PERFECT STORM:
The Science Behind Subrogating Catastrophic Flood Losses

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It became known as the Great U.S.A. Flood of 1993, and still remains one of the most significant and damaging natural disasters ever to hit the United States. This natural occurring flood cost an estimated $21 billion, covering parts of nine mid-western states and lasting three months. As the flood waters rose, 1,369 brand-new Subaru automobiles, ready for distribution and valued at more than $17 million, were being stored by the Chicago & Northwestern Railroad (now Union Pacific) for Subaru of America, Inc. at the old American Motors outdoor storage facility in Kenosha, Wisconsin. Lloyds of London and its lead underwriter, Commercial Union Insurance Company, ultimately paid more than $11 million after the early morning flood waters rose above the dashboards of many of the new vehicles.

Five years later, in the early morning hours of February 3, 1998, much of the San Francisco Bay area and Alameda County, California were struck by an incredibly strong storm system which had moved on shore the preceding afternoon. Several days of preceding rainy weather resulted in saturated ground conditions in most areas of the state. Nearly four inches of rain fell in a 24-hour period, resulting in a 100-year flood event in Hayward, California. For miles in all directions, businesses suffered water damage and devastation. On the 520-acre auto auction lot owned by Bay Cities Auto Auction, a Cox Enterprises entity, thousands of cars were being stored on the property and more than 2,210 vehicles suffered severe water damage, resulting in more than $4 million being paid by Transportation Insurance Company and its excess carrier.

Natural disasters, especially major flood losses, remain the nemesis of most insurance carriers. The damages can be astronomical and the chances of subrogation appear slim when everyone has suffered similar damage. However, when it seems that only God is responsible for sending devastation of such magnitude, it is time for subrogation professionals to roll up their sleeves and get to work. It is also time to hire an expert in hydrology or hydraulics. With the help of a hydrology expert, Matthiesen, Wickert & Lehrer recovered more than $7 million for Lloyds of London in the Great U.S.A. Flood of 1993. Five years later, with the help of expert, Rick Van Bruggen, Matthiesen, Wickert & Lehrer recovered more than $2.5 million for Transportation Insurance Company after the Great California Flood. With perfect storms such as these, subrogation recovery almost always seems impossible. In reality, however, quite the contrary is true. Flood waters, just like pieces on a chess board, never lie. The subrogation professional’s distinct advantage is that while God may send the rain, what happens to the flood waters once they reach Earth is almost always affected by man.

The behavior of water is predictable. It is affected by gravity, seeks its own level, and follows the contour of the Earth's surface – whether natural or man-made. As a result, with the use of a qualified hydrologist, subrogation counsel can accurately map, mimic, and image the exact behavior of the flood waters, before, during and after the flood event. This ability to prove what happened to the water means that we can accurately point to the effect that man-made objects, construction projects, barriers, and other obstacles had on the water, and show precisely how the specific flood damage being subrogated was affected or caused by these man-made conditions. It is, therefore, critical that the subrogation professional has a working knowledge of and understands the behavior of water and the science behind hydrology.

THE 100-YEAR FLOOD

The term "100-year flood" still seems to cause confusion among public lenders, professionals, and insurance companies. Many continue to believe it is a description of a flood that occurs only once every 100 years. In truth, the term "100-year flood" is an abbreviated way of describing the magnitude of a rainfall and subsequent flood event that has a one percent chance of occurring. It is important to note that the same statistical chances apply for any storm at any time in any given year. The "return period" (or recurrence interval) of an annual maximum flood event has a return period of X years if its magnitude is equaled or exceeded once, on the average, every X years. A reciprocal of X (1/X) is the exceedance probability of the event, meaning the probability that the event is equaled or exceeded in any one year. For example, a 100-year return period (1/100) means there is a 1% probability of an occurrence in any one year. A 10-year return period (1/10) means there is a 10% probability of an occurrence in any one year. A 500-year return period (1/500) means there is a 0.2% probability of such an occurrence in any one year. This is why many hydrologists have tried to change the terminology from "100-year flood" to a "1 percent flood".

RAINFALL INTENSITY – DURATION - FREQUENCY CURVES

Rainfall data is still obtained from rain gage[1] records, just like it was 100-years ago. Any one storm can have different plotted frequencies for different durations. A plot of rainfall intensities (in inches/hours) can occur over various periods of time (from minutes to days) and have correspondingly different return frequencies. For example, on January 9-10, 1995, a severe storm in Northern California produced the following results:

- 100-year, 1-hour rainfall depths recorded in Placer County;
- 200- to 500-year, 4- to 6-hour depths recorded in the Dry Creek watershed;
- 500- to 1,000-year, 24-hour rainfall depths occurred in Sacramento County; and
- 10,000-year rainfall plotted at Granite Bay (2-3 hour duration).

