



GREEN SHIELD
— RISK SOLUTIONS —



LOCKTON®

REINSURANCE

ALIGNING UNDERWRITING AND PORTFOLIO ANALYTICS

THE KEY TO RESILIENCY
IN AN EVER-CHANGING
RISK LANDSCAPE



● **Exposure**

● **Peril**

● Risk Transfer

● Placement

The critical need for insurance companies to build resilience in the face of an escalating wildfire risk landscape has never been clearer. The devastating impact of the recent Los Angeles fires is a stark reminder of the growing pressure these companies face and the increased difficulty that exists in navigating the wildfire insurance market.

As wildfires become a growing concern for portfolio managers, the tools used to measure wildfire risk are becoming more crucial. While managing an insurance portfolio requires analytics in a variety of areas, it is vital that these processes don't work in isolation from one another. When underwriting and portfolio management tools talk to each other, this communication supports a view of risk that is comprehensive across the business. This collaboration passes on important details, leading to better modeling and a risk profile that's closer to reality. The result? More resilient communities and a more resilient portfolio.

Lockton Re

Lockton Re, the global reinsurance business of Lockton Companies, helps businesses understand, mitigate, and capitalize on risk. With over 500 colleagues in 22 locations globally, the business is continuing to grow, pushing the reinsurance industry forward with smarter solutions that leverage new technologies—delivered by people empowered to do what's right for clients.

Lockton Re's reports, market commentary and insights focus on key topics, occurrences, or changes in the (re)insurance and broking market place that impact our clients and partners. In order to help guide relevance for the reader, we categorize this content into four areas—Exposures, Perils, Risk Transfer, and Placement.

Green Shield Risk Solutions

Green Shield Risk Solutions is a Chicago-based catastrophe risk mitigation specialist, focusing on addressing wildfire risk through a comprehensive strategy that extends beyond traditional hazard scoring. Through its Property Guardian™ platform, Green Shield provides insurers, reinsurers, and managing general agents with tools to select, mitigate, monitor, and manage wildfire risk more effectively.

Powered by cutting-edge wildfire analytics, Property Guardian delivers real-time, science-backed analyses and mitigation recommendations through reports and application programming interface (API) services. These wildfire risk insights are property specific and provide detailed assessments quickly, delivering results in as little as 45 seconds for reports and less than 2 seconds through API. Each risk assessment incorporates more than 200 advanced data points to analyze factors related to the structure, parcel, community, and region that contribute to a property's wildfire exposure.

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Introduction

Over the better part of the past decade, the combination of climatological and anthropogenic factors has resulted in a significant increase in wildfire activity across the western United States. For portfolio managers, this has caused many headaches across the insurance risk value chain, from underwriting resilient properties all the way through to obtaining attractive reinsurance pricing. The key to success for any wildfire-exposed portfolio revolves around sound analytics at all levels of the business, particularly as part of an underwriting strategy aimed at finding resilient risks. In areas susceptible to significant wildfire activity, the identification of these “diamonds in the rough” often comes down to the physical characteristics of the property and any risk mitigation practices the property owner may be implementing. While primary risk characteristics, such as the construction and occupancy of the property, are regularly captured data points, it is the frequently less-captured distinguishing features that can differentiate the bad risks from the attractive ones. In the world of catastrophe risk management, these are referred to as secondary risk characteristics, or secondary modifiers, and are a key driver of risk differentiation at the point of sale.

“During the development of underwriting guidelines, risk differentiation and identification of resilient risks are crucial components to building a resilient portfolio.”

Over the past 10 years, the analytics space surrounding wildfire risk has exploded with different products and toolsets to help portfolio managers find resilient risks and manage their portfolios appropriately. However, each tool is fit for a single purpose, and therefore it is difficult, if not impossible, to find a single solution that helps navigate all wildfire-related challenges, from risk selection all the way downstream to portfolio analytics. Most of the time, this causes a disconnect between the tools in a portfolio manager’s toolbox such that the communication between underwriting and portfolio management products is limited, and the credits being provided to policyholders are not being appropriately propagated through to reinsurance pricing. This can directly result in a mischaracterization of the risk profile of any wildfire-exposed portfolio and an overspend on reinsurance coverage.

To address this issue, it’s crucial to have tools that work well together and provide the data necessary to see that the credits captured during the underwriting process have the same impact when performing portfolio analytics. In this paper, Green Shield Risk Solutions and Lockton Re are collaborating to provide a proposed solution to this challenge. We will highlight the impact that capturing these risk-differentiating features has on a portfolio’s risk profile, identifying clear cost savings for any insurance company using this strategy, ultimately leading to a more resilient business.

