Section 4: Structure Impacts

4.A – Overview

The University used data collected from the PADEP and mining companies to analyze the effects that underground bituminous coal mining had on structures from 21 August 2013 to 20 August 2018. Of the 3,612 total structures that were undermined by active mining operations in this assessment period, 455 structures (~15 %) had a structural "Reported Effects" with 247 classified as "Company Liable." Of particular note are 64 structural reported effects occurring at inactive mining operations. Using the data collected by the PADEP on each reported effect, analysis was done to determine category of the resolution and the amount of time to reach a determination. In addition, information was obtained on the structure type as well as the nature of the damage. Using the information collected in 3rd and 4th assessments (Iannacchione et al. 2011; Tonsor et al. 2014), the University was able to compare and contrast ongoing changes over a 15-year period.

4.B - Data Sources

The University employed multiple data sources to obtain information on the structures undermined during this assessment period, working with both the mining companies and the PADEP to ensure a complete and accurate analysis. The structures location and designation were obtained through AutoCAD and GIS maps provided by the mine operators and/or 6-month mine maps submitted to the CDMO. All recorded impacts were obtained from the BUMIS database maintained by the CDMO. Clarification on reported effects was gathered through conversations with PADEP personnel, the staff at CDMO, Structure Analysis reports (SA), and damage reports sent to the CDMO by mining companies. All photographs were obtained from mine "shadow's" files or from the University during site visits to impacted structures.

The above data sources allowed the University to map the extent of mining using ArcGIS. All structures were mapped when located within a 200-ft radius from the edge of the mining extent (referred to as the 200-ft buffer) as well as any structures located outside of the 200-ft buffer that were reported effects. For each of these structures, the mine type, mining method, and overburden were determined.

4.B.1 - Structures Tracked by PADEP

Subsidence control plans are required by Pennsylvania for any structures that will be undermined (Pennsylvania Code, Title 25, Chapter 89.142a). The regulations required for the subsidence control plans of structures are summarized below.

4.B.1.a - Overburden Less Than 100-ft

§89.142a(a) requires the mine to maintain stability beneath structures when mining under overburden less than 100-ft.

4.B.1.b - Pre-mining Surveys

§89.142a(b) requires that the mine operator conducts pre-mining surveys of:

- Dwellings,
- Buildings assessable to the public,
- Noncommercial buildings customarily used by the public, and
- Barns, silos, and certain agricultural structures.

The survey must be conducted prior to the time the structure lays within a 30-degree angle of the underground mine. Surveys must describe the pre-mining condition of the structure. If the structure is historically or architecturally significant, special craftsmanship to restore or replace the structure must be identified.

4.B.1.c - Mining Beneath Protected Structures

§89.142a(c) sets the default standard for mining beneath structures and features as 50 % coal support, although the PADEP may require a greater percentage. This requirement is only for a limited class of structures and features, i.e. public buildings, 20 acre-ft impoundments, etc. Subsection (c) also clarifies alternatives to coal support standards including surface measures that may be undertaken in conjunction with planned and controlled subsidence.

4.B.1.d - Prohibition on Irreparable Damage to Dwellings and Agricultural Structures Greater than 500-ft^2

§89.142a(d) prohibits operators from mining in a manner which would cause irreparable damage to:

- dwellings and
- permanently affixed appurtenant structures, e.g. barns, silos, and certain permanent structures of 500-ft^2 or more used for agricultural purposes.

4.B.2 - University's Process for Tracking Structures

The University developed a protocol to track, categorize and map all structures in the ArcGIS database. The process below was followed for all longwall, room-and-pillar, and pillar retreat mine types.

First, a 200-ft buffer zone was created from the edge of the 5th assessment mining extent. The 200-ft buffer was the outer boundary set for structures that would be inventoried as 'undermined'. All structures outside of the 200-ft buffer, expect those with reported effects, were eliminated. Next, all structures within the 200-ft buffer whose area did not meet the minimum requirements set in §89.142a(f)(1)(v) were eliminated. Then, using the BUMIS database, all structures with a reported effect, regardless of proximity to mining, were identified by matching the property numbers in BUMIS with the property numbers on the parcel layers in the ArcGIS maps. If there were multiple structures located on the property, the Feature ID column in BUMIS was used to identify the structure with the reported effects. In cases where the Feature ID or Parcel number were not available, the University corresponded with the PADEP to identify the structure. The structures with reported effects and a final resolution were then classified as company liable or company not liable. Lastly all structures were summed and classified according to their location relative to the mine.

