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Outline

- Environmental Liability and Insurance: A Little Bit of History
- What is a Pollutant?
- Who Buys and Why?
- Underwriting Pollution Exposures
- Environmental Pricing Considerations
- Actuarial Analysis for Environmental
- Status of Market
- Future Outlook
- Conclusions
- Case Studies

Polling Question 1

The pollution exclusion in the CGL policy provides strong protection for (re)insurers from environmental exposures:

1. Strongly agree
2. Somewhat agree
3. Not at all

Pollution Exclusion History

- Once upon a time, pollution was not mentioned in the GL policy.
- Along came Love Canal, Superfund and other events, and the GL policy became a source of extensive payments, litigation and confusion over what coverage was provided for pollution claims.
- In seeking to limit the extent to which the GL policy covers environmental liabilities, the 1973 edition of the CGL policy included a pollution exclusion.

Pollution Exclusion History

CGL Endorsement
In response to the legal and social environment, ISO created a pollution exclusion endorsement that became part of their 1973 CGL form

Hostile Fire Exception
A few years later, the 'hostile fire' exception was added to the exclusion, which was incorporated into the main body of the CGL form in 1988.

Absolute Exclusion
As a result of legal challenge developments, it became apparent that a successor exclusion was needed, which led to adoption of the "absolute" pollution exclusion by ISO in 1984

Custom Exclusions
Despite the intended "absolute" nature of this exclusion, there was continuing litigation and controversy, so ISO and many carriers adopted their own "total" pollution exclusion during the 1990 – 95 timeframe.

Can we rely on the "Total Pollution Exclusion?"

Polling Question 2

Which of the following is not generally considered a “pollutant”?

1. Cleaning fluids spilled into groundwater
2. Microscopic dust containing irritants
3. Acid gas released in a residential area
4. Campaign slogans leading up to the next election

What is a pollutant?

"Pollutants" means any solid, liquid, gaseous or thermal irritant or contaminant, including smoke, vapor, soot, fumes, acids, alkalis, chemicals and waste. Waste includes materials to be recycled, reconditioned or reclaimed.

- Almost any substance can fall into the category of irritant or contaminant (odors, dirt, rocks, asphalt, bacteria, salt water, etc,)
- Neither 'irritant' nor 'contaminant' is defined in the policy so courts use a dictionary definition
- Not such a simple question

A special mention for asbestos

- Abatement and removal - someone needs to do it
- Inadvertent disturbance
- Specialist vs. occasional
- Asbestos-in-place

Why is it an acceptable risk for an EIL writer given industry history?

- Historical losses primarily related to occupational exposure related to manufacture and installation and use of asbestos-containing material
- Today the use of asbestos is highly regulated
- Coverage today focuses on management, abatement and removal, not product liability
- Inspections are performed by experts who understand the risks before coverage is offered