The Secondary Modifiers That Matter

Commonly across the market today, a focus is put on predictive analytics in the form of wildfire scores or catastrophe model output. However, expanding that focus to include a combination of predictive and preventative data, such as identifying key property-specific mitigation characteristics known as secondary modifiers, helps build a more holistic approach toward resiliency.

By incorporating secondary modifiers, underwriters are able to apply model credits associated with actual mitigation attributes identified at each risk, helping to improve risk assessment accuracy and potentially reduce reinsurance costs at the portfolio level. Effectively capturing secondary modifiers for each property at-bind is a critical first step in capitalizing on portfolio-level modeled loss-reduction benefits.

Some of the most impactful secondary modifiers include:



Roof Covering

The material and condition of the roof covering are critical in determining a structure’s vulnerability to wildfires. According to the Insurance Institute for Business & Home Safety (IBHS), embers are the leading cause of ignition during a wildfire.¹ The roof, being the most exposed area where embers land, is often the most vulnerable part of a structure. During a wildfire, embers don’t just lightly touch the roof—they bombard it, often resembling a night sky filled with stars. Firefighters, particularly those trained in National Wildfire Coordinating Group (NWCG) classes, are taught that if 25% of the roof becomes involved in fire during high-wind events, the structure is likely a total loss, and it’s not worth risking safety to save it.



Roof Vents

Roof vents, if not properly protected, can serve as entry points for embers, leading to potential ignition. Not all roofs have vents, and some structures lack attic space, which provides natural protection against ember penetration. However, when vents are present, they are designed to allow airflow, which also means they can allow embers to enter. It is crucial to assess whether vents are present on a roof and, if so, to ensure they are adequately protected. Recommended measures include installing 1/8-inch metal mesh or using flame- and ember-resistant venting options such as Brandguard Vents, Embers Out, and Vulcan Vents, which offer enhanced protection in wildfire-prone areas.

¹ Insurance Institute for Business & Home Safety, “Embers Cause Up To 90% Of Home & Business Ignitions During Wildfire Events,” PR Newswire, March 12, 2019, <https://www.prnewswire.com/news-releases/embers-cause-up-to-90-of-home--business-ignitions-during-wildfire-events-300811068.html>.



Deck

Decks are often overlooked but can be significant ignition points, especially if constructed with flammable materials. Debris or other combustibles beneath decks can ignite from small fires, while embers landing on the deck can cause ignition if the wood is not well sealed. Decks can also act as a wick, drawing fire back to the structure. During the Woolsey Fire in 2018, many oceanfront structures burned down due to their decks facing the ocean. Embers falling between the boards or swept under the decks ignited light grasses and brush beneath, leading to the destruction of these homes.



Firewise Community²

Being part of a Firewise community indicates that the property adheres to specific wildfire safety practices. These communities have committees, boards, and volunteers dedicated to wildfire mitigation. They represent a significant investment in mitigation, with a minimum of eight dwelling units and a maximum of 2,500. Firewise communities undergo comprehensive wildfire risk assessments, and multiple Firewise communities can exist within a single city. This designation is not for an entire city but for specific areas, making it challenging to scale. Understanding that wildfires are not just a parcel-level event but a community-wide concern is essential for providing ultimate protection. Firewise communities lead the charge in effective mitigation strategies.



Defensible Space

The area surrounding a structure, known as defensible space, is crucial for wildfire risk mitigation. While other modifiers focus on ember fallout, poor defensible space increases the risk of direct flame impingement. When evaluating a property, it's essential to consider the vegetation within the zero-to-five-foot area around the structure. If vegetation in this zone ignites, it can easily transfer flames to the structure's walls.



Skylights

Skylights, depending on their material and installation, can be vulnerable during wildfires. Plastic skylights may melt under intense heat, while even noncombustible skylights can accumulate embers on the upward side, where leaves, debris, and pine needles might also gather, increasing the risk of ignition.

Scaling Secondary Modifiers Across an Entire Portfolio (Book of Business)

When managing a large portfolio of properties, accurately capturing secondary modifiers for all locations ensures that these key risk attributes are properly represented in catastrophe models. Without proactive data collection, models are forced to rely on default assumptions, which may not be an accurate reflection of the underlying exposure, and can lead to a skewed risk profile and an overestimation of loss.