Amazingly enough, all of the above statistics came from the same storm event. As a result, simple rainfall and weather records are not, by themselves, accurate depictions of the event for which you are subrogating. Micro-bursts can cause downpours ten times the magnitude of the rainfall being experienced just a few hundred yards away.

100-YEAR STORM VERSUS 100-YEAR FLOOD

Two sets of terminologies which are confused more than any other involve the 100-year storm with the 100-year flood. These are two distinct and different events. Floods are classified according to their frequency and depth. For example, there are 10-year, 25-year, 50-year, 100-year, and 500-year floods. A 100-year flood occurs less frequently than a 10-year flood, but because it has a larger volume and greater depth of water, it has far more destructive power, causes more damage, and is a more serious threat to human safety. We do not necessarily get a 100-year flood from a 100-year rainfall. This is where man comes into play. God may send a 10-year rainfall, but it is man that transforms it into the 100-year flood. Whether or not a 100-year rainfall causes a 100-year flood depends on the "time of concentration"[2], of the watershed, which itself, depends on watershed size, runoff characteristics[3], and other geological conditions.

THE SCIENCE OF HYDROLOGY

Hydrology is defined as "a science dealing with the properties, distribution and circulation of water on the surface of the land, in the soil, in underlying rocks, and in the atmosphere." This is, in fact, a very broad definition encompassing many disciplines relating to water. When encountering a flood loss, it is critical to engage subrogation counsel and an expert hydrologist immediately. Piecing together the pieces of an unseen puzzle is quite complicated. It becomes somewhat simpler, if you can combine the technical advances of hydrology and hydrologic computer models with anecdotal testimony of witnesses and physical evidence such as high water marks on buildings, automobiles, or other landmarks present at the time of the flood. Such "hard" evidence not only makes hydrologic models and simulations more reliable and accurate, but they also make them more believable.

HYDROLOGIC SIMULATIONS AND MODELING

Frequently, even a storm event of historic proportions might not have caused damage to your insured's property had it not been for a specific existing condition, such as a levy in disrepair, clogged sewer drains, culverts in need of maintenance, malfunctioning flap valves, etc. While it is easy to show that a drain was not kept clean or that a culvert was left in a clogged condition, it is another thing entirely to prove to a jury that the condition actually caused the flood damage for which the insurance company has paid and you are now subrogating. A flood level of two feet may only require some cosmetic cleanup and minor repairs to a fleet of stored vehicles but with flood levels six inches higher, you could be looking at crushing all of the cars. This is where modeling becomes indispensable.

There are computer models that use rainfall depth-duration-frequency data and watershed characteristics, such as the Time of Concentration, in order to develop peak flows (Qs). It is usually the case that stream flow gage data is either of a short time record or unavailable, whereas rain gages are more plentiful and typically have longer periods of record. It is by way of a Hydrologic Analysis that we determine what the design flows are for storm drain systems, bridges and culverts. Examples of Hydrologic Simulation Models are:

- HEC-1 (Corps of Engineers – **H**ydrologic **E**ngineering **C**enter);
- HEC-HMS (Corps of Engineers – **H**ydrologic **M**odeling **S**ystem); and
- TR-55 (Soil Conservation Service - **T**echnical **R**elease No. 55).

These models can be plugged into a computer which can literally recreate with great precision the behavior of the water at various times during the storm event. This is critical in not only showing what caused the flood damage, but also to show that it could have been prevented and/or should have been noticed by a specific defendant, security guards, etc.

HYDROLOGY VERSUS HYDRAULICS

While *hydrology* is the study of the rainfall-runoff process, including the determination of design frequency storms and floods, *hydraulics* is the study of how the water flows. In the case of flood flows, it could be the analysis of pipe and channel systems, culvert and bridge design, and the determination of river floodways and floodplains. The hydraulics part is essential to determine how much water fits in the pipe or channel or how far it spreads out on the floodplain. As with hydrologic simulations, hydraulic simulations can also be conducted. Frequently, hydrology and hydraulics are combined in order to connect with a coherent theory as to why a specific tortfeasor caused the flood damage, even though the rainfall is considered to be an act of God. Sometimes a tortfeasor can be blamed for the flood damage simply because a channel or culvert system, while adequate to handle the storm, became inadequate over time because of sedimentation, overgrowth, or lack of maintenance of the system. Hydraulic simulations will explain whether or not that lack of maintenance actually caused the water to overflow the banks of the culvert or channel, or whether it would have overflown anyway. Examples of Hydraulic Simulation Models are:

- HEC-2 (Corps of Engineers – **H**ydrologic **E**ngineering **C**enter);
- HEC-RAS (Corps of Engineers – **R**iver **A**nalysis **S**ystem); and
- WSPRO - USGS/FHWA, **W**ater **S**urface **Pro**.