Longwall mining operations required a special grouping to differentiate areas of full extraction over the panels to limited extraction over room-and-pillar developments. The structures groupings over longwall are therefore:

- Over the Longwall
- Over Room-and-pillar
- Within 200-ft buffer
- Outside 200-ft buffer

Room-and-pillar mining operations only contain areas of limited extraction. Groupings for room-and-pillar mining are:

- Over Room-and-pillar
- Within 200-ft buffer
- Outside 200-ft buffer

Whenever a room-and-pillar mining operation contains sections where pillars are partially extracted, they are classified as pillar recovery mines. Groupings for room-and-pillar mining with pillar retreat are grouped as follows:

- Over Room-and-Pillar
- Over Pillar Recovery
- Within 200-ft buffer
- Outside 200-ft buffer

All structures were tallied in the groups listed above, and those with reported effects were identified as company liable or company not liable. All structures were then identified based on structure type: dwelling, barn, garage, building, outbuilding, shed, silo, trailer, etc.

4.C - Summary of Trends in Structures Undermined during the 5th Assessment Period

In the 5th assessment there were 49 active mines that undermined 3,612 structures. There was a total of 391 reported effects from these active mines and an additional 64 reported effects from mines that were inactive during the 5th assessment (Table 4-1).

Table 4-1.Total of undermined structures and structures with reported effects by mine type.

Mining Type	Undermined Structures	Reported Effects	Company Liable Effects
Room-and-Pillar	1,585	45	3
Pillar Recovery	242	1	0
Longwall	1,785	345	229
Mines not active in the 5th assessment	-	64	15
TOTAL	3,612	455	247

Of the 455 total structural reported effects from active and inactive mines, 247 (or 54 %) had a company liable final resolution. The remaining 208 reported effects had a company not liable final resolution or are still in interim resolution (Table 4-2).

Table 4-2. Outcome of all structural reported effects.

Total Reported Effects	Reported Effects with a Final Resolution		Interim Resolution
	Company Liable	Company Not Liable	
455	247	99	109

Table 4-3 summarizes the effects reported during the 5th assessment period organized by final resolution type and provides the context of similar data from the previous two assessment periods. The number of reported effects that were company liable is lower during the 5th assessment (decreased by 91 from the 4th assessment period) despite an increase in effects reported of 66.

Table 4-3. Total Structural reported effects and reported effects with final resolutions over the last three assessment periods.

Assessment Period	Total Reported Effects	Reported Effects with a Final Resolution	
		Company Liable (% of reported effects)	Company Not Liable (% of reported effects)
5th	455	247 (54.3 %)	99 (21.7 %)
4th	389	338 (86.9 %)	92 (23.6 %)
3rd	456	301 (66 %)	59 (12.9 %)

The scope of work requests reporting and evaluation of all reported structure effects. There are 109 structural reported effects that haven't achieved a final resolution and are classified as an interim resolution. Seventy-nine are associated with active mining operations and thirty are from inactive mines (Table 4-4). Structure effects in interim resolution is higher in the 5th assessment relative to previous assessment periods.

Table 4-4. Number of Interim Resolutions during the 5th assessment period in the active and inactive mines.

Total Interim Resolutions	Active Mines (% of interim resolutions)	Inactive mines (% of interim resolutions)
109	79 (72.5 %)	30 (27.5 %)

Table 4-5. Total number of reported effects in Interim Resolutions at the end of the last three assessment periods.

Assessment Period	Interim Resolutions
5th	109
4th	59
3rd	72

There were 247 structures classified as company liable with active longwall mines accounting for 229, or 92.7 %. The total number of reported effects over the room-and-pillar mines and the pillar recovery mines is much lower than the longwall mines. In the 5th assessment only three company liable effects occurred over the room-and-pillar mines and none occurred over the pillar recovery mines. This is consistent with patterns in the 3rd and 4th assessments. Pillar recovery and longwall mines are both capable of producing subsidence basins because of their high extraction ratios. However, many more company liable impacts occur over longwall mines because pillar recovery mines can selectively extract pillars, leaving appropriate support under structures on the surface.