“By focusing on accurately capturing and scaling secondary modifiers, insurers can better demonstrate the strength of their underwriting and loss-control practices.”

For instance, a default model assumption can lead to unintended consequences in loss estimates. This could produce a risk profile that does not accurately represent the underlying exposure and, in many cases, may result in an overestimation of loss.³ By focusing on accurately capturing and scaling secondary modifiers, insurers can better demonstrate the strength of their underwriting and loss-control practices.

Conversely, failing to capture these attributes—such as the presence of multiple decks, skylights, poor roofing, and inadequate defensible space—can also result in underestimating the true risk. This could lead to greater losses than anticipated. Even with robust underwriting practices, the absence of this critical data could obscure the actual risk profile of the portfolio.

Industry Standards and Model Influence

In the context of wildfire risk management, it is important to recognize the various standards that guide our industry. Several organizations and frameworks provide benchmarks for building resilience and wildfire mitigation, including:

- NFPA 1140 Standard for Wildfire Protection (2022)
- IBHS Wildfire Prepared Home Standard
- CA AB 38
- California Building Code Chapter 7A
- California Wildfire Mitigation Program
- Colorado State Forest Service Wildfire Mitigation Measures
- CDI Safer from Wildfires Program

In addition to these external standards, the insurance industry often develops its own Internal Insurance Industry Standards.

While the various external standards and best practices are valuable, it is only the extent to which these practices are captured in downstream modeling data that matters when it comes to the quantification of risk at the portfolio level. Catastrophe models use vulnerability curves specific to the risk characteristics at the property level to determine expected levels of damage and potential losses to an insurer. These models and their output are what your reinsurance partners and external stakeholders use when assessing your loss curve to price reinsurance coverage.

Ultimately, it's the catastrophe model that determines the perceived effectiveness of your underwriting and risk management.

² "How to Become a Firewise USA® Site," n.d., <https://www.nfpa.org/education-and-research/wildfire/firewise-usa/become-a-firewise-usa-site>.

³ Wildfire Prepared Home, "How to Prepare Your Home Checklist," Wildfire Prepared Home, August 2023, <https://wildfireprepared.org/wp-content/uploads/WPH-How-To-Prepare-My-Home-Checklist.pdf>.

Navigating a Growing Market of Analytics

The insurance market is filled with a multitude of risk selection tools that provide valuable insights to help insurance carriers underwrite with confidence. These tools are often designed to make the underwriter's job as easy as possible, providing a very easy-to-understand risk "score" with minimal information needed from the underwriter. This creates one simple, easy-to-use metric that underwriting guidelines can be built around, and if the methodology of the tool is trusted, it can be a great step toward a resilient book of business.

While a single number is digestible and easy to interpret, it provides little utility for any purpose outside of risk selection, and, specifically, it is difficult to translate that number into any usable insight when looking at a portfolio view of risk. For example, if there are certain characteristics to a given property that reduce the risk score from a nine (high risk) to a three (low risk), it is important that the tools being used when performing portfolio analytics also capture those characteristics and provide similar credits.

With that said, two problems often arise here:

1. The tool being used for underwriting may not give the user insight into why one risk is a three and another risk is a nine, disabling any ability to carry that insight downstream.
2. The underwriting tool may be determining a view of risk using different property-specific variables than the ones considered by the downstream catastrophe models.

The reason why these are problems is due to how the models handle exposures with "unknown" risk characteristics. When certain secondary risk characteristics get modeled as

"unknown" or "default," the model in many cases may assume a more conservative view than what the view would be if that missing information were provided. The model may not know enough about the risk to be able to backfill that data on its own, so rather than assuming the best-case scenario, the model can either assume some kind of weighted average of the possible modifier options, or for some modifiers, it is possible that the worst-case scenario can be assumed.

Given this behavior of the models, it is possible for a location to be assigned low risk by an underwriting tool due to one set of property assumptions, and then be subsequently viewed as high risk by a catastrophe model using a different set of property assumptions. This divergence is ultimately what can cause portfolio-modeled losses to be overstated, resulting in an overspend on reinsurance.

The ultimate solution is to have an underwriting tool that speaks a similar language to the downstream catastrophe models. The ideal tool would provide outputs in the form of actionable insights that can be used as inputs to whichever model is being used to develop the risk profile of the portfolio. This way, credits that are being given to individual policyholders in the form of reduced premiums can also be reflected in cost savings for the insurance company in the form of more attractive reinsurance costs.