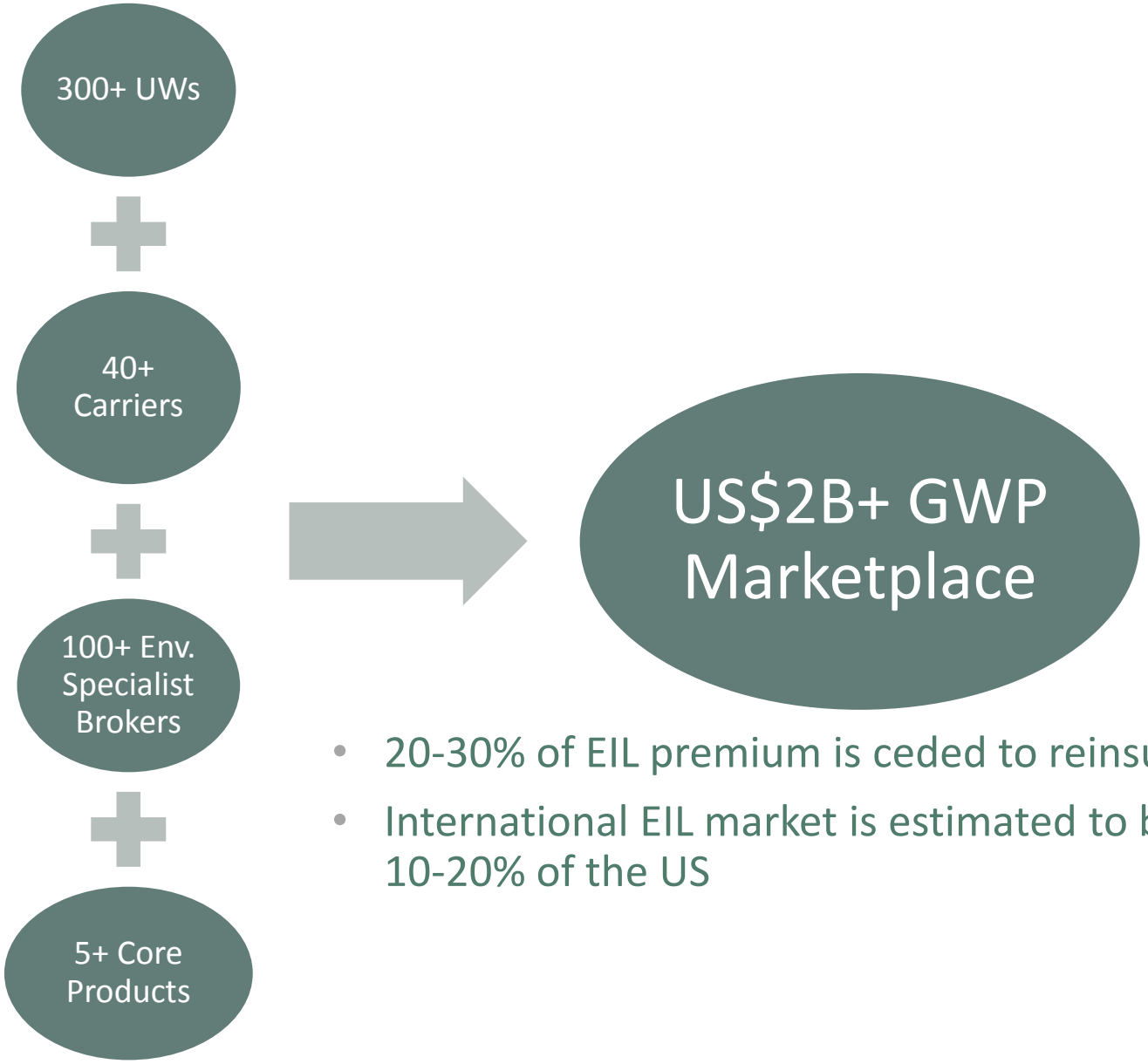
ISO CGL Coverage Gaps - Pollution

- The Absolute Pollution Exclusion – What Does it Mean?

> "Arguably one of the least understood and most litigated portions of the commercial general liability (CGL) policy, the "pollution exclusion," has vexed policyholders and insurers alike for over 20 years." C. F. Stanovich, The CGL Pollution Exclusion, IRMI Publication, March 2003.

- Subsequent versions of the CGL policy have included separate exclusions for pollution-related exposures such as asbestos, lead, mold, silica and others.

US Environmental Marketplace Overview

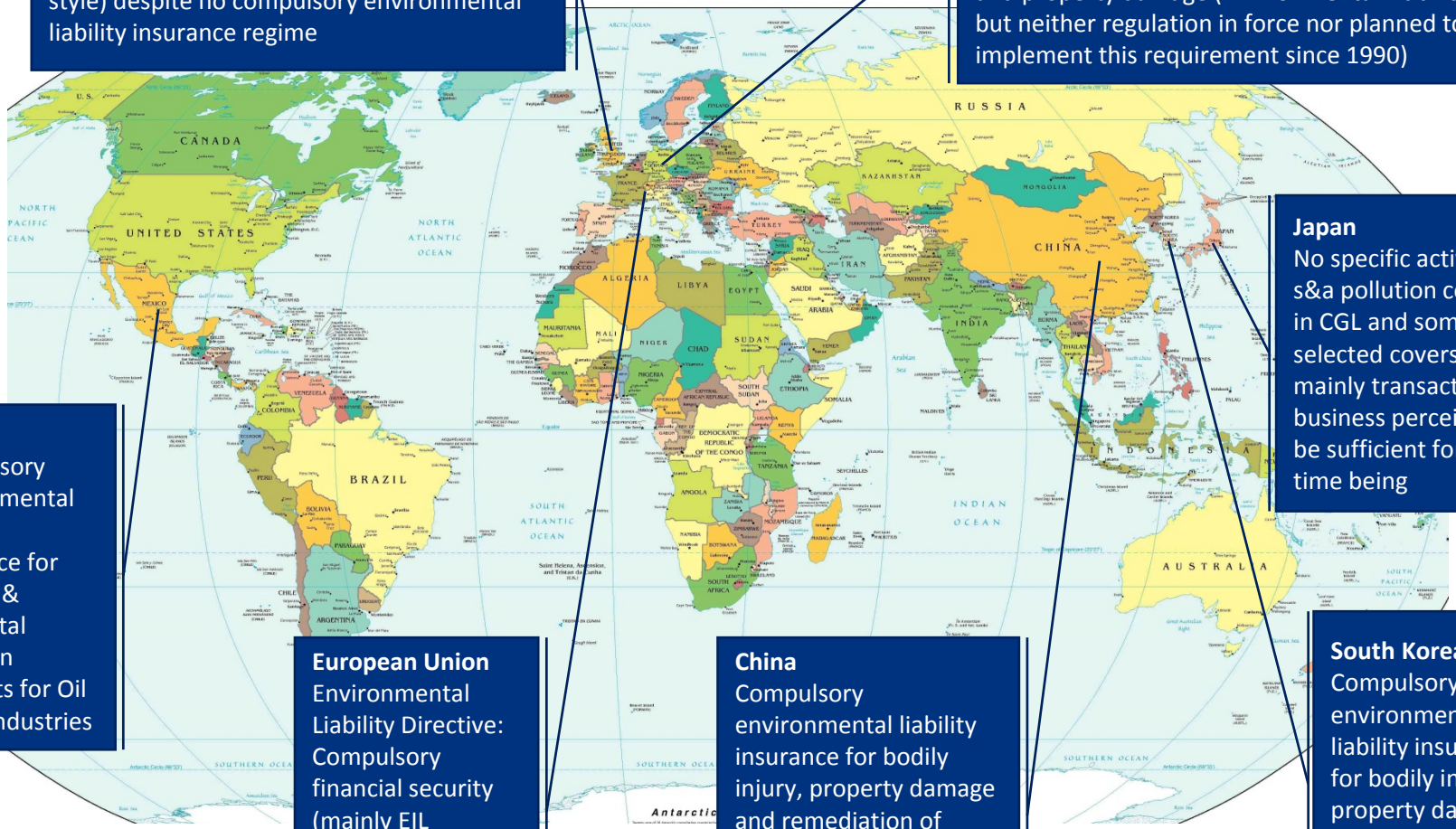


- 20-30% of EIL premium is ceded to reinsurers
- International EIL market is estimated to be 10-20% of the US