While hydrology and hydraulics are complex areas of science, the resulting models and computer graphics can explain to a jury in a simple manner exactly how and why the flood damage was caused. Subrogation professionals' time is no better spent when investigating flood losses than taking the time to interview a multitude of neighbors and eye-witnesses, to include anecdotal observations of water levels and water flow. Photographs of debris marks and high water level marks on buildings, pillars, street signs, etc., are indispensable in making the flood expert's finished product both more accurate and more believable. The number of photographs taken should be proportional to the reserve amount or the estimated size of the claim.

FLOODPLAINS AND FLOODWAYS

Federal flood insurance was first made available in 1968 through the enactment of the National Flood Insurance Act.[4] Prior to this program, affordable private flood insurance was generally not available. Under the National Flood Insurance Program (NFIP), federally subsidized flood insurance is made available to owners of flood-prone property in participating communities. These participating communities are required to adopt certain minimum floodplain management standards and programs, including restrictions on new developments and designated floodways, a requirement that new structures in the 100-year flood zone be elevated to or above the 100-year flood level[5], and that subdivisions are designed to minimize exposure to flood hazards. For high-hazard coastal zones, additional standards are imposed, sometimes including the requirement that buildings be elevated on pilings and that the Base Flood Elevation (BFE) include potential wave heights. The National Flood Insurance Act also required the identification of all floodplain areas and established flood risk zones. This is good news for subrogation professionals because it provides a warning to landowners and potential tortfeasors that flooding may occur and additional safeguards should be taken. Sometimes, constructive notice to a potential tortfeasor of the dangerous propensity of flooding in an area is as easy as indicating it in the property deed, legal description, or other documents relating to the property. In the earlier example involving the Subaru vehicles being flooded in Kenosha, Wisconsin, there was a great deal of disagreement as to whether or not the vehicles were actually parked on a "100-year floodplain". There was even disagreement as to exactly what that meant. City and state records were sketchy, and the entire area had been covered in crushed gravel, further complicating the question as to whether or not a floodplain had existed. Early land deeds were pulled and anecdotal testimony from farmers in the area was successfully solicited in order to show a pattern of flooding in the area where the vehicles were stored. One farmer had kept meticulous rainfall and flood records in an old notebook going back fifty years.

The National Flood Insurance Program (NFIP) adopted as a national standard a "100-year floodplain" to describe Special Flood Hazard Areas (SFHAs) that are depicted on the Flood Insurance Rate Maps (FIRMs) as "Zone A". Due to the confusion the term created, use of the term "100-year floodplain" has been replaced with a new designation of "base flood". Buildings located in a 100-year flood area (Zone A) are required to have flood insurance as a condition of receiving a federally backed mortgage loan or a home equity loan. In the 500-year flood area (Zone B) you *may* purchase flood insurance, but it is not required.

In contrast to a “floodplain”, “floodways” are determined within the floodplain.[6] Any encroachment or development on floodplains reduces the flood carrying capacity of a river, increasing flood heights in adjacent areas. In order to limit floodplain development within a central channel area of a river where most of the flood water conveyance occurs, floodways are established. Usually, there is no development allowed in the floodway. Flood damage which occurs in a floodway presents opportunities for subrogation. However, one example to the contrary is in Sonoma County, California, where development in the floodway can exist but must not have any net hydraulic effect on the conveyance of the river and homes must be on piers at a minimum level.

Most standard property policies and flood policies contain subrogation clauses which prohibit the insureds from giving up any rights to recover from any entities that may be responsible for a flood loss. Impairment of an insurer’s subrogation rights, which should be looked for in contracts, leases, or other agreements which the insured entered into, discharge the insurer from any obligation to make a payment under the policy. This became a big issue with Hurricane Katrina. Owners and mortgagees should be careful not to sign releases that might impair the subrogation rights of their insurers.

SUBROGATION OF FLOOD LOSSES

It should be remembered that tortfeasors includes not only private individuals and companies, but also government entities. In the California flood loss (Bay Cities Auto Auction) described earlier in this article, Matthiesen, Wickert & Lehrer recovered more than $2.5 million from the State of California, the County of Alameda, and the City of Hayward. This was no small feat considering the dire economic situation the State of California and many of its political subdivisions were under at that time. Inverse condemnation is a legal remedy for a private landowner (or its subrogated carrier) whose interests or ownership in land has been interfered with, damaged, or outright taken away by a governmental action, such as routing drainage water for an entire watershed into a confluence area which results in the increased likelihood of flooding for one particular resident as opposed to the others. The fact that this one resident has an increased risk of damage to his property in order that all the residents in the watershed area can be somewhat free from flood loss, means that the government has taken away a property right of that single resident and damages may be recovered. While inverse condemnation is much more complex than this, the subrogation professional should simply be on the lookout for potential recovery from governmental entities as well as private concerns.

