



# Illustrated Effects of Mine Subsidence

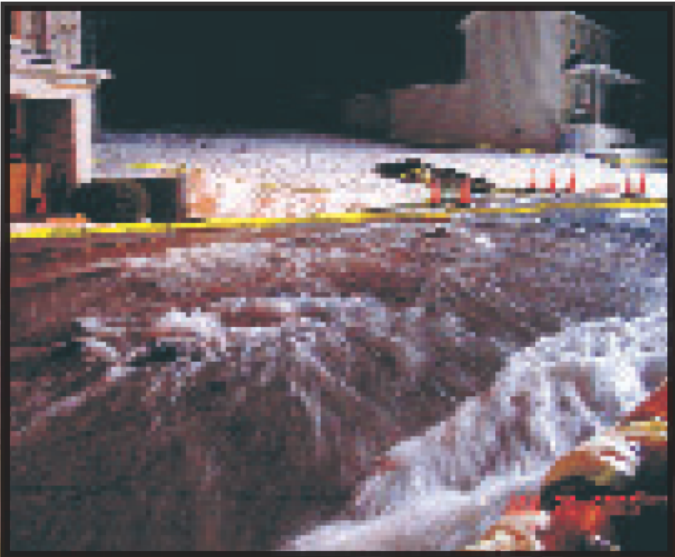
Commonwealth of Pennsylvania  
Department of Environmental Protection  
Mine Subsidence Insurance Fund

[www.paMSI.org](http://www.paMSI.org)

## Mine Drainage

Mine drainage occurs when old underground mine workings gradually fill up with water, and the water breaks out onto the ground surface usually near a coal outcropping on or near a hillside. Sometimes heavy rains or melting snow can raise the water level in a mine and trigger a mine water breakout.

If such a breakout occurs suddenly and unexpectedly near a building, substantial damage can occur. Although this is not considered mine subsidence, under certain circumstances, building damage from such a mine water breakout would be covered by Mine Subsidence Insurance.



## Sinkhole Subsidence

Sinkhole subsidence occurs in areas overlying underground mines which are relatively close to the ground surface. This type of subsidence is fairly localized in extent and is usually recognized by an abrupt depression evident at the ground surface as overburden material collapses into the mine void. Sinkhole subsidence is perhaps the most common type of mine subsidence and has been responsible for extensive damage to many structures throughout the years.



Illustration of Sinkhole Subsidence.



## Trough Subsidence

Subsidence troughs over abandoned mines usually occur when the overburden sags downward due to the failure of remnant mine pillars or by punching of the pillars into a soft mine roof or floor. The resultant surface effect is a large, shallow yet broad depression in the ground which is usually elliptical or circular in shape.



Illustration of Trough Subsidence.



Subsidence is usually greatest at the center of the trough and it progressively decreases until the limit of the impacted surface area is reached. Horizontal ground movements also occur within a subsidence trough. Structures near the center of the trough

can experience damage caused by the compression of the ground surface, and structures near the edges can be damaged by tension or stretching of the surface. Ground movement within a subsidence trough can result in damage to buildings, roadways, bridges, railroads, underground pipelines and utilities, and practically any other structure or surface feature that may be present. In addition, the flow of streams may be altered or disrupted, and surface cracks may occur, particularly near the edges of the trough.



The illustration depicts the typical surface effects of mine subsidence. It is important to note that mine subsidence can occur as a result of mining at any depth. As a general rule, the total surface area affected by subsidence increases as the depth of mining increases. This means a structure can be damaged by subsidence even if it is located directly above a pillar or solid block of coal.

Mine Water Breakout

Sinkhole Subsidence

Overburden

Trough Subsidence

Coal Pillars

Mine Entries or Rooms

Underclay

Collapse Stopped by Strong Rock Strata

Coal Outcrop