Environmental Insurance is a Global Issue

United Kingdom
Increasing demand for EIL insurance (US EIL style) despite no compulsory environmental liability insurance regime

Germany
Compulsory environmental liability for bodily injury and property damage (Environmental Liability Act, but neither regulation in force nor planned to implement this requirement since 1990)



Japan
No specific activities; s&a pollution covers in CGL and some selected covers for EIL mainly transactional business perceived to be sufficient for the time being

Mexico
Compulsory environmental liability insurance for sudden & accidental pollution incidents for Oil & Gas industries

European Union
Environmental Liability Directive: Compulsory financial security (mainly EIL insurance) for remediation of environmental damage in some countries

China
Compulsory environmental liability insurance for bodily injury, property damage and remediation of environmental damage for defined industries with hazardous activities; regulations not yet in force

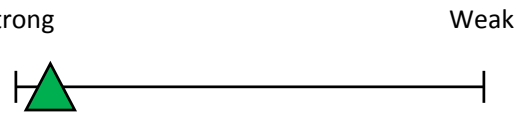
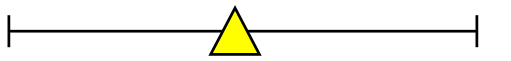
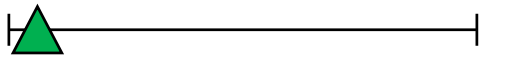
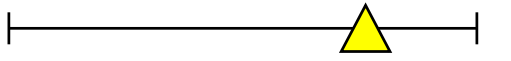
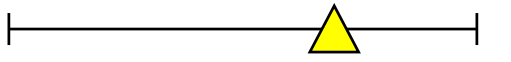
South Korea
Compulsory environmental liability insurance for bodily injury, property damage and remediation of environmental damage (provided by EIL Pool)

Polling Question 3

Which of the following is not a common reason for a company to buy Environmental Insurance?

1. Regulatory requirements
2. Stochastic determination of risk management priorities
3. Precondition of a loan
4. Recognition of an exposure that can threaten financial stability

Who buys and why

Driver	Buyer Motivation
I. Compulsory Coverage (Tanks, Regulatory)	
II. Contractual / Lender Requirements (Real Estate)	
III. High Risk Operations (Oil & Gas, Power, Mining)	
IV. Risk Management	
V. Emerging Risk Issues (Odor, Legionella)	

- ✓ They have a regulatory obligation
- ✓ They feel they have a true exposure
- ✓ The bank/lender told them to
- ✓ Satisfy contractual obligations

Underwriting Considerations

Does your Insured have Exposure?

"I've never had a pollution loss."

Pollution losses are typically a **severity** issue - not a frequency issue, so many companies have not had a loss yet but when they do it could be very painful.

Almost everyone is exposed to environmental risk

Manufacturing – raw material handling, waste disposal, product liability

Corporations – regulations, buy/sell decisions, M&A, accounting risk

Commercial Real Estate – former contaminated land use

Construction – exacerbation, disposal, site conditions, construction defects

What is Keeping UWs up at Night?

Fungus & Legionella

Dust

Fuel, Workplace Chemical Releases

Construction Defects = Sick Building Syndrome

Silt & Sedimentation Exposure

Asbestos

Lead (not just Lead-Based Paint anymore!)

Defense (US Plaintiff Attorneys / Class Action suits)

Emerging Pollutant Risk (PFOAs / Nanoparticles)

Media Focus on Pollutants

Cat Risk Storms / Wood Frame Construction / Climate Change

ODORS, ODORs, ODORs

Transportation Spills – Loading/unloading

Waste Disposal PRPs

Vapor Intrusion

The Usual Suspects – EIL Loss Leaders

- Oil & Gas
- Mining Sites
- Redevelopment Sites
- Mold & Legionella
- Dry Cleaners

Oil & Gas, Mining, Rail and Chemical Plants - Highly Exposed Risks

- Response Costs to major cat events is rising
  - Lac-Mégantic rail disaster
  - Enbridge Kalamazoo River Pipeline Spill
  - TVA Kingston Coal Plant Fly Ash Slurry Spill
  - ITT Terminal Fire

- Environmental Underwriters are relying on General Liability Market to provide S&A Coverage

- Recent experience found market capacity for General Liability S&A Pollution to be $1-$1.3 Billion

- Risk profile incomplete without
  - Integrity testing
  - Phase II assessment data