Subrogation with regard to Hurricane Katrina damage, while perhaps politically incorrect, may still be viable. There are numerous examples of decision making in the New Orleans area which illustrate a lack of local government concern about specific hazards to private residents. Local officials often resisted proposals to protect their communities from storms because they did not want to pay their share of federal projects. Levy districts opposed hurricane protection floodgates at the mouths of the city’s drainage canals, leading to the construction of walls along the canals which failed in Hurricane Katrina. In the 1980s, the Federal Insurance Administration (FIA) launched a subrogation suit for more than $100 million against Jefferson, Orleans and St. Bernard Parishes, contending that these parishes caused the FIA to pay excessive flood insurance claims by failing to maintain levies and failing to enforce elevation requirements for new construction. This inaction on the part of the parishes led to buildings being flooded and their owners seeking compensation from the National Flood Insurance Program (NFIP). The courts ruled in the FIA's favor and ordered the parishes to improve their levy maintenance and enforcement practices. The City of New Orleans also did not update its 1970 comprehensive plan for almost 30 years. When it got around to this in 1999, its *New Century New Orleans Land Use Plan* made absolutely no mention of the extreme flood hazard facing the city, ways of mitigating the hazard through land use and building regulations or how the city might recover from an event such as Hurricane Katrina. Still local governments are willing to reduce natural hazards by managing development. It is not that they are opposed to land use measures, but, like individuals, they tend to prioritize things and view natural hazards as a minor problem that takes a back seat to more pressing issues such as unemployment, crime, housing, transportation and education.

SUMMARY

Subrogating flood losses remains a complicated issue which requires the diligence of subrogation professionals and their interaction with subrogation counsel and hydrology experts. The five largest flood losses ever subrogated at Matthiesen, Wickert & Lehrer, S.C. have all been closed files marked "no subrogation". This is quite telling. Recognition of subrogation potential remains the biggest obstacle in successful subrogation of flood losses. Potential subrogation usually cannot be recognized unless you understand and speak the language of hydrology, and are willing to invest the time and resources necessary to flush out third party liability. When in doubt, consult with an expert and subrogation counsel. God sends the rain, and the last time we checked he had absolute immunity. Therefore, subrogation professionals should focus on the actions of man which contribute to turning the naturally occurring perfect storm into the perfect disaster.

BASIC HYDROLOGY TEST FOR SUBROGATION PROFESSIONALS

(1) What is the percent chance that a 100-year flood will occur at any given location within the next year?

- (a) 1%
- (b) 10%
- (c) 28%
- (d) 63%
- (e) 100%

(2) What is the percent chance that a 100-year flood will occur at any given location within the next 100 years?

- (a) 1%
- (b) 10%
- (c) 28%
- (d) 63%
- (e) 100%

(3) What is the percent chance that a 100-year flood will occur at any given location twice in ten years (e.g., in Kenosha, Wisconsin in 1993 and then again in 1998)?

- (a) 0.1% (1 in 1,000)
- (b) 0.4%
- (c) 2%
- (d) 10%
- (e) 50%

(4) What is the percent chance that a 100-year flood will occur at any given location twice in three years (e.g., in Kenosha, Wisconsin in 1993 and then again in 1996)?

- (a) 0.01% (1 in 10,000)
- (b) 0.03%
- (c) 0.4%
- (d) 2%
- (e) 10%

(5) What is the chance that a 100-year design frequency bridge or levy will be overtopped at least once during the design engineer’s 30 year career?

- (a) 10%
- (b) 15%
- (c) 25%
- (d) 30%
- (e) 45%

Answers: (1) (a) 1%; (2) (d) 63%; (3) (b) 0.4% (4 in 1,000); (4) (b) 0.03% (3 in 10,000); (5) (c) 25%.

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[1] Gage can be spelled either gage or gauge. It seems, however, that modern hydrologists prefer the shorter of the two spellings.

[2] The time of concentration is the time it takes for the outflow from a certain watershed area to equal the net inflow. For a constant rainfall rate, it is the time from the beginning of rainfall to the peak outflow from the watershed. For example, if a watershed contains primarily steep slopes, the time of concentration will be less. Steep slopes tend to result in shorter response time and increased discharge while flat slopes tend to result in a longer response time and reduced discharge.

[3] Runoff characteristics include soil type, urbanization, channel slope, impervious cover, land use, etc.

[4] 42 U.S.C. §§ 4001, *et seq*.

[5] This is known as the Base Flood Elevation or BFE.

[6] A floodway is defined as the channel plus any floodplain area that must be kept free of encroachment in order that the 100-year base flood is carried without increasing flood heights anywhere in the floodplain by more than one foot.