



# CRT Supplemental Hurricane Disclosure

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...and a *better* housing finance system

## For families

...innovating to improve the liquidity, stability and affordability of mortgage markets

## For customers

...competing to earn their business

## For taxpayers

...reducing their exposure to mortgage risks

**Freddie Mac is committed to helping families maintain homeownership, including through difficult times such as natural disasters. Please see our website for a range of tools to learn more.**

## Recent Hurricane Impacts

...Geospatial models indicate limited CRT exposure to flood damage

## Analysis of Historical Storms

...Sandy and Katrina did not result in material credit losses in total portfolio

## CRT Portfolio

...Geographically diversified and less susceptible to regional downturns and isolated hurricanes

## Committed to providing transparency to investors in response to recent hurricanes

- Enhancing transparency on CRT loans impacted by hurricanes Harvey and Irma:
  - Previously disclosed the estimated loan counts and unpaid principal balance of all CRT loans within the 108 counties listed by the Federal Emergency Management Agency (“FEMA”) as major disaster areas.
  - This supplemental disclosure provides flood depth estimates for hurricanes Harvey and Irma generated by Aon Benfield and Guy Carpenter.
  - Estimates are derived using address level data evaluated as of September 1<sup>st</sup>, 2017 and geospatial models.
  - Focused on loans with significant flood damage as flood is often not covered by hazard insurance.
- We have also summarized loss estimates for prior natural disasters (Katrina and Sandy) that can be replicated using Freddie Mac’s Historical data set:
  - Historical loss and exposure analysis intended to help investors better estimate potential impacts from recent natural disasters.
  - Historical results are not indicative of future performance.

<sup>1</sup> Vast majority of Hurricane Irma damages are related to wind or storm surge. Wind damage is typically covered under insurance and storm surge is typically located nearby the seacoast in NFIP zones that require flood insurance.

# Summary of Recent Hurricanes



## Recent hurricanes caused physical building damage from heavy winds and flooding

Wind damage is covered under mandatory homeowners' insurance. Flood damage will be covered by the NFIP insurance program if a borrower is located in a specially designated flood zone

### Summary of Broker Model Estimates

- Freddie Mac's current outstanding CRT UPB is \$562 Billion, of which 2% (\$12 Billion) is located within the Harvey disaster zone and 5% (\$29 Billion) is located within the Irma disaster zone.
- CRT exposure to recent hurricanes expected to be limited.
  - In aggregate **3 to 8 bps** (up to \$400 Million) estimated to have experienced flood levels in excess of 3 feet as a result of hurricanes Harvey and Irma.
- Nearly half of this exposure (40-45%) is located within NFIP zones that are mandated to have flood coverage.

Hurricane Exposure on \$562 Billion CRT Portfolio					
CRT Hurricane Exposure	CRT UPB in Disaster Zones		CRT UPB Within Disaster Zones w/ Flood Depth > 3 Ft		
	\$ Billions	% of Total CRT	\$ Billions	% of Total CRT	Mandated Flood Coverage
Harvey	12	2%	\$0.15 to \$0.4	3 to 7 bps	39% - 44%
Irma	29	5%	Less than \$0.1	< 1 bps	~46%

#### Notes:

- CRT Disaster Zones refers to the 108 counties listed by FEMA as major disaster areas.
- CRT Reference Pool Size includes all CRT transactions to date (STACR and ACIS) at current reference pool sizes.
- Ranges are generated by Aon Benfield (Impact Forecasting) and Guy Carpenter (KATRISK).

# Detailed Analysis of Broker Models – Hurricane Harvey



Estimate that less than 3% (\$400 Million) of the Harvey disaster zone CRT UPB experienced flood levels in excess of 3 feet (equivalent to 2-7 bps of current CRT UPB).