Inactive mines had 15 company liable effects recorded in the BUMIS database. All of these impacts were reported over the Maple Creek Mine. This mine last operated in 2003 and historically utilized the longwall, room-and-pillar, and pillar recovery mining methods. All these impacts occurred over a portion of the mine that was mined prior to the implementation of Act 54.

Table 4-6 shows the number of days to reach a final resolution during the 5th assessment based on the categories listed in BUMIS. All 346 reported effects, reaching a final resolution, were grouped into the twelve BUMIS categories. The category under company not liable with the highest number is "Not Due to Underground Mining." On average the final resolutions that took the longest number of days to reach a final resolution was the "Withdrawn" category at 333 days. Of the company liable effects, the highest number of resolutions was the "Agreement (unspecified)" category at 125 with an average time of 276 days. Unspecified agreements occurred only in longwall mining operations.

Table 4-6. Determination of liability based on final resolution category recorded in BUMIS as of 20 August 2018.

Final Resolution		**Number**	**Average Time to Resolution (Days)**
Class	**Category**		
Company Not Liable (Unaffected/No Liability)	Damage Claim Form Not Returned to CDMO	28	127
	No Liability	16	66
	Not Due to Underground Mining	49	194
	Withdrawn	5	333
	Referred to BAMR	1	30
Company Liable (Assigned/Assumed Liable)	Agreement (Pre-Mining)	12	13
	Agreement (Unspecified)	125	276
	Company Purchased Property	76	11
	Undisclosed Settlement	10	283
	Compensated	12	221
	Repaired	10	257
	Resolved	2	2
TOTAL		346	162

The average time for all structural final resolutions in the 5th assessment was 162 days. Table 4-7 shows the average times for the 3rd and 4th assessment periods. A comparison of all three assessment periods shows consistency in both the number of reported effects as well as the average time to final resolution.

Table 4-7. Average time to resolution for all reported effects over the last three assessment periods.

Assessment Period	Reported Effects with a Final Resolution	Average Time to Resolution
5th	346	162
4th	360	173
3rd	330	169

Figure 4-1 shows the days to reach a final resolution by mine types based on three broad groupings of resolution categories. The reported effects over the inactive mines took on average the longest time to reach an agreement or get compensated. The longwall mines had the highest average for days to determine no liability, while room-and-pillar mines had the lowest. The same patterns occurred in the 4th assessment.

