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Parametric Earthquake Insurance – ACWA JPIA

Why Use Parametric Insurance?

Speed of Payment

- Because the Index Value can be verified very quickly, the claim can be paid **within days of the event**.
- This allows for very quick post-event liquidity to deal with the immediate aftermath of a disruptive event.

Broadness of Cover

- Payment can be used for **any financial loss** resulting from the event.
- Expenses and loss that is typically excluded from traditional insurance coverage can be addressed.
- **No financial deductible**.

Flexibility in Design

- Parametric coverage can be **customized** to solve specific problem(s) that are difficult for traditional insurance to deal with.
- This could include (but is not limited to) contingent business interruption, difficult to insure risks, supply chain exposures, and many others.

Parametric Solutions: Core Comparison

Key points where parametric insurance differs from conventional

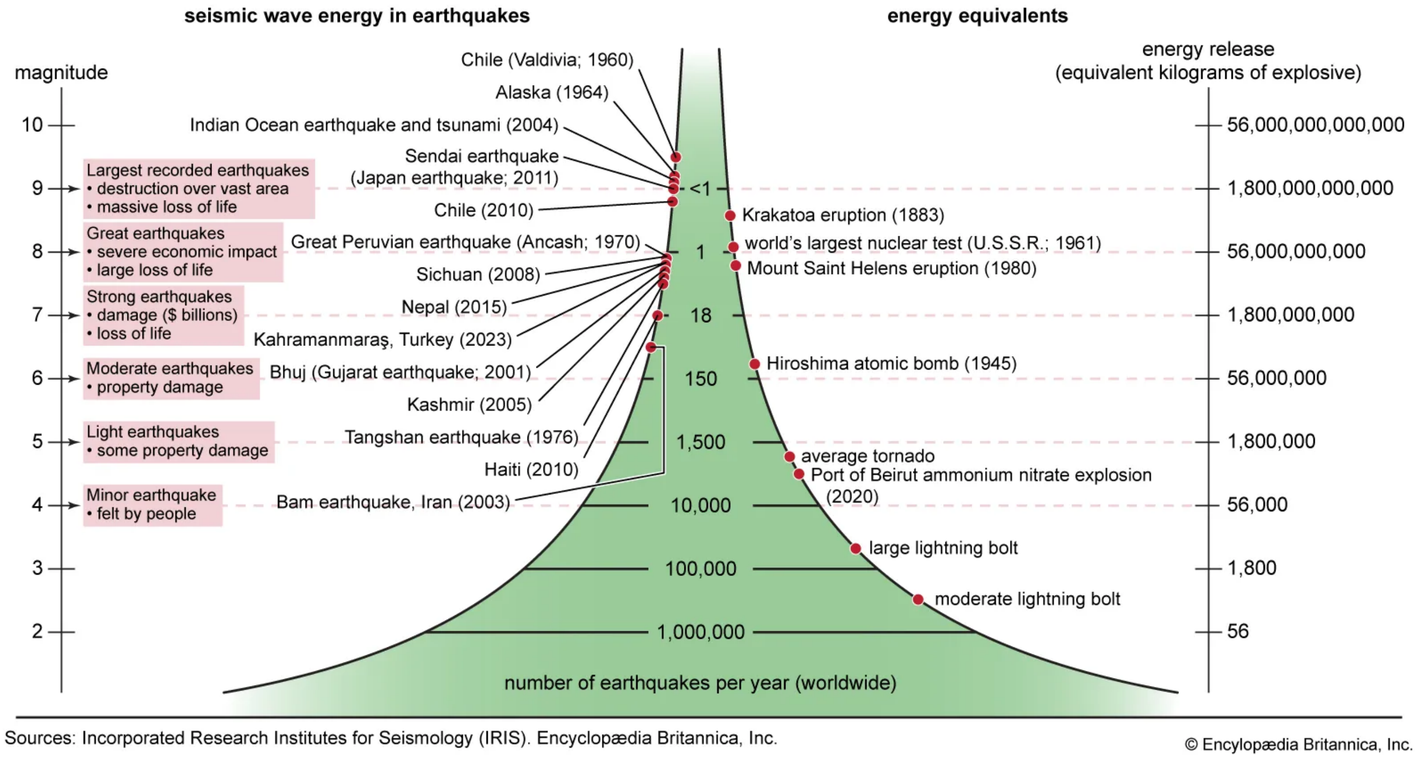
	Traditional	Parametric	Parametric Advantages
Loss Trigger	Physical damage or loss	Event occurs and meets objective thresholds	A set of objective, pre-defined triggers determines the loss event rather than a claims adjustment process
Loss Recovery	Claims adjustment determines payout	Pre-agreed payout based on “payout table”	Pre-determined loss recovery provides a transparent claims payment
Basis Risk	“Manuscripted” into policy – exclusions, deductibles, terms, sub-limits, etc.	Actual Economic Loss > Claims Payout	Form of “basis risk” is different, but either policy type can have greater basis risk
Claims Timeline	Long – months to years to adjust	Short – claims paid within 2-4 weeks	No traditional “loss adjustment” process, claims paid in days
Policy Term	Typically Annual	1-3 Years, more sometimes possible	Longer terms provide for known costs and capacity availability
Exclusions	According to the policy	None	Simple coverage without dollar deductibles, exclusions, sublimits, etc.
Policy Structure	Generally standardized and rigid	Flexible and customized to the client	Aon works with the client and markets to develop the unique solution required

