' excess rainfall policy 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 the British Virgin Islands was below the attachment point of the Excess Rainfall policy and therefore no payout is due.

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

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.