Underwriting Considerations – Redevelopment Sites

- Historically
  - Cleanup Costs Cap (for Knowns) and Pollution Liability For Unknown Risks and Third Party Liabilities
    - Historically written unprofitably
    - Inaccurate estimates – Shovel Risk volumes, unit costs, scope, time

- Today
  - Typically driven by historical operations, historical fill, or proximity to polluted sites
  - Development Costs – critical to underwrite shovel risk and excluded known development costs
  - Tort Liability – for responsible parties, new owners, tenants
  - Contaminants – required remediation vs. residuals under institutional controls
  - On-going remedial obligations – monitoring, engineering systems
  - Off Site Liabilities – contaminated waterways, adjacent operations

Underwriting Considerations – Habitational / Hospitality Sites

- Market is pulling back due to Mold and Legionella Losses

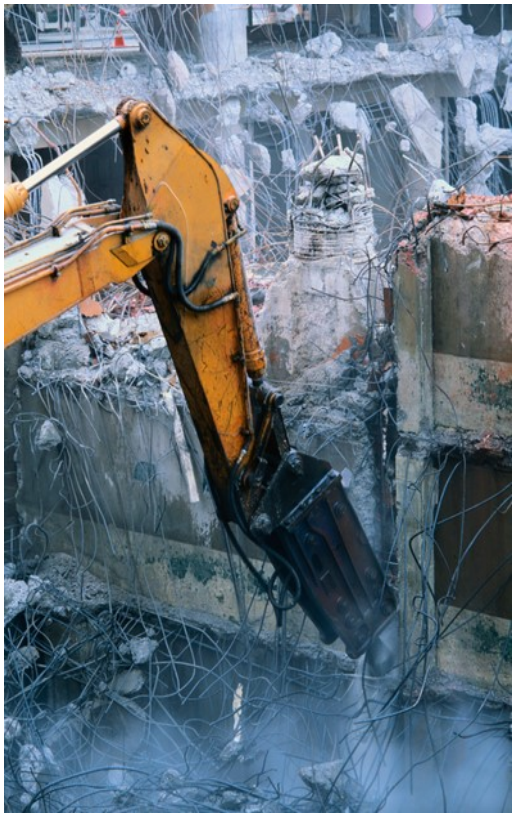
- Many markets continue to “class” underwrite habitational risks by:
  - Relying on historical loss runs (property, general liability, and pollution)
  - Setting retentions above perceived burn layers
    - (i.e., the greater of $100k or $5k per door / 1,000 sq ft deductibles)
    - Exclusions for mold discovered during renovations, or under vinyl wallpaper

- Few Markets underwrite these risks on a site by site basis requiring
  - Review historical losses, flood maps, customer reviews
  - Property Condition Reports
  - Mold Management Plans
  - Legionella HACCP Plans (Hazard Analysis and Critical Control Point)
    - Plumbing systems, cooling towers, decorative fountains, whirlpools, air washers, misters, humidifiers

- Overall philosophy – NO data, NO deal. Often we don’t get the information and decline the risk.

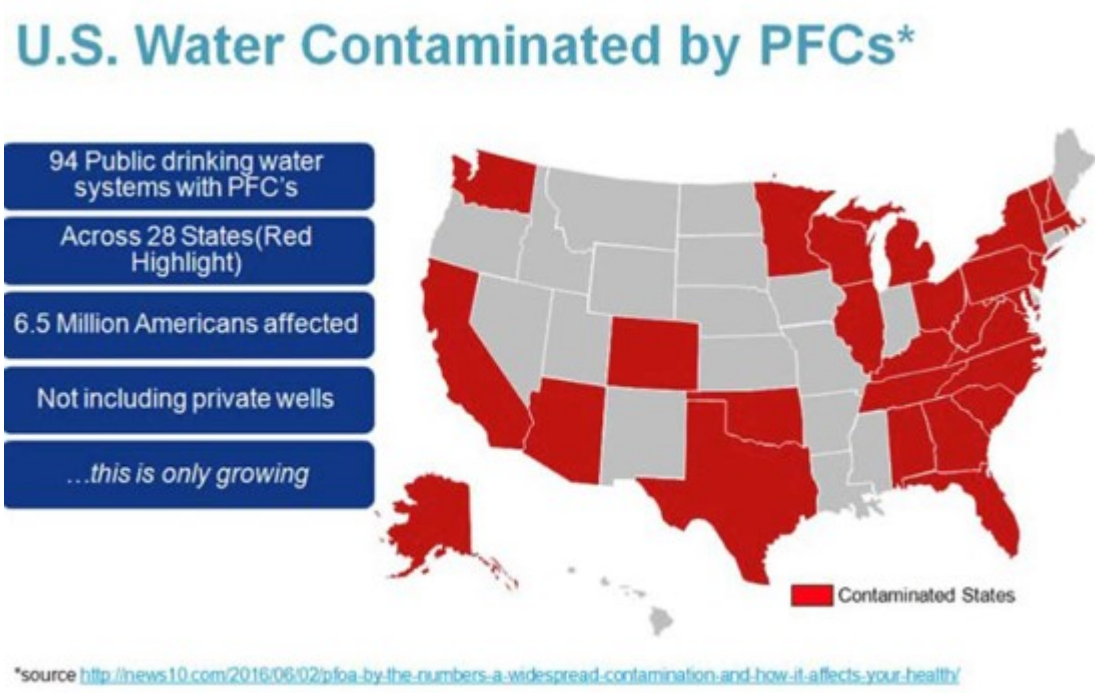
Contractors Pollution – Underwriting Considerations

