Flood Risk Models

Solutions for Reinsurance/Insurance

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CAS Seminar on Reinsurance
June 1-2

Session Agenda

- This presentation reviews how flood models are used within the Private market sector to Underwrite and Price Flood exposure – for both Primary and Reinsurance solutions.
  - CoreLogic/EQECAT history of Flood Solutions
    - Flood solutions since 1995
    - Detailed, granular data
  - Single Site Models
    - Underlying data layers and Scientific Elements
    - Solutions available
    - Example
  - Portfolio Model

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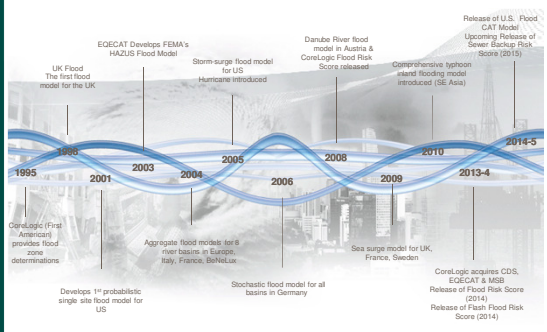
CoreLogic/EQECAT Flood Modeling – A History



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The CoreLogic Vision

Make property as easy as Auto

vs

Complete View of Property

From Point to Portfolio

Our mission is to empower our clients to make smarter decisions through data-driven insights.

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The CoreLogic Advantage: From Point to Portfolio

Urgent

Relevant

Solutions Available

Flood Risk

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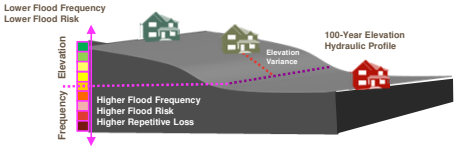
Delivering a New Flood Solution

Past Technology Challenges Lead to a New Approach

- Flood modeling requires massive data sets and granular data
  - Elevation is *very* important
  - High-severity loss events can occur anywhere.
  - Low-severity loss events drive location AAL & PML.
- Run-times are important
  - Performance delivered using grid-computing resources



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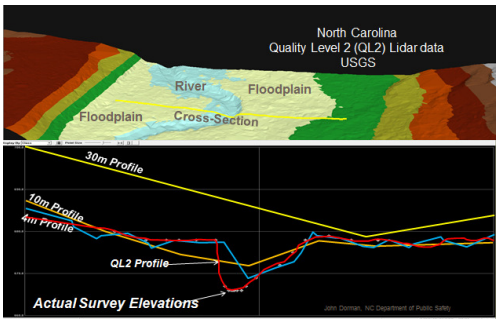
Importance of High Resolution Data



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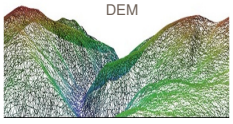
Flood Data Layers

Watersheds

Streams

- Elevation - 10m NED
- 86,000 Watershed covering mainland U.S.
- 3.5M miles of streams and rivers
- 20,000 streamflow gauges
- 280M+ river and stream cross section
- Parcel geocoding
- Detailed CoreLogic property characteristics database to refine vulnerability
- MSB replacement values

DEM



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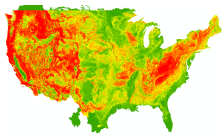
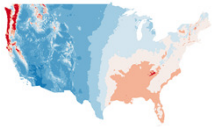
Data Layers Cont.

- 129 Data Layers
  - Hydrologic
    - Catchment area
    - % of storage in catchment
  - Climate Characteristics
    - Annual average precipitation (rain & snow)
    - Rainfall frequency
    - Rainfall duration
    - Maximum temperature
  - Watershed Morphology
    - Basin shape and slope
    - Mean catchment elevation
    - Basin Shape Factor

Catchment Slope



Average Annual Precipitation



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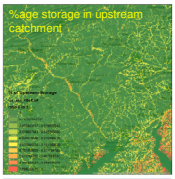
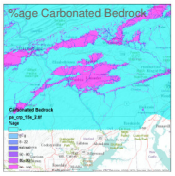
Data Layers Cont.

- Geologic
  - % of catchment on carbonated rocks
  - Soil permeability
- Landuse
  - % forestry in catchment
  - % upstream permeability
  - % upstream development
- Population
  - Population density





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Single Site Models

Risk Selection/Underwriting and Pricing

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Single Site Models – Underwriting and Risk Selection

- Locational accuracy is the key
  - CoreLogic PxPoint/ParcelPoint - geocode the address to the midpoint of the appropriate parcel.
- CoreLogic Risk Scores measure the relative risk of an event, with scores ranging from 1-100
  - Flood Zone Flooding / Flood Risk Score (Rivers, lakes, coastal)
  - Coast Storm Surge
  - Inland Flash Flood Scores
  - Basement Flooding Scores
  - Sewer Backup Scores

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Single Site Models – Underwriting and Risk Selection

- CoreLogic EQECAT Flood Model
  - Hybrid involving hydrological, hydraulic and statistical approaches
  - More than 120 data-layers representing different variables/parameters
  - Cross-section analysis at each point based on 10 m DEM and CoreLogic Water Surface Elevation
  - Stochastic event set preserves spatial variability observed from historical data
  - Less uncertainty and computationally efficient

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Geocode Comparison – Importance of Location Accuracy

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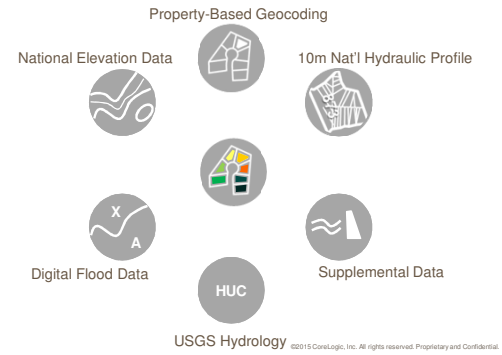
Scientific Elements in FRS Computation