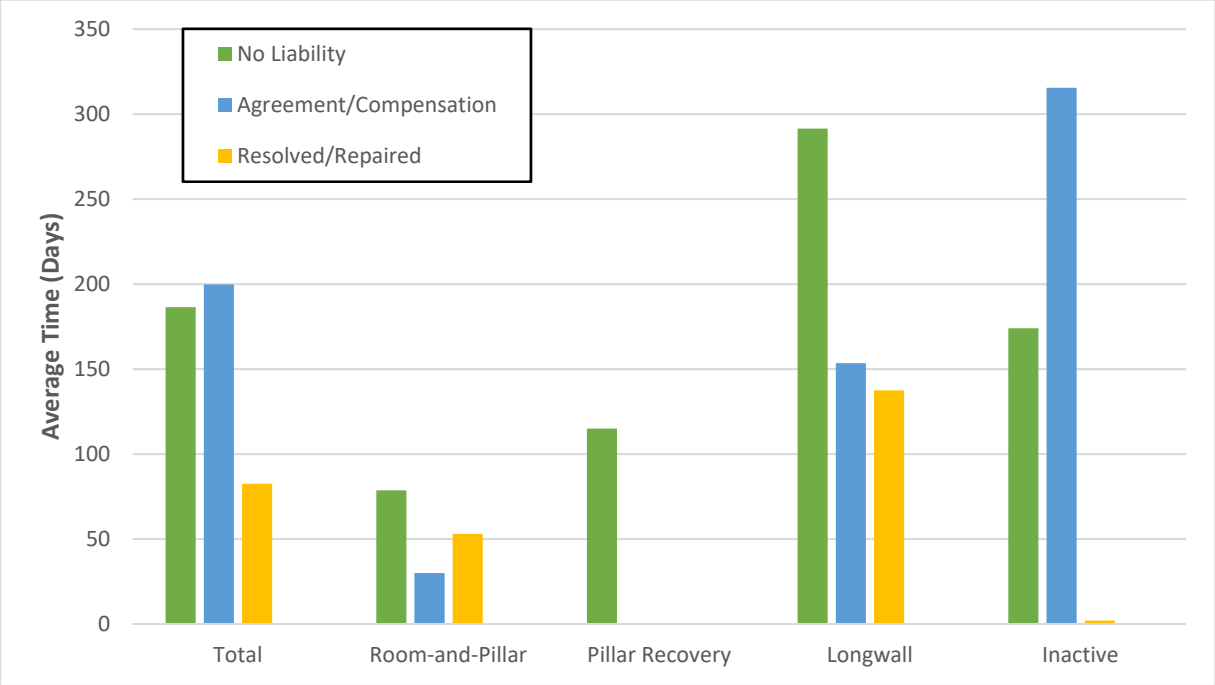

Figure 4-1. Average days required to resolve reported effects based on mining type.

4.C.1 - Structures Impacted

Along with the location of the structures undermined, the type of structure was also tracked. Figure 4-2 shows the top ten structure types that were unmined in the 5th assessment period. These structures include all structures inside of the 200-ft buffer with or without reported effects and all structures located outside of the 200-ft buffer that had a reported effect. A dwelling was

the most commonly undermined structure. There were three room-and-pillar mines, Horning, Kocjancic, and Roytown, that did not undermine structures in the 5th assessment period. Enlow Fork, a longwall mine, undermined 884 structures, the largest amount by a single mine.

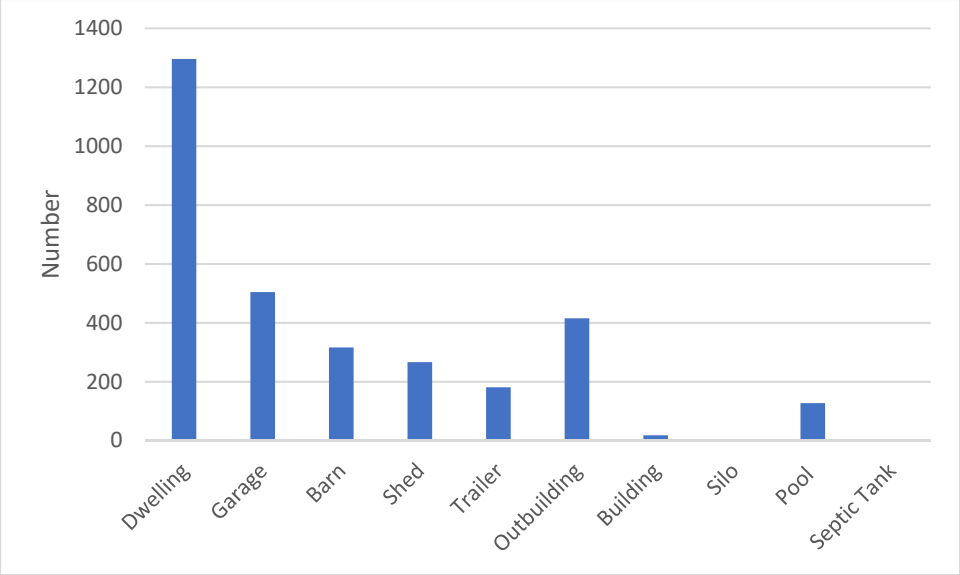

Figure 4-2. Type of structures undermined. These data exclude Clementine 1, 4 West, and Crawdad Mines because the information on structure type was not available.

4.D - Structures and Mining Type

All mines in the 5th assessment period fall into three mine types, longwall, room-and-pillar, and pillar recovery. Within the three mine types there are three mining methods: longwall mining, room-and-pillar development mining, and pillar recovery mining. Longwall mines use both the longwall and room-and-pillar mining methods, room-and-pillar mines use only room-and-pillar mining, and pillar recovery employs both room-and-pillar and pillar recovery mining methods. The mining method that is expected to have the largest impact on structures is longwall mining. The size and depth of the longwall subsidence basin is largely controlled by the panel shape and area. In a pillar recovery mine, subsidence can occur when multiple pillars are extracted. However, pillar recovery can be done strategically to avoid areas with structures. Room-and-pillar mines are not expected to impact the surface structures. Inactive mines can impact surface structures when time-dependent factors act to fail the mine in ways that induce subsidence.