Key Attributes:

1. **Independence:** Coverage triggered by independent event parameters (based on third-party data)
2. **Fast:** Payout structure formulaic and pre-negotiated (pays fast – within days)
3. **Coverage is broad:** Designed around ex-ante expectation of economic exposures arising out of the event

Magnitude Explained

- Earthquake magnitude, commonly expressed using the *moment magnitude (M_w),* or historically expressed using *Richter Magnitude (M_L)* is a logarithmic scale to measure energy released by an earthquake. A single step (e.g. M6 -> M7) in the scale is the equivalent of 32 times more energy released. Two steps (e.g. M6 -> M8) is the equivalent of *one thousand times* more energy being released by an earthquake.
- Magnitude is well-correlated with macroeconomic impacts of earthquakes, including non-damage business interruption, wide area damage, ingress/egress challenges, damage to public infrastructure, etc.



Sources: Incorporated Research Institutes for Seismology (IRIS). Encyclopædia Britannica, Inc.

Shake Intensity Explained

- **Magnitude** defines the **relative size of an earthquake**. The most common reported metric is Moment Magnitude (Mw).
- While this provides information as to the severity of the event overall, it doesn't reveal much about the shaking at a particular location in the affected area.

- **Shake Intensity**, also reported by the USGS, **tells us the severity of ground shaking at a specific location**. This metric reveals much more about the potential damage and disruption to a specific site or area.
- There are a number of ways in which Shake Intensity is measured, one of which is *peak spectral acceleration* (PSA03). Also common are *Peak Ground Acceleration (PGA),* and *Peak Ground Velocity (PGV).*

For more information, visit USGS website: https://www.usgs.gov/programs/earthquake-hazards/earthquake-magnitude-energy-release-and-shaking-intensity