Including these risk characteristics in the exposure data that gets fed into the model can have material impacts on the risk profile of the portfolio, reducing metrics such as the average annual loss (AAL), as well as other metrics more commonly used for reinsurance pricing, such as the 100- or 250-year return period loss.

“The ideal tool would provide outputs in the form of actionable insights that can be used as inputs to whichever model is being used to develop the risk profile of the portfolio.”



Building a Representative Portfolio with Quantified Assumptions

Colorado

217
Firewise Communities

1,085
Area Covered (sq. miles)

104,094
Total Area (sq. miles)

1.04%
Percentage Covered (%)

California

912
Firewise Communities

4,560
Area Covered (sq. miles)

163,696
Total Area (sq. miles)

2.79%
Percentage Covered (%)

To demonstrate how secondary modifiers can impact a book of business, **a notional portfolio was built inclusive of 150k single-family, wood-frame risks, all in moderate-to-severe wildfire regions**, using attributes derived from the CAL FIRE Damage Inspection (DINS) dataset.⁴ By focusing on property attributes rather than specific locations, the DINS dataset provided an unbiased foundation for understanding how these attributes contribute to wildfire risk and what is common in these wildfire-prone areas. These insights were crucial to developing a representative distribution of risk characteristics that reflects real wildfire-exposed risks.

When analyzing the dataset, we observed noticeable differences between characteristics common to structures in Northern and Southern California. Additionally, Northern California exhibited characteristics similar to those found in Colorado. To ensure an accurate representation of each region, we used a range of variables across the dataset to account for this variability.

Expert judgment also played a significant role in our assessments. For attributes such as skylights and defensible space, Paul Brady, Head of Wildfire Insights & Mitigation at Green Shield—a seasoned professional with extensive experience conducting thousands of residential and commercial inspections—provided input to fill gaps where data was incomplete

or unavailable. This ensured that our assumptions reflected practical, real-world insights, while the use of the DINS dataset helped eliminate potential biases from our analysis.

In addition, Firewise data provided valuable context for understanding community-level mitigation efforts. There are 217 Firewise communities in Colorado and 912 in California.⁵ While the exact coverage per community may vary, we used an estimated area of five square miles per community to contextualize their impact. This data allowed us to better understand the extent of community-level resilience and incorporate it into the portfolio-level risk assessment.

By accurately capturing these secondary modifiers, we were able to create a notional portfolio that serves as a showcase of how these factors could influence a book of business. This unbiased approach, using the property attributes from the DINS dataset, demonstrates how integrating secondary modifiers can improve underwriting precision, reduce modeled loss estimates, and align broader risk management objectives, even in high-risk wildfire environments.

⁴ California Department of Forestry and Fire Protection (CAL FIRE), "CAL FIRE Damage Inspection (DINS) Data [Data set]," 2024, <https://calfire-forestry.maps.arcgis.com/home/item.html?id=994d3dc4569640caadb3198d5a3da1>.
⁵ "State Listing of Participants," n.d., <https://www.nfpa.org/education-and-research/wildfire/firewise-usa/Firewise-USA-sites/State-listing-of-participants>.

Quantifying Portfolio Impact

Using the aforementioned notional dataset, we performed a case study to highlight the potential impact of this strategy on key portfolio loss metrics. For this study, we utilized the Verisk US Wildfire Model released in Touchstone 2024 and ran this exposure against its 10,000-year catalog.⁶ As mentioned above, the secondary modifiers utilized in this notional, representative view are listed below:

- Deck
- Defensible Space
- Firewise Community
- Roof Covering
- Roof Vents
- Skylights

To show the impact of capturing these secondary modifiers, we created five separate portfolios >>

- 1. Default Portfolio:** All secondary modifiers were left as "unknown."
- 2. Maximum Impact:** All secondary modifiers were set to the most resilient option.
- 3. Defensible Space Only:** If the only risk characteristic captured was defensible space. The distribution of defensible space values for this portfolio reflects what is shown for the representative portfolio settings below.
- 4. Roof Cover Only:** If the only risk characteristic captured was roof cover. The distribution of roof cover values for this portfolio reflects what is shown for the representative portfolio settings below.
- 5. Representative Portfolio:** This view utilizes all six secondary modifiers using a representative distribution of settings within each modifier in order to mirror what an average homeowner's portfolio might look like if this information were captured.