- Underwriting
  - What do you do?
  - History & experience
  - Mix of business
- Complexity
  - Inclusion of Professional Liability
  - High Risk Services
    - Wood Frame Construction
    - Oil & Gas
    - Coal Plant Decommissioning



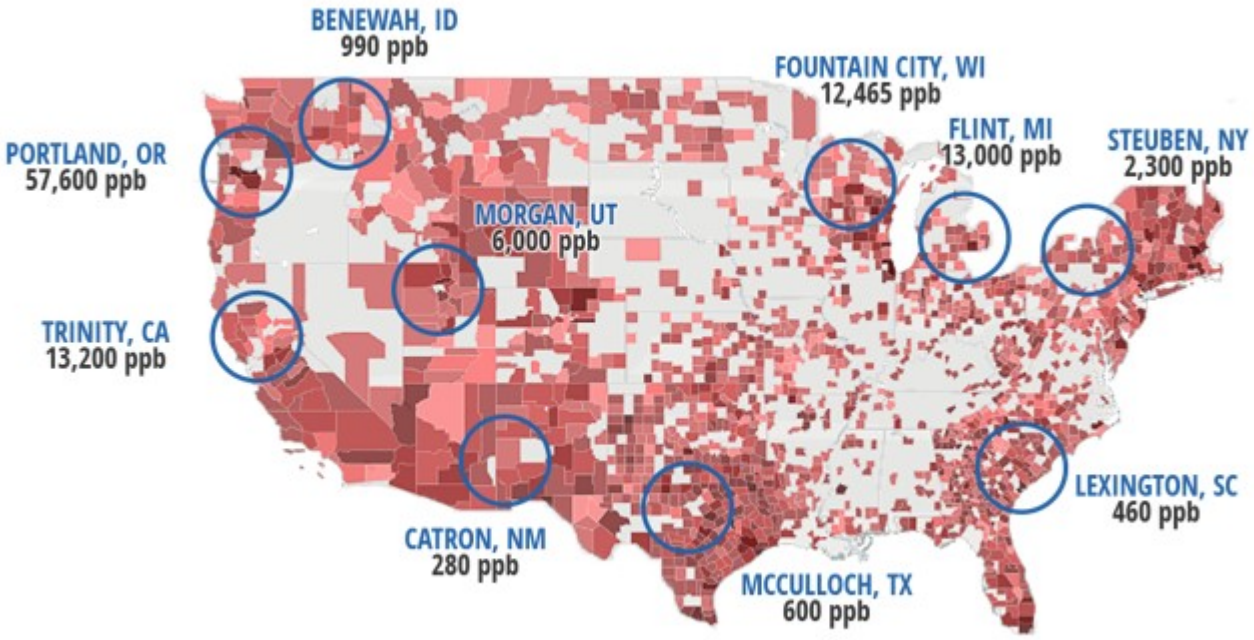
Emerging Risk Issues

- PFAS (Per-and Polyfluoroalkyl Substances)
  - Been studied by EPA since the 1990s. PFAS bio-accumulate, are extremely stable, and can results in cancer or impacts to human organs
  - Water- and oil-repellent, extremely heat-resistant, and have surfactant properties
  - Used in Food packaging, nonstick cookware, firefighting foams, water-resistant materials like tarps and jackets, and as surfactants and stain preventers
  - Phased out of manufacturing in 2000
  - There are 610 known sites contaminated with PFAs including military bases, airports, and public water systems that serve over 19,000,000 people



Emerging Risk Issues

- Lead in Drinking Water
  - Lead in drinking water is pervasive across the entire US
  - Lead is leaching from aging infrastructure with old lead pipes and plumbing fixtures
  - Flint water crisis related changing water supplies and then failing to treat water with corrosion inhibitors allowing lead to leach from old pipes.



Claims Trends

- California still trends as the top loss location with 20% of claims for both Contractors and Site pollution, driven by aggressive regulatory changes and enforcement
- Increasing claims frequency and severity for claims related to mold and legionella driven by wood frame construction and habitational exposures.
- Increase in frequency of claims notices from insureds who have received Potentially Responsible Party information requests due to US EPA's stated policy to focus on major sites requiring cleanup. Passaic River NJ (Diamond Alkali Superfund site) is a good example
- There are 14 sites nationally that have been targeted for an EPA directive for "immediate, intense action" with Diamond Alkali site on that list
- https://www.epa.gov/sites/production/files/2017-05/documents/cercla_delegation_memo_and_delegations.pdf

Polling Question 4

Standard actuarial methods can easily be applied to EIL insurance

1. Yes, certainly
2. Yes, with appropriate adjustments
3. Not at all

Pricing Considerations: General

	Sites	Services	Package
Exposure	# Locations – often non-linear	Revenue – often non-linear	Revenue
Term	1-3-5 typical for Operational Transactional up to 10	One year most common Some multiyear up to 3 Projects up to 6 + Compl Ops	One year
Coverage provided	First party – cleanup, Bus Int. Third party (BI/PD)	Third party only May include professional	Third party only
Defense covg	Up to 25% outside the limit	Outside limits	Outside limits
Covg trigger	Claims Made	Claims Made or Occurrence	Occurrence
Covered pollution date(s)	Operational: present or recent, subject to retro date Transactional: past only Can be combined in single policy	During policy term	During policy term
Classes	Based on type of property / use of location	Type(s) of services performed	GL Classes