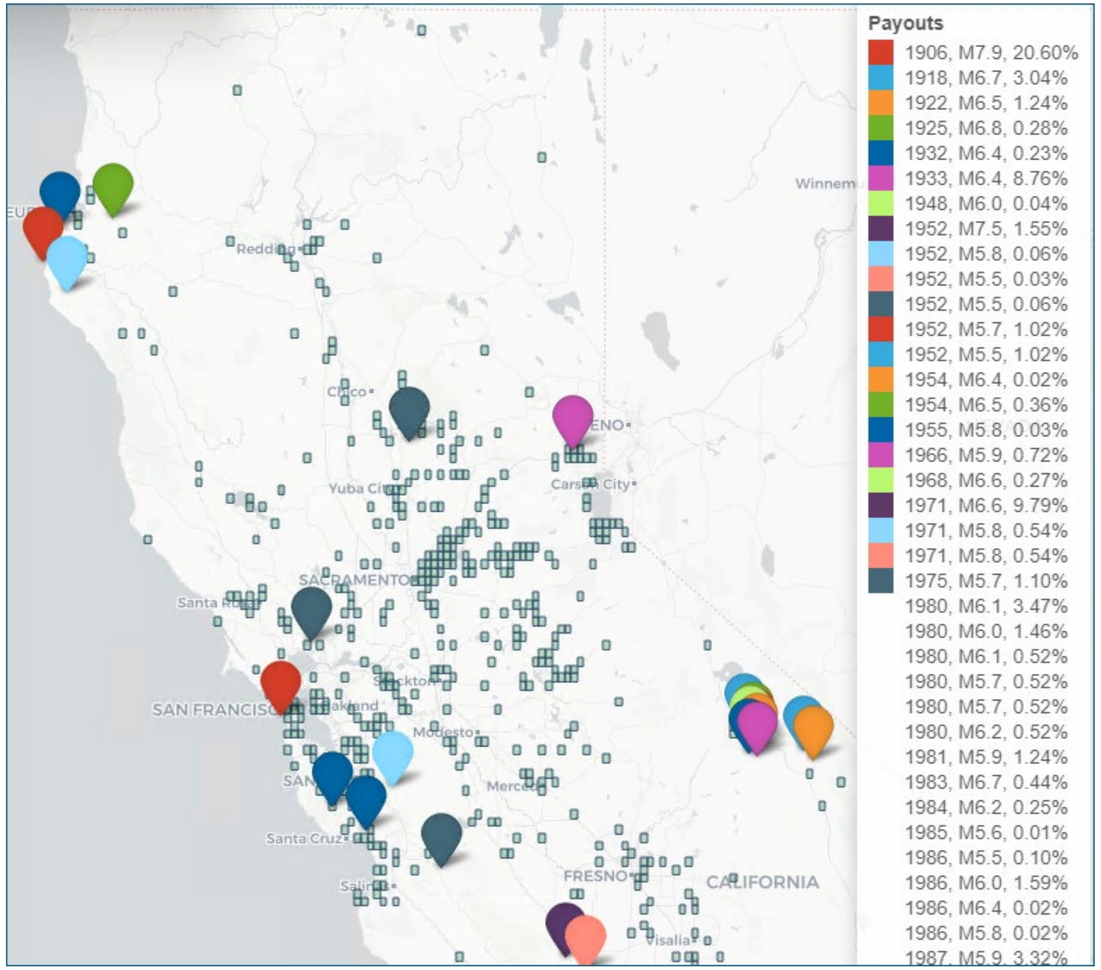
Standard USGS Conversion of MMI to PGA (%g) Values

Near-Source Modified Mercalli Intensity (MMI)	I	II-III	IV	V	VI	VII	VIII	IX	X
Maximum Peak Ground Acceleration. (PGA) in %g	< .17	.17 – 1.4	1.4 - 3.9	3.9 - 9.2	9.2 - 18	18 - 34	34 - 65	65 - 124	> 124
Perceived shaking	Not Felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
Potential Damage	None	None	None	Very Light	Light	Moderate	Moderate / Heavy	Heavy	Very Heavy

When a trigger event occurs, the USGS reports a grid of maximum PGA readings at all locations impacted by the earthquake; these numbers are used to determine the payout at each impacted location based on the payout table in the parametric policy

BHSI Parametric Indication: Shake Intensity

Coverage that triggers based on the amount of shaking from an earthquake



Terms

Insured: Association of California Water Agencies (ACWA)
Period of insurance: 12 months from date to be agreed by BHSI
Covered Peril: Earthquake
Maximum Limit(s) (100%): $10M per occurrence and in the aggregate
Premium (100%, ex taxes): **$497,143**, incl. 12.5% ART Commission, but Excl. Applicable SL Taxes & Fees
BHSI Paper: National Fire & Marine Insurance Company
Validity of Indicated terms, until: December 1, 2025

Box Definitions, TIV, and Sub-Limits

- There are ~44,000 locations on the SOV and a Total Insured Value of $13.28Bn
- Coverage uses a 0.05x0.05 degree grid with 932 cells; each grid cell is approximately 9.5sqmi
- The structure covers all cells with TIV >1M within them
- The total TIV covered by this program is $12.98Bn (~=98% of the TIV)
- Each grid cell is assigned a sub-limit based on the TIV within the cell
- The sum of sub-limits is $60M = 6.0 x $10M occ/agg limit. Each cell has a sublimit of 0.4622% of the TIV within the cell. For example, if there is $100M of TIV in a single grid cell, it is assigned a value of $462,200.