## Hurricane Harvey

### Estimates of Flood Depth and NFIP Coverage

Harvey - CRT Exposure by Flood Depth				
Flood Depth Category ft	Disaster Zone UPB	Loan Count	Disaster Zone UPB % of Total	Mandated Flood Coverage
Greater than 3 ft	\$150 to \$400 Million	800 to 2,000	1.3% to 2.9%	39% to 44%
Less than 3 ft	\$1.0 to \$1.2 Billion	5,000 to 5,500	9.0% to 9.5%	11% to 18%
Limited or No Impact	\$10.1 to \$10.6 Billion	52,000	88% to 89%	4% to 5%
<b>Total CRT UPB in Disaster Zones</b>	<b>\$12 Billion</b>	<b>58,000</b>	<b>100%</b>	<b>6% to 9%</b>

- While we previously disclosed the total hurricane impacted UPB of \$12 Billion, using modeled estimates we are able to estimate depth of flood levels.
- Of the total \$12 Billion CRT UPB in the Harvey disaster zone, approximately \$150 to \$400 Million (800 to 2,000 loans) is estimated to have greater than 3 feet of flooding, using a range of estimates provided by Aon Benfield and Guy Carpenter.
  - Damage from flooding increases significantly when flood depth exceeds 3 feet, as damage expands beyond flooring to electrical wiring and drywall.
- Nearly 45% of the loans with greater than 3 feet of flood are mandated to have flood coverage.

#### Notes

- "Limited or No Impact" refers to rainfall flash flood (high depth not expected), or where loans were outside of the directly flooded area.
- Ranges are generated by Aon Benfield (Impact Forecasting) and Guy Carpenter (KATRISK).

# Detailed Analysis of Broker Models – Hurricane Irma



- Similarly, CRT losses for Hurricane Irma are expected to be lower since majority of damage relates to wind and storm surge (covered by other insurance).

## Hurricane Irma

### Estimates of Flood Depth and NFIP Coverage

Irma - CRT Flood Exposure				
Flood Depth Category	Disaster Zone UPB	Loan Count	Disaster Zone UPB % of Total	Mandated Flood Coverage
Greater Than 3 Ft	\$50 Million	275	0.2%	46%
Less Than 3 Ft	\$475 Million	2,500	1.6%	32%
Limited /No Impact	\$28.5 Billion	142,225	98.3%	NA
<b>Total CRT UPB in Disaster Zone</b>	<b>\$29 Billion</b>	<b>145,000</b>	<b>100%</b>	

  

Irma - CRT Storm Surge Exposure				
Flood Depth Category	Disaster Zone UPB	Loan Count	Disaster Zone UPB % of Total	Mandated Flood Coverage
Greater Than 3 Ft	\$375 Million	1,400	1.3%	69%
Less Than 3 Ft	\$600 Million	2,600	2.1%	80%
Limited /No Impact	\$28 Billion	141,000	96.6%	NA
<b>Total CRT UPB in Disaster Zone</b>	<b>\$29 Billion</b>	<b>145,000</b>	<b>100%</b>	

- Approximately \$50 Million of CRT UPB was impacted by flood levels greater than 3 feet, of which nearly half is mandated to have flood coverage.
- As illustrated in Storm Surge Exposure, approximately \$375 Million was impacted by greater than 3 feet of flood, however the majority are required to have flood coverage.

# Prior Natural Disaster Analysis



- Although in prior storms (2005 and 2012) we have noted a surge in delinquencies, they did not result in ultimate credit losses. **Economic factors** remain the key driver of credit losses in a geographically diversified portfolio.

## Hurricane Katrina (2005) and Superstorm Sandy (2012)

### Performance Relative to Broader Freddie Mac Historical Dataset

Katrina - Comparison to Freddie Mac Historical Dataset							
Region	Status Prior to Hurricane Katrina <sup>2</sup>	Loan Count	Ever D180 <sup>3</sup>			Losses	
			Within 1 Year	Within 2 Years	To Date	Mod Cost <sup>4</sup>	Total Loss Rate <sup>5</sup>
Katrina Zone <sup>1</sup>	Performing, Not Modified	47,819	210 bps	230 bps	478 bps	8 bps	80 bps
	Non Performing	1,736	960 bps	1,090 bps	1,610 bps	87 bps	666 bps
Full US	Performing, Not Modified	4,311,246	10 bps	30 bps	404 bps	20 bps	140 bps
	Non Performing	90,284	600 bps	760 bps	1,410 bps	100 bps	820 bps

  