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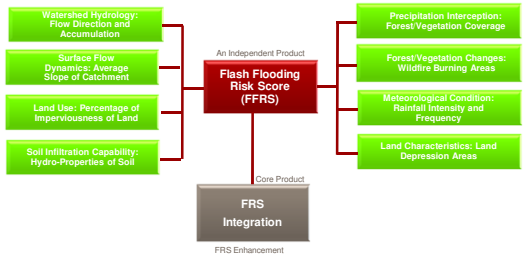
Components of Flash Flooding Risk Model



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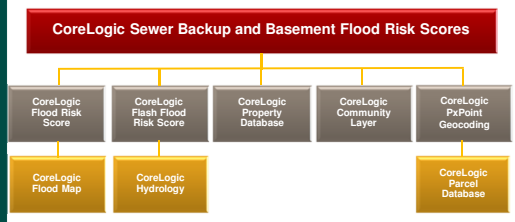
Leverage Existing CoreLogic Flood Tools

- CoreLogic Flood Risk Scores (riverine and coastal flooding) and CoreLogic Flash Flood Risk Scores, identify flood risk from surface water.
- CoreLogic property database with 150 million properties
- Integration of the natural factors and the structure information



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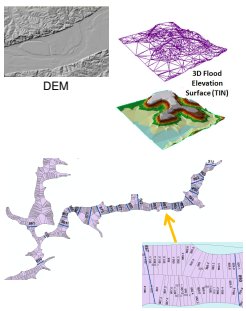
The CoreLogic Solution

Highlights

- Granular flood model
  - The highest resolution flood model available, using 10m DEM
- Dynamic flood model
  - Accounts for levees and other man-made flood protection barriers
  - Rivers, lakes, coastal surge, inland flash flood included
- A stochastic flood event set
  - Validated with historic gage station data
- The flood model with the longest history in the market



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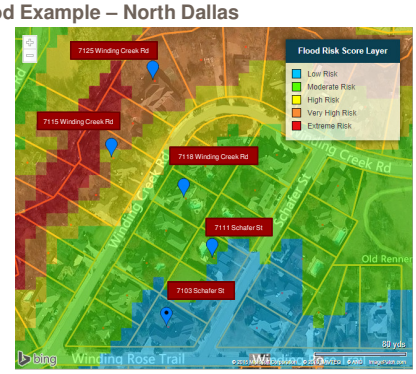
Flood Example – North Dallas



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Flood Example – North Dallas

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Flood Example – North Dallas

sitenumber	address	city	state	zipcode	lon	lat	Flood Risk Score (FRS)	Flash Flood Risk Score (FFRS)
1	7125 Winding Creek Rd	Dallas	TX	75252	-96.790262	32.996794	60	42
2	7115 Winding Creek Rd	Dallas	TX	75252	-96.790621	32.996233	50	53
3	7118 Winding Creek Rd	Dallas	TX	75252	-96.789994	32.995940	40	50
4	7111 Schafer St	Dallas	TX	75252	-96.789748	32.995506	30	42
5	7103 Schafer St	Dallas	TX	75252	-96.790145	32.995006	20	34

Site Number	Is Inside FEMA 1% Zone	Distance to Zone	Distance Units	HUC12	Ground Elevation	Water Surface Elevation (WSE)	Elevation Units	WSE Source
1	Yes	-	ft	120301050104	640.420	638.800	ft	TIN
2	No	5.835	ft	120301050104	636.483	637.400	ft	TIN
3	No	232.726	ft	120301050104	645.669	637.400	ft	TIN
4	No	338.516	ft	120301050104	648.950	637.300	ft	TIN
5	No	353.586	ft	120301050104	648.622	634.900	ft	TIN

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Flood Example – North Dallas

Peril [Flood - Inland]	Loss Metric [D]	Site Number	Mean Annual (USD)	Standard Deviation (USD)	50 Year AEP (USD)	100 Year AEP (USD)	250 Year AEP (USD)	500 Year AEP (USD)	50 Year OEP (USD)	100 Year OEP (USD)	250 Year OEP (USD)	500 Year OEP (USD)
Flood - Inland	D	1	241	5,017	0	0	8,319	31,718	0	0	8,319	31,718
Flood - Inland	D	2	567	7,861	0	5,836	43,572	90,561	0	5,836	43,253	90,561
Flood - Inland	D	3	30	1,772	0	0	0	0	0	0	0	0
Flood - Inland	D	4	30	1,772	0	0	0	0	0	0	0	0
Flood - Inland	D	5	4	672	0	0	0	0	0	0	0	0

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EQECAT Flood Model Overview

- Probabilistic Single Site Analysis
- Coverage:
  - Continental United States
  - Riverine and coastal
- Results:
  - Probabilistic loss results at several return periods
    - 50 Year, 100 Year, 250 Year, 500 Year
  - Identifies IN or OUT of FEMA 100 Year flood zone (SFHA)
  - Estimates of water depth at various return periods
  - Expected annual damage and gross loss for the site

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The CoreLogic Solution

Timelines for Delivery

- RQE® Platform
  - June 2015: Single Site Model
  - December 2015: Portfolio Model
- Additional CoreLogic Platforms
  - Risk Meter Online™ (http://www.riskmeter.com)
  - APIs

RQE Risk Quantification & Engineering

RiskMeter Online™

What new technology does is create new opportunities to do a job that customers want done.
-Tim O'Reilly

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