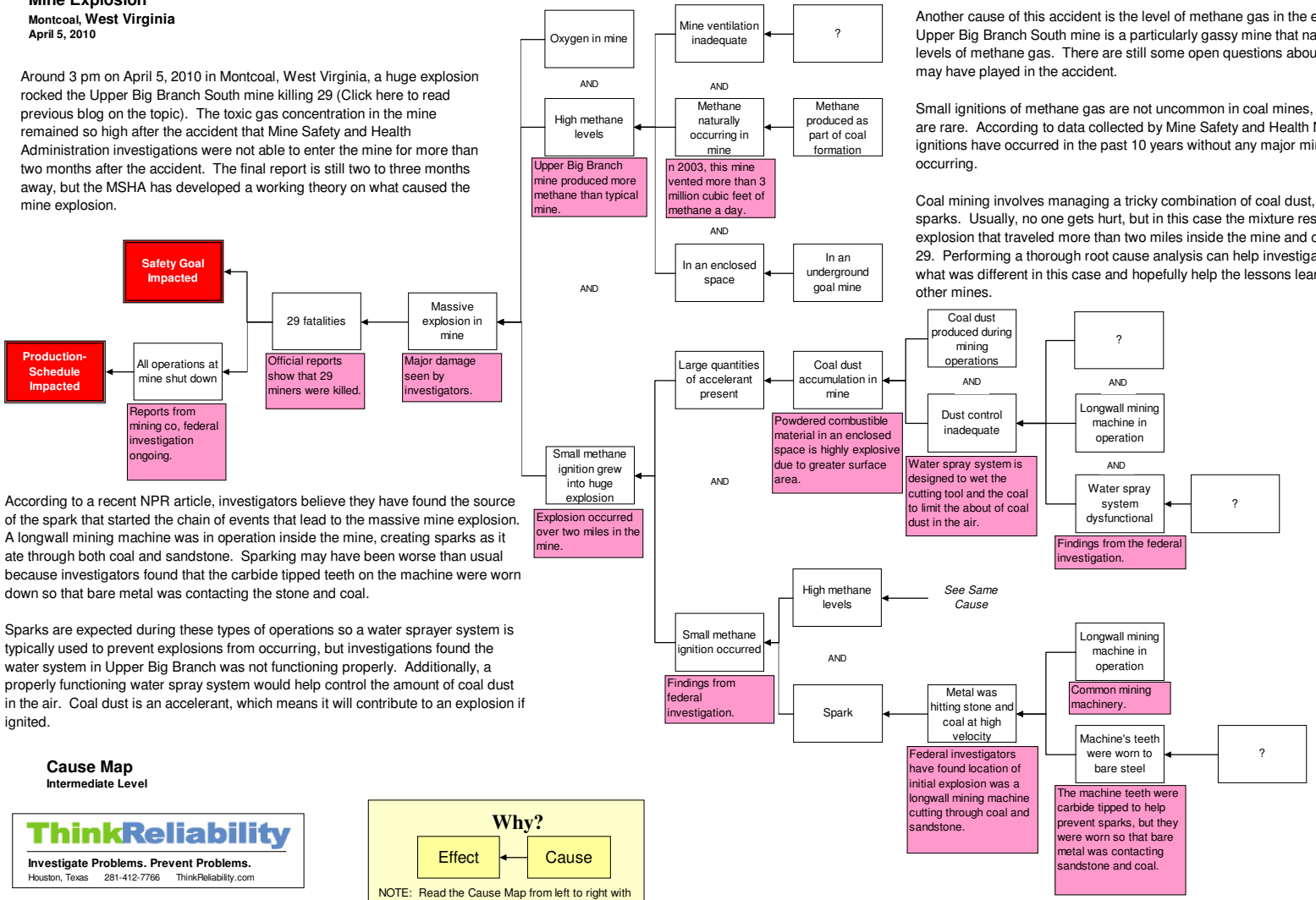
A thorough root cause analysis built as a Cause Map can capture all of the causes in a simple, intuitive format that fits on one page.

Mine Explosion

Montcoal, West Virginia
April 5, 2010

Around 3 pm on April 5, 2010 in Montcoal, West Virginia, a huge explosion rocked the Upper Big Branch South mine killing 29 (Click here to read previous blog on the topic). The toxic gas concentration in the mine remained so high after the accident that Mine Safety and Health Administration investigations were not able to enter the mine for more than two months after the accident. The final report is still two to three months away, but the MSHA has developed a working theory on what caused the mine explosion.



According to a recent NPR article, investigators believe they have found the source of the spark that started the chain of events that lead to the massive mine explosion. A longwall mining machine was in operation inside the mine, creating sparks as it ate through both coal and sandstone. Sparking may have been worse than usual because investigators found that the carbide tipped teeth on the machine were worn down so that bare metal was contacting the stone and coal.

Sparks are expected during these types of operations so a water sprayer system is typically used to prevent explosions from occurring, but investigations found the water system in Upper Big Branch was not functioning properly. Additionally, a properly functioning water spray system would help control the amount of coal dust in the air. Coal dust is an accelerant, which means it will contribute to an explosion if ignited.

Another cause of this accident is the level of methane gas in the environment. The Upper Big Branch South mine is a particularly gassy mine that naturally emitted high levels of methane gas. There are still some open questions about the role ventilation may have played in the accident.

Small ignitions of methane gas are not uncommon in coal mines, but large explosions are rare. According to data collected by Mine Safety and Health News, about 600 ignitions have occurred in the past 10 years without any major mine explosions occurring.

Coal mining involves managing a tricky combination of coal dust, methane and sparks. Usually, no one gets hurt, but in this case the mixture resulted in a massive explosion that traveled more than two miles inside the mine and claimed the lives of 29. Performing a thorough root cause analysis can help investigators understand what was different in this case and hopefully help the lessons learned be applied to other mines.

Cause Map
Intermediate Level

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Why?

Effect ← Cause

NOTE: Read the Cause Map from left to right with the phrase "Was Caused By" in place of each arrow.