Pricing Considerations vary by class and coverage: Sites

- Class – e.g. Redevelopment vs. Vacant Land
- # Locations – factor applied, less than linear
- Quality of risk
  - Quantitative, e.g. historical claims
  - Qualitative, e.g. risk management practices
- Additional considerations
  - Emissions
- Additional coverages
  - Non-owned disposal sites
  - Storage tanks
  - Transportation
- Policy Term
  - Term factors are often significantly less than linear…
    - More significant underwriting cost for environmental study
    - For Transactional, major exposure is during redevelopment
    - Harder to reconcile for Operational and Services Policies

Pricing Considerations vary by class and coverage: Services

- Class:
  - E.g. Electrical vs. HVAC vs. Oil contractor
  - Residential vs. Commercial
  - Environmental remediation vs. other services
- Revenue – factor applied, less than linear
- Quality of risk:
  - Quantitative, e.g. historical claims
  - Qualitative, e.g. risk management practices
- Additional coverages:
  - Professional / Design exposure
  - Cyber
- May be combined into a basket rate or priced individually

Actuarial Analysis Challenges

Data

- High severity / Low frequency nature means data for large claims (the ones we care most about) is sparse
- Long Term policies and long claim latency means that most industry loss experience is immature

Rate Changes

- Transactional business typically does not renew
- Package policy rate change may be distorted by changing weights of Environmental and other coverages
- Other policy changes can require complex adjustments to capture meaningful rate change
- Impact of factor changes from year to year can be tricky to calculate

Case Studies

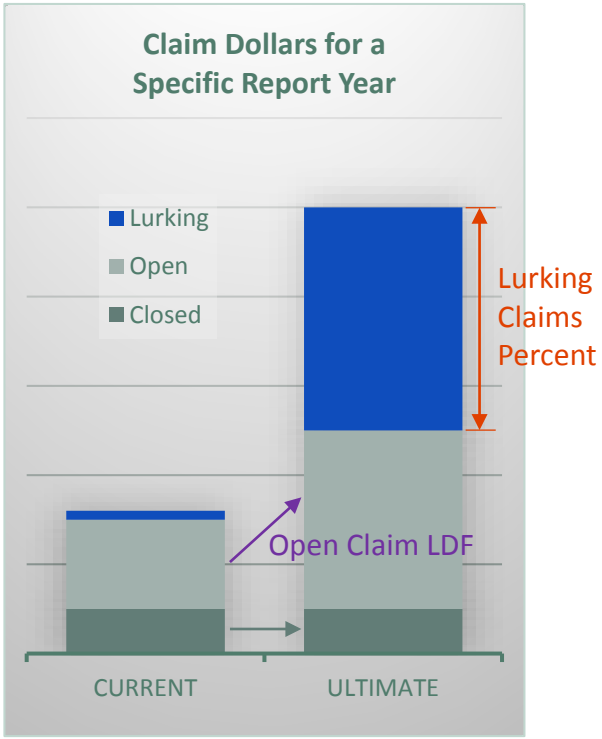
	Other lines	Environmental
Earning Premium	Average of two years' WP may be a good estimate	Multiyear nature of policies means that EP can grow slowly over time
On Level Factors	Average of two years' WP factor may be a good estimate	A single year's EP may be comprised of policies written over many years
Triangles / LDFs	Policy Year or Accident/Report Year can work	Policy Year can take much longer to mature, and will be distorted if the term profile has changed
Weighting of historical experience	Usually ok to add total premium and loss from multiple sublines / coverages as long as each is developed appropriately	Due to longer sites terms on average, adding sites and services business will typically overweight services which earns more quickly

Report Year Severity Approach for Claims Made Coverage

Advantage: All claims known from a given Report Year (RY)

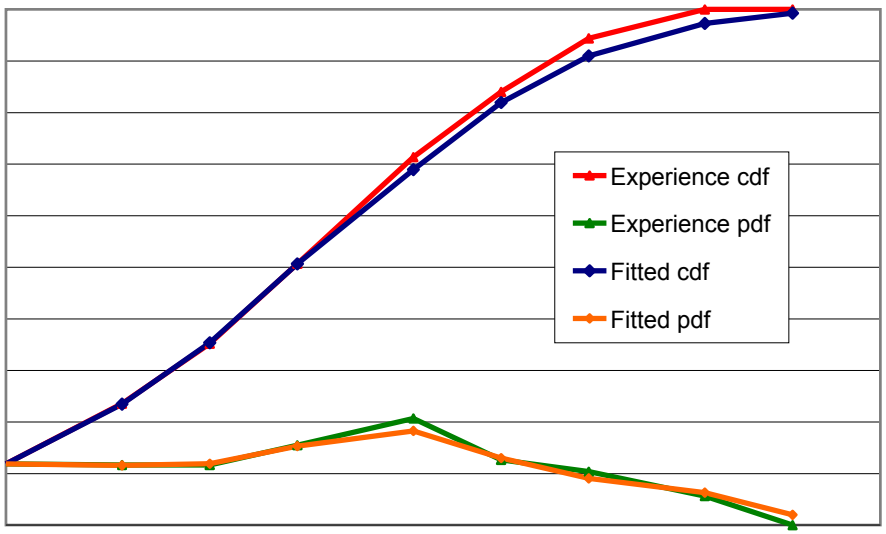
Disadvantage: Not known which will become major