Payout Table

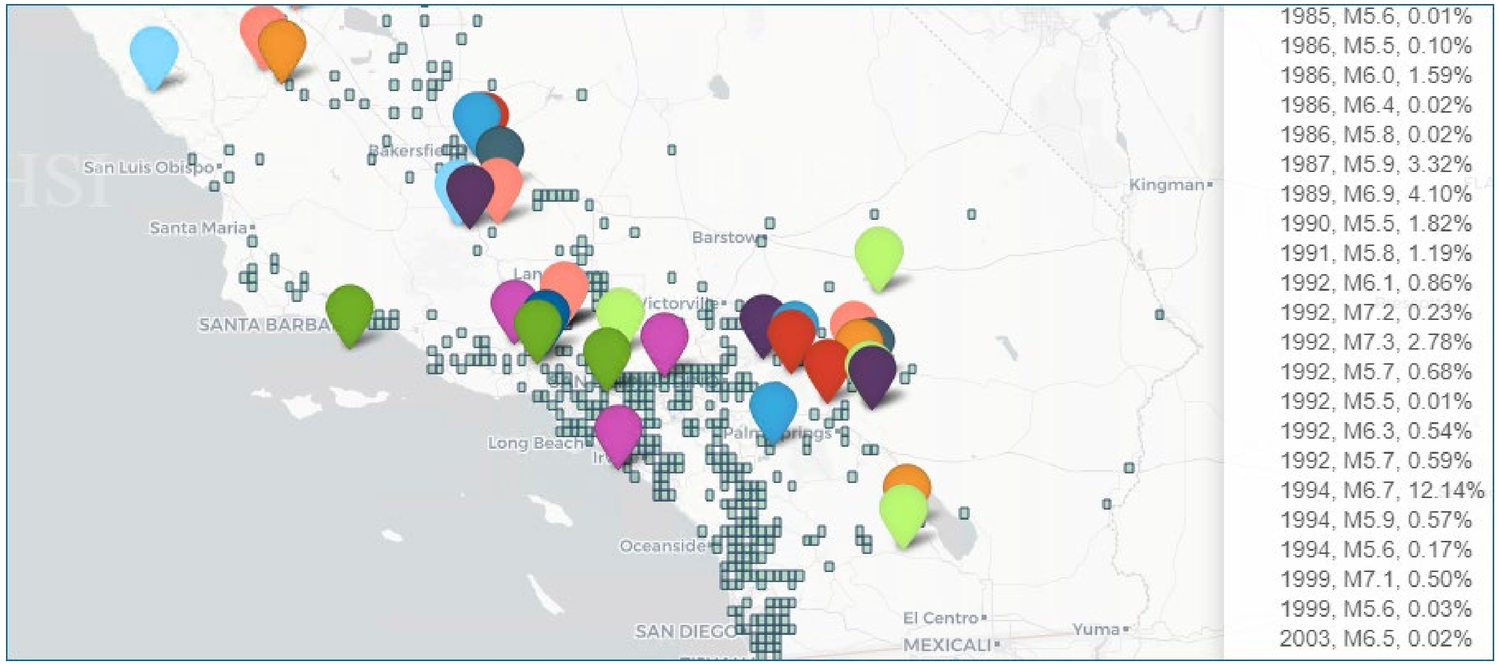
Min PGA [%g]	Option A
20	20%
30	30%
40	40%
50	50%
60	70%
70	90%
80	100%

Payout is based on the **maximum** peak ground acceleration **(PGA) within a 0.05-deg box around the location**, as provided by the USGS Shakemaps, subject to a minimum magnitude of 5.5Mw.

If a single event triggers payouts across multiple locations, payout will be the **sum** of payouts among the individual locations, subject to individual location, occurrence, and term aggregates.