Notional Portfolio Exposure Profile

Roof Vents	Vents	75%
	No Vents	25%
Deck	Wood Deck	15%
	No Deck	85%
Firewise	Colorado	1%
	California	3%
Skylights	With Skylights	10%
	Without Skylights	90%
Defensible Space	5 Feet	10%
	30 Feet	60%
	100 Feet	20%
	200 Feet	10%
Roof Covering	Southern California	
	Asphalt	50%
	Tile	40%
	Wood	2%
	Metal	8%
	Northern California + Colorado	
	Asphalt	75%
	Tile	4%
	Wood	1%
	Metal	20%

⁶⁻⁷ "Bushfire and Wildfire Models," January 31, 2024., <https://www.verisk.com/products/wildfire-models/>.

Results

20%
Reduction in AAL

17% & 14%
Reduction in PML

6%–13%
Impact from Capturing Defensible
Space or Roof Covering Only

Maximum Impact of Credits Can Be
Greater Than a
50%
Decrease in Loss

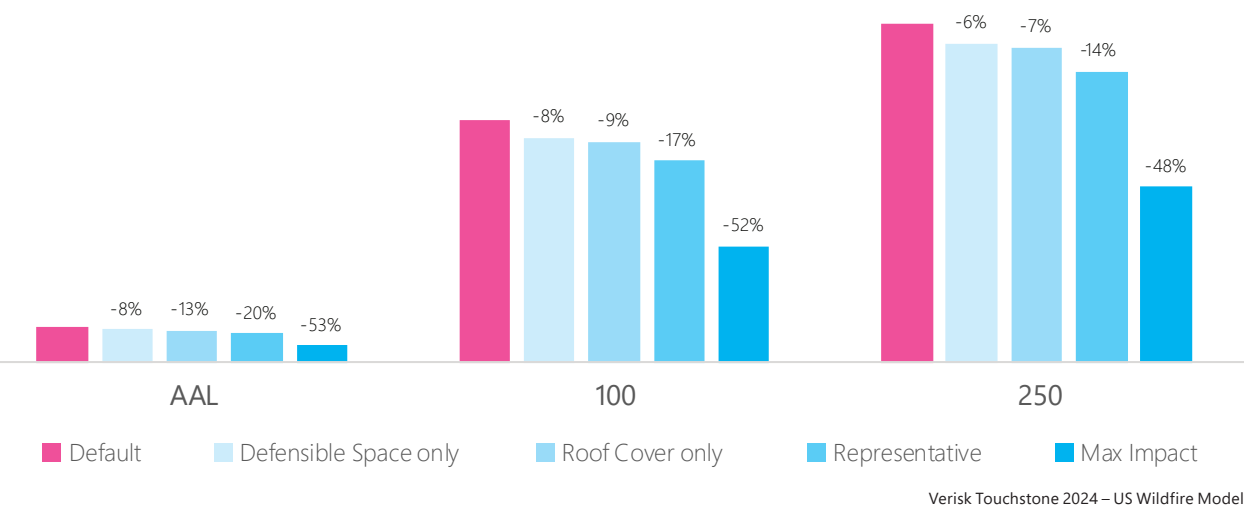
As we can see from the results in Figure A (below) **the difference between zero secondary modifier assumptions (the default portfolio) and a representative set of assumptions is approximately a 20% reduction in AAL** and approximately a 17% and 14% reduction in probable maximum loss (PML) at the 100-year and 250-year return periods, respectively. These impacts are nothing short of a material difference in the risk profile of this business and undoubtedly would positively impact the cost of reinsurance for this portfolio.

What’s even more remarkable is that even if the only secondary modifier was defensible space or roof covering, this represented anywhere from 6%–13% savings for this notional portfolio, depending on your metric of interest. Again, this is a material impact on losses just from collecting one single

additional datapoint as part of a company’s exposure management workflow.

While the previous three portfolio configurations provide insight into what might be considered characteristic of the average portfolio, it is worth noting that the maximum impact of these credits can be greater than 50% decreases in loss across both the AAL and tail of the risk curve. Therefore, while a representative portfolio was designed for the purposes of this case study, it is certainly possible that for portfolios with more stringent underwriting guidelines, the impacts of capturing these risk characteristics in modeling data can be even more significant when compared to relying on the model default assumptions.

Loss Impact by Portfolio Type – Figure A⁷



⁶⁻⁷ “Bushfire and Wildfire Models,” January 31, 2024., <https://www.verisk.com/products/wildfire-models/>.