1. Experience:
   - Develop current claim dollars by component:
     - Lurking claims (early in valuation)
       - Final value is unknown
       - Lurking claims percent to vary by age
     - Open claims (ultimate value estimated)
       - On average, will grow over time
       - Higher LDF than for total claim cohort
     - Closed claims
       - Will not develop further in most cases
   - Using the above, estimate ultimate aggregate claim value by layer
   - Repeat for each Report Year

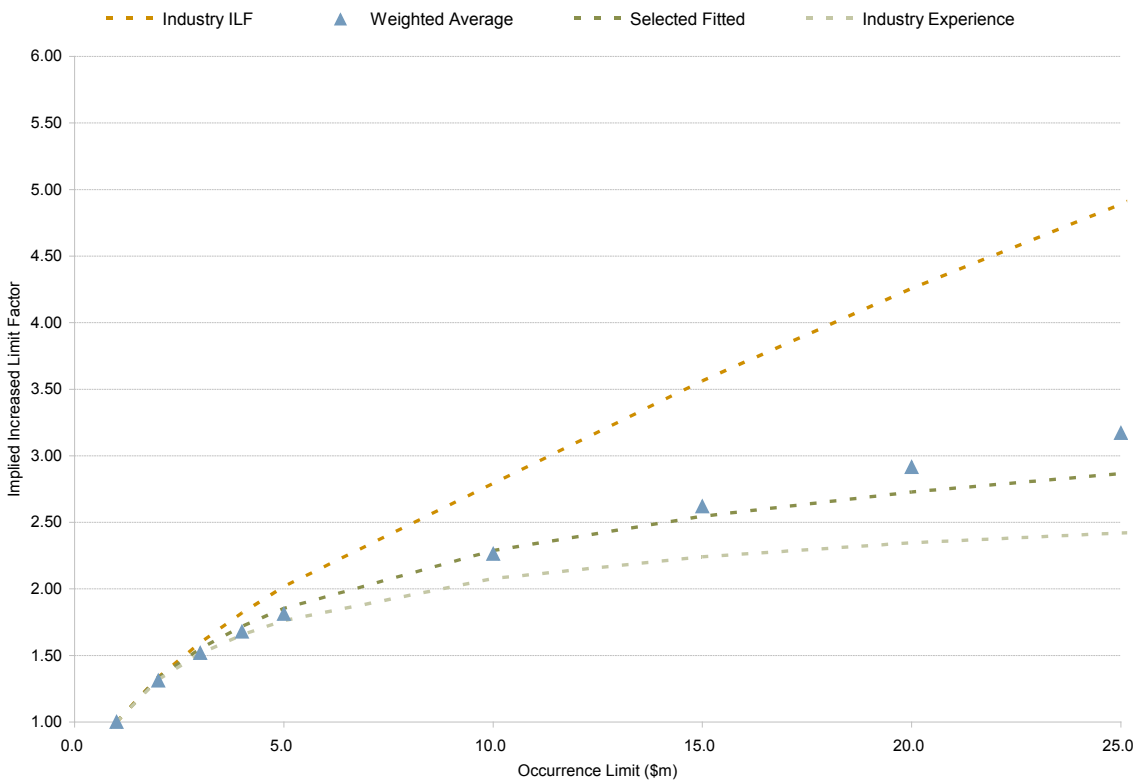


Report Year Severity Approach for Claims Made Coverage

2. Exposure
   - Postulate a prospective ground up ("PGU") severity distribution
     - Independent of policy attachments and limits
   - Detrend to each historical year
   - Determine expected loss by layer if that (PGU) distribution is correct (A)
   - Compare to actual loss by layer (B)
   - Minimize the error between (A) and (B) to derive a PGU severity distribution to use for this year's modeling



Pricing Considerations: ILFs and Severity



- Market ILFs universally imply a much higher severity than has been observed historically
- Two sets of theories:
  - Coincidence
    - Common Source
    - What the market will bear
    - Irrational fear of the product
  - Intelligence
    - Catastrophic potential due to change in:
      - Scientifically accepted thresholds
      - Legislative / Regulatory Doctrine
      - Judicial Award Practices

Pricing Considerations: SIRs and Limits

Two general approaches:

- Apply SIR factor and ILF independently
  - This is the simpler, more traditional approach
  - Can over- or under-state the impact of the SIR in outlying cases
  - May be justified by relying on the high correlation of SIR and Limit
- Calculate SIR credit ($) using base limit premium
  - Can be facilitated by a difference-of-factors approach
  - More common: lookup tables for net ILF using SIR and Limits chosen
  - Assumption: Value of SIR is independent of limit… sounds reasonable

Environmental Book – Portfolio Risks

- Most environmental books have 2-4 core products, each with different earning patterns and uncorrelated risks.
- The combined casualty and professional coverages have attractive annual policies that fully earn over 12 months but have both frequency and severity of claims
- The site pollution and contractors pollution books earn over multiple years but have low frequency of claims and are subject to severity that may develop years after an initial reserve is set