Hypothetical Earthquake Event

Image shows SoCal grid cells with TIV >$1M, and historical triggering events



Grid Cell	TIV within Grid Cell	Grid Cell Assigned Value (.4622% of TIV)	Hypothetical PGA	Associated Payout (% of Assigned Value)	Payout Earned
1	100,000,000	$462,200	22%g	20%	$92,440
2	375,000,000	$1,733,250	36%g	30%	$519,975
3	75,000,000	$346,650	18%g	0%	$0
Total	$550,000,000	$2,542,100	xxx	xxx	$612,415

Hypothetical Event Scenario

The table below shows a hypothetical earthquake event where three grid cells experience shaking.

- Grid Cell 1 experiences 22%g shaking, which equates to a payout of 20% of the assigned value of that grid cell, or $92,440.

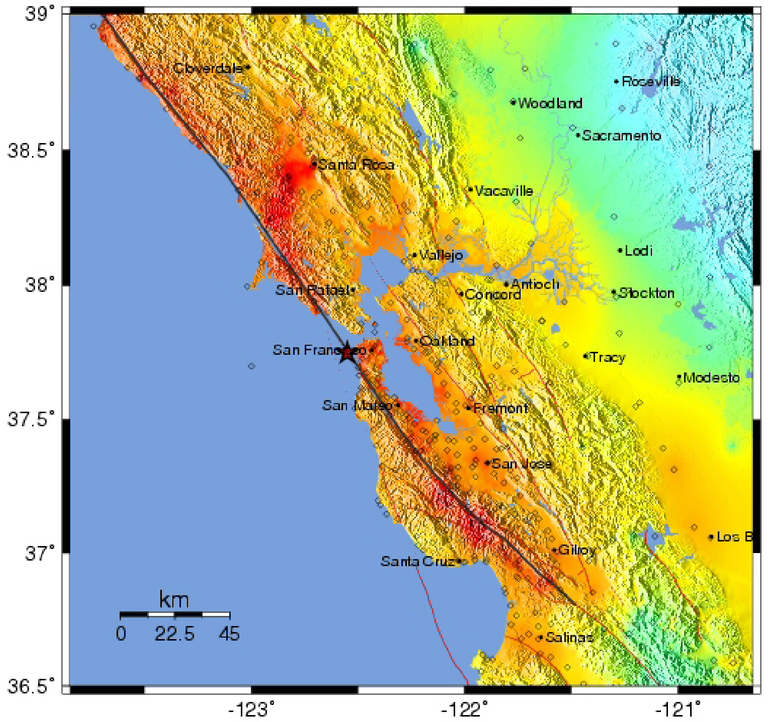
- Grid Cell 2 experiences 36%g shaking, which equates to a payout of 30% of the assigned value of that grid cell, or $519,975.

- Grid Cell 3 experiences 18%g, which is below the minimum threshold of 20%g, thus does not trigger any payout.

The combined event payout is $612,415

Selected Historical Events and as-if payouts

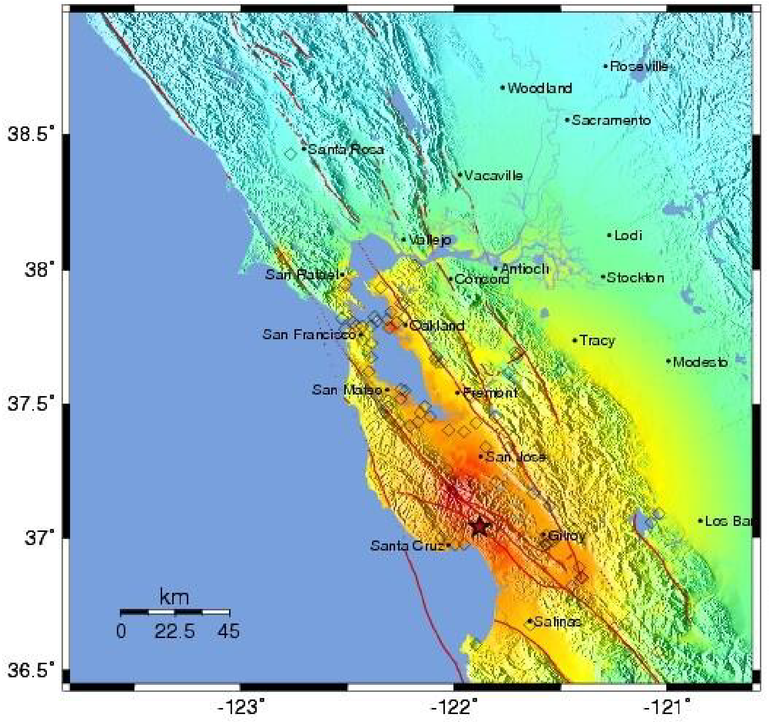
1906 San Francisco Earthquake, M7.8, Depth 10km