Sandy - Comparison to Freddie Mac Historical Dataset							
Region	Status Prior to Hurricane Sandy <sup>2</sup>	Loan Count	Ever D180 <sup>3</sup>			Losses	
			Within 1 Year	Within 2 Years	To Date	Mod Cost <sup>4</sup>	Total Loss Rate <sup>5</sup>
Sandy Zone <sup>1</sup>	Performing, Not Modified	346,063	42 bps	105 bps	193 bps	4 bps	22 bps
	Non Performing	32,739	6,780 bps	7,130 bps	7,440 bps	260 bps	2,720 bps
Full US	Performing, Not Modified	6,102,843	34 bps	80 bps	142 bps	2 bps	22 bps
	Non Performing	356,191	5,680 bps	6,040 bps	6,360 bps	380 bps	2,290 bps

- While historical delinquency rates in Katrina and Sandy disaster zones are significantly higher than Freddie Mac's broader portfolio, the ultimate credit losses are in line with the portfolio.
- Total losses to date on loans within the Katrina and Sandy disaster zones are very limited when compared to Freddie Mac's geographically diversified portfolio (e.g. ~1 bps of portfolio loss).
- For context, estimated total economic cost was \$108 Billion for Katrina and \$75 Billion for Sandy. Current Harvey estimates are ~\$70 Billion.

- 1: Disaster Zones refer to the counties that were listed as disaster zones by FEMA.
- 2: Performing loans refers to loans that were not delinquent prior to the storm.
- 3: Ever D180+ refers to loans that were reported delinquent for at least 180 days. In the Historical Dataset, is defined as delq\_sts not in ('0','1','2','3','4','5'); average rate based on loan count
- 4: Modification related shortfall
- 5: Loss Rate = (Actual Loss + ModCost) / UPB at Aug 2005 cycle for Katrina and October 2012 cycle for Sandy

**Estimate that loans impacted by flooding in Superstorm Sandy have added 1 bps of credit loss versus non-impacted loans in the Sandy Declared Disaster Area.**

## Super Storm Sandy

*Broker Model  
Estimates of Flood  
Depth*

Hurricane Sandy Impacted Loans - Historical Performance							
Flood Depth Category	Loan Count	% Within NFIP Zones	Ever D180			Losses	
			Within 1 Year	Within 2 Years	To Date	Mod Cost	Total Loss Rate
Greater than 3 ft	6,045	70% - 76%	127 bps	215 bps	290 bps	3 bps	37 bps
Less than 3 ft	7,818	45% - 50%	76 bps	137 bps	229 bps	4 bps	31 bps
Limited / No Impact	332,200	N/A	40 bps	102 bps	190 bps	4 bps	21 bps
<b>Total</b>	<b>346,063</b>		<b>42 bps</b>	<b>105 bps</b>	<b>193 bps</b>	<b>4 bps</b>	<b>22 bps</b>

**+1 bps of total loss from the impacted loans**

- Loans with flood levels greater than 3 feet were more likely to be located within NFIP Flood Zones which require flood insurance.
- Although delinquencies to date have been higher, overall credit losses have been minimal.

### Notes

- Based all loans within the historical dataset that were located within the Sandy Disaster Zone (SF LLD disclosed in June 2017 with performance cutoff as of Dec 2016)

## Limitations Regarding Use of Catastrophe Models

This report includes information that is output from catastrophe models of Impact Forecasting, LLC (IF). The information from the models is provided by Aon Benfield under the terms of its license agreements with IF.

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It should be noted that uncertainties exist when modeling flood events that can lead to significant differences between actual and modeled flood extents and depths. For example, limited input data, including precipitation and stream gauge observations, are used for modeling large geographic areas. The data is prone to error and can be incomplete. Further, mathematical modeling techniques used for propagating potential flood water and estimating run-off patterns are simplifications of complex physical systems and cannot account for all variables that impact the possibility of flooding at any given location. Lastly, the value of Impact Forecasting's flood extent modeling is to assist companies to rapidly estimate potential flood exposure from an event within hours of the event making impact. In fact data observations used to develop the extent were collected as the event was unfolding between August 23<sup>rd</sup> and 30<sup>th</sup>. Over time, actual claims and loss reports from properties impacted by the flooding will provide a more accurate basis for determining the overall impact of the event to the Freddie Mac portfolio.

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As with any actuarial analysis, the results presented herein are subject to significant variability. While these estimates represent our best professional judgment, it is probable that the actual results will differ from those projected. The degree of such variability could be substantial and could be in either direction from our estimates.

In performing this analysis, we relied on the company for estimates regarding KatRisk Flood Depths and FEMA DFIRM maps. We did not perform an independent review of these estimates.