Core Products	Average Term	Risk Frequency	Risk Severity
Site Pollution	2-3 years	Low	Medium - High
Contractors Pollution	1-3 years	Low	Low-Medium
Contractors Pollution + Professional	Annual	Low-Medium	Medium-High
Combined Casualty + Pollution/Professional	Annual	High	Medium-High

State of the Environmental Market

Growing Market Segment

1. Large portion of Insureds are first time buyers.
2. Contractual Requirements Increasing from GC's, Lenders.
3. Increased Environmental Awareness

Site Pollution

1. Decreasing rates on most profitable classes
2. Tightening terms and pricing for habitational risks and long-term redevelopment deals
3. Redistribution of UW Talent 2008 – Present
4. Market Contraction on long term policies, redevelopment risk.

Contractors Pollution

1. Flat to Decreasing Rates
2. Near Immediate Response Time
3. Broadest Terms and Conditions
4. Strong Construction Rebound, large growth in Wrap-up Policies, Increasing Owner/GC requirements.

Combined environmental / Casualty

1. Increasingly Competitive Space on most profitable classes
2. Significant Movement from Standard Market Carriers

Problems and Challenges

- Multi-year policy terms (AIG left the market)
- Risk uncertainty
- Slow earned premium pattern
- Rating basis for Sites
- Rate change
- Risk engineering
- Cheap, cheap, cheap
- How clean is clean?
- Asbestos

Where is the Market Headed?

Challenges:

- market penetration is still low >> expand the pool of insureds
- distribution >> broker proficiency
- lingering confusion over GL exclusions/endorsements
- non-standardized products are viewed as too complex
- staffing/expenses

Opportunities

- Sharpen the core (flow business >> small insureds)
- Claims reporting apps (24-hour emergency response)
- GL exclusions (asbestos, mold, lead paint, silica, etc.) provide coverage gaps that environmental coverage can fill
- emerging markets
- construction/project-specific covers

Polling Question 5

The risks and parameters of Environmental Insurance today is

1. By now, well understood and predictable
2. Better understood but there is still a lot we don't know
3. Uninsurably risky

Conclusions

- Environmental exposure is more common and prevalent than you might think
- Environmental insurance isn't as easy to define as some people think
  - It isn't all 'environmental'
  - Some commonalities with general casualty but also many unique aspects
- Global market largely driven by local compulsory requirements
- Very difficult to be precise about loss picks of individual segments:
  - Low volume of relevant data
  - Long development pattern
  - High limits and long policy terms
  - Driven by severity more than frequency
- Lack of correlation can make diverse portfolios more predictable

Case Studies

Case Study 1

- **April 2018 - Jury Awards Neighbors of North Carolina Hog Farm US $50 million In Nuisance Case**
- Plaintiffs accused Murphy-Brown of failing to take necessary steps to eliminate **obnoxious**, recurrent **odors** and other causes of **nuisance**, including pests that periodically plagued their properties.

Case Study 2

Wood frame Construction / Mold

The Risk:

- Approx. $30M new construction 5 story Wood Frame 132 multi-family apartment rental building with approx. 128,000 sq ft.
- Project located in Cerritos, CA (Southern CA / Los Angeles area)

The Event:

- Inclement weather / series of rainstorms from Mid Dec 2016 until mid Jan 2017
- Resulting in visible mold growth in areas of the building
- Alleging $500K in Damages to address damaged work and mold growth

Case Study 3 … Waste Disposal Nightmare

A hospital located in S. California sent a load of paper & boxes to a recycling facility.

Workers at the recycling company complained that an unknown liquid was leaking from several of the boxes and leaked unto an employee

Further investigation revealed that several boxes of pathology waste had been inadvertently mixed in with boxes of waste paper.

Incoming trucks had to be stopped and business was interrupted as responders sifted through tons of paper and separated out all of the medical waste.

The medical waste as well as the contaminated paper had to be disposed of at a medical incinerator at significant expense. All plant shredders and equipment had to be decontaminated. A public relations firm was retained and on standby should news of the incident went public.

Case Study 4 … Alchemy is still a thing

A customer stored Mercury on insured property

A district attorney alerted the EPA when they learned through criminal investigations that the suspect was storing mercury at a storage facility. The mercury was intended to extract gold from ore.

Operations were interrupted at the storage facility for 5 days while 55-gal drums full of mercury were removed from 3 units randomly located throughout the facility. Transportation and disposal costs were significant.

The policy was triggered due to a threatened release of mercury and detection of mercury fumes at the site.

Case Study 5 … Trouble on the High Seas

Discharge from corroded pipes at insured site

Pipe corrosion was accelerated in piping located over salt water. The piping is used to discharge oil from docked vessels.

During a scheduled discharge, oil was observed leaking from a pipe onto equipment and into the water. The EPA and Coast Guard were notified about the incident.

Cleanup costs included containment of the oil within the port and removal of oil from the water. Additionally, the vessel and port equipment required cleanup.

All vessels into and out of the port were stopped leading to potential demurrage claims.

[The port is undertaking an 18 month project to relocate all piping to avoid contact with salt water moving forward.]

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