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<.17*	*.17-1.4*	*1.4-3.9*	*3.9-9.2*	*9.2-18*	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	*8.1-16*	*16-31*	*31-60*	*60-116*	*>116*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Parametric Payout: $2,060,000

1989 Loma Prieta, M6.9, Depth 18km



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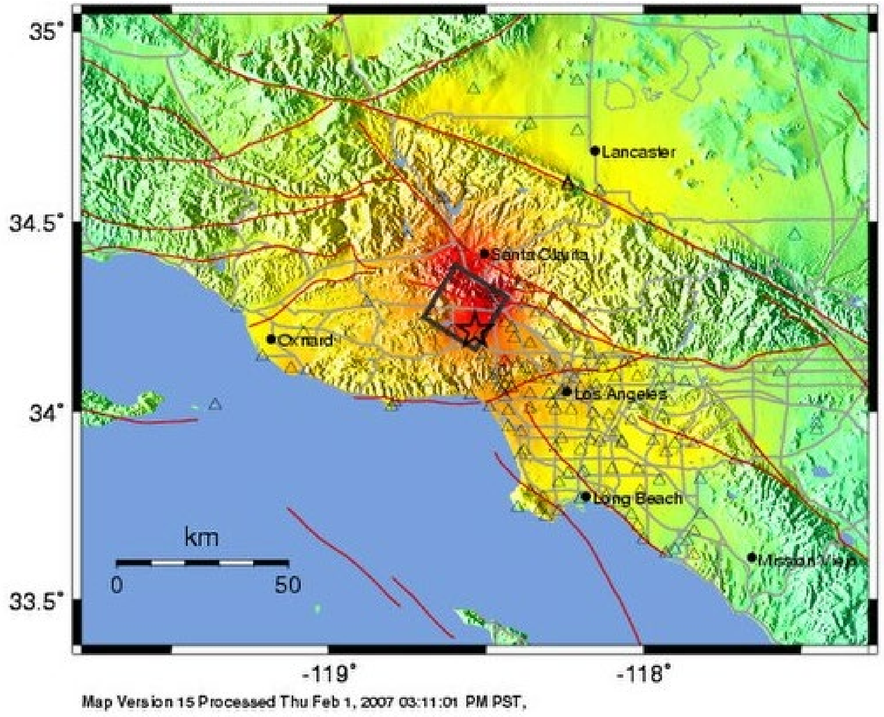
Parametric Payout: $410,000

1994 Northridge, M6.7, Depth 18km



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INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Parametric Payout: $1,214,000

In total, the proposed policy would have triggered 36 payouts between 1906 and 2025

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Understanding the Parametric Claims Process

How will parametric claims be adjudicated

Event Occurs

- An earthquake takes place with parameters that may trigger the policy (e.g. epicenter and magnitude within defined area and range, or significant ground shaking at a covered location)

Data Verification

- 0-7 days following the trigger event, USGS provides the earthquake's epicenter location and moment magnitude
- USGS publishes ShakeMap
- Carrier (or sometimes a third party) confirms policy has triggered based on publicly available data from USGS and policy terms

Proof of loss submitted

- Timing at the discretion of the insured
- Insured provides a signed/notarized loss affidavit stating that its estimated direct/indirect losses exceed 20% of the calculated claims payout

Claim Paid/Closed

- Typically 1-3 days following receipt of proof of loss, carrier pays claim

Elapsed time: 4-10 working days

Parametric Protection for a Stronger Property Program – Next Steps

PROPERTY PROGRAM COMMITTEE MEETING TOWN HALL

ASSESS NEEDS FOR MARCH 26 PROPERTY PROGRAM MEETING

End of Parametric Presentation

Next

Ask ACWA JPIA Anything @ 10:30 AM