Conclusion

As the risk of wildfires continues to grow, portfolio managers need advanced analytics that not only identify property-specific risk but also seamlessly integrate these insights across the insurance value chain. The collaboration between Green Shield Risk Solutions and Lockton Re provides a powerful solution to this challenge. By capturing critical secondary risk characteristics, Green Shield’s wildfire analytics enable insurers to differentiate high-risk properties and unlock significant cost savings. These detailed property-level insights are easily mapped to catastrophe models, directly impacting key loss metrics such as AAL and return period losses.

The downstream benefits of Green Shield’s solutions, combined with Lockton Re’s expertise in navigating the reinsurance market, ensure that insurers can achieve more accurate risk profiles and secure favorable reinsurance terms. This alignment between underwriting and portfolio analytics helps carriers mitigate wildfire risk more effectively, reduce reinsurance costs, and build more resilient portfolios.

Together, Green Shield and Lockton Re offer an integrative approach to addressing the wildfire peril, empowering insurers with the tools and insights needed to build resilience in an increasingly volatile landscape.

>> Continued from page 3 - **Green Shield Risk Solutions**

Green Shield is the first managing general agent to integrate dynamic wildfire propagation modeling through a strategic partnership with Technosylva®, a global leader in wildfire risk analysis and the state of California’s primary partner in wildfire management. The partnership with Technosylva enables Property Guardian, the wildfire risk analytics division of Green Shield, to integrate real-time wildfire simulations into its analytics and provide detailed insights into wildfire behavior, allowing underwriters to make informed decisions and develop strategies for risk mitigation. These simulations answer key questions, such as:

- The likelihood of a wildfire reaching the property
- The probable direction and path of a wildfire
- The estimated time for a wildfire to reach the property
- The expected ignition path as the wildfire approaches
- The predicted severity of the wildfire, including the flame length and rate of spread

The Green Shield team includes top-tier professionals in underwriting, data science, and meteorology alongside National Fire Protection Association–Certified Wildfire Mitigation Specialists, International Society of Arboriculture–Certified Arborists, and seasoned “hotshot” firefighters. With this deep well of expertise, Green Shield offers unmatched guidance in safeguarding what matters most.

In addition to wildfire risk insights, the Property Guardian team can provide an expert review and opinion of risk along with bespoke engineering and mitigation solutions, all delivered through our end-to-end Risk Mitigation Platform. Where on-site inspections are necessary, our team of Certified Wildfire Mitigation Specialists will thoroughly inspect and provide tailored guidance for up to 15 commercial structures at a single location, all captured in one detailed report. Green Shield also provides Portfolio Audit services to help clients pinpoint wildfire mitigation opportunities across an entire book of business or investment portfolio, highlighting key areas for underwriting and focused mitigation efforts.

Authors and Contacts



AUTHORS

Paul Brady, ARM CWMS
Head of Wildfire Insights and Mitigation
ISA Certified Arborist, WE-15457A
Green Shield Risk Solutions
+1 (818) 625 9099
pbrady@greenshieldrisk.com

Brian Bastian, MEng CPCU ARE
Head of Product
Green Shield Risk Solutions
+1 (570) 441 8443
brian.bastian@greenshieldrisk.com

CONTACT

Josh Clifton
Green Shield Risk Solutions,
Head of Marketing & Communications
+1 (773) 230 1304
joshua.clifton@greenshieldrisk.com



AUTHOR

Matt Cohen
Lockton Re Head of Global CAT Modeling
+1 (617) 913 4409
matt.cohen@lockton.com

CONTACTS

Isabella Gaster
Lockton Re Global Head of Marketing
+44 (0)7795 400981
isabella.gaster@lockton.com

Elizabeth Miller Kroh
Lockton Re Head of Marketing,
North America
+1 (445) 248 2228
elizabeth.kroh@lockton.com

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⁴ California Department of Forestry and Fire Protection (CAL FIRE), "CAL FIRE Damage Inspection (DINS) Data [Data set].," 2024, <https://calfire-forestry.maps.arcgis.com/home/item.html?id=994d3dc4569640caadbbc3198d5a3da1>.

⁵ "State Listing of Participants," n.d., <https://www.nfpa.org/education-and-research/wildfire/firewise-usa/Firewise-USA-sites/State-listing-of-participants>.

⁶⁻⁷ "Bushfire and Wildfire Models," January 31, 2024., <https://www.verisk.com/products/wildfire-models/>.



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www.locktonre.com



261 Fifth Avenue, New York • NY 10016

The St. Botolph Building, 138 Houndsditch • London EC3A 7AG

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