4.D.1 - Active Longwall Mines

The seven active longwall mines, accounted for 1,785 of the 3,612 structures, or 49.4 %, undermined during the 5th assessment period. Table 4-8 lists the structures undermined by mining operation. Enlow Fork undermined the most residential structures and had the highest amount of company liable impacts. Enlow Fork correspondingly mined the most area in the 5th assessment period. Monongalia County Mine was the only longwall mine that did not have any company liable effects.

Table 4-8. Number of total structures unmined by longwall mines and number of structures with reported effects.

Mine Name	Total Number of Structures	Company Liable (% of total)	Company Not Liable	Interim Resolution
Bailey	173	26 (15 %)	2	12
Cumberland	289	8 (3 %)	7	9
Emerald	160	5 (3 %)	16	3
Enlow Fork	884	180 (20 %)	12	30
Harvey	195	7 (4 %)	1	14
Monongalia County	61	0 (0 %)	5	0
Tunnel Ridge	23	3 (13 %)	0	5
TOTAL	1,785	229 (13 %)	43	73

The location of the structures impacted are important to note in longwall mining. Figure 4-3 illustrates the four zones where structures could be located. Anything located over the mined longwall panel is in the subsidence basin, where the most damage is expected to occur. The gate roads used for the development of the longwall panel employs the room-and-pillar method, which in Pennsylvania is capable of supporting the overlying strata. Less structures are impacted over the gate roads. Subsidence related impacts are less likely for structures located within or outside the 200-ft buffer.

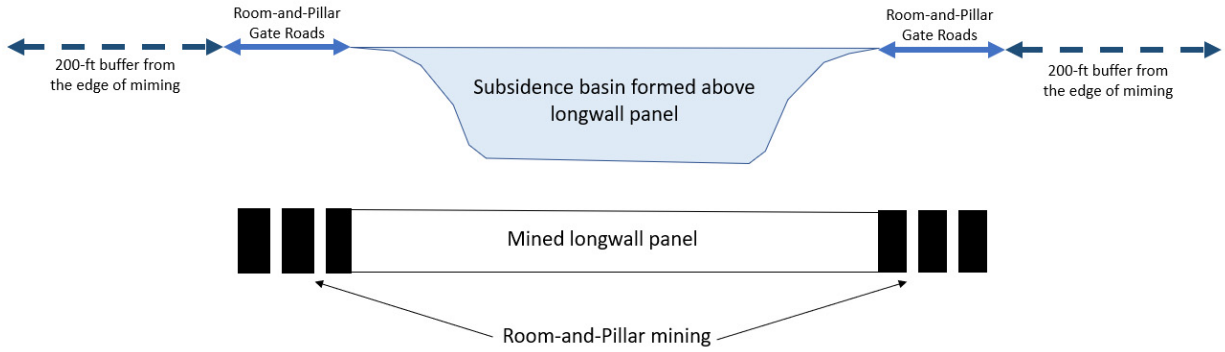

Figure 4-3. Zones that structures were placed in based on the location over or near the edge of mining activity. (Figure not to scale.)

Longwall mines had 345 reported effects during the 5th assessment (Table 4-1). Table 4-9 shows the number of reported effects located in each of the four zones for each mine. Of the 232 structures with reported effects located over the longwall panels 81 %, or 188, had a final resolution of company liable. So, of the total 229 company liable effects from longwall mines in the 5th assessment 82 %, or 188, were located directly above a longwall panel. The University notes that while there are many effects over longwall panels, there were only two mines where more than 50 % of structures above the panels reported effects. Figure 4-4 shows that in most

cases small percentage of total structures over the longwall panels had a reported effect, however a large percentage of those reported effects was determined to be company liable. These data indicate that if a structure has a reported effect and is located over the longwall panel, then it has a high chance of becoming company liable.

Table 4-9. Location of structures with reported effects per longwall mining operation.

Mine Name	Over Longwall	Over Room-and-Pillar	Inside 200-ft Buffer	Outside 200-ft Buffer
Bailey	26	3	4	7
Cumberland	14	2	2	6
Emerald	3	1	3	17
Enlow Fork	167	35	9	11
Harvey	14	3	4	1
Monongalia County	0	0	0	5
Tunnel Ridge	8	0	0	0
TOTAL	232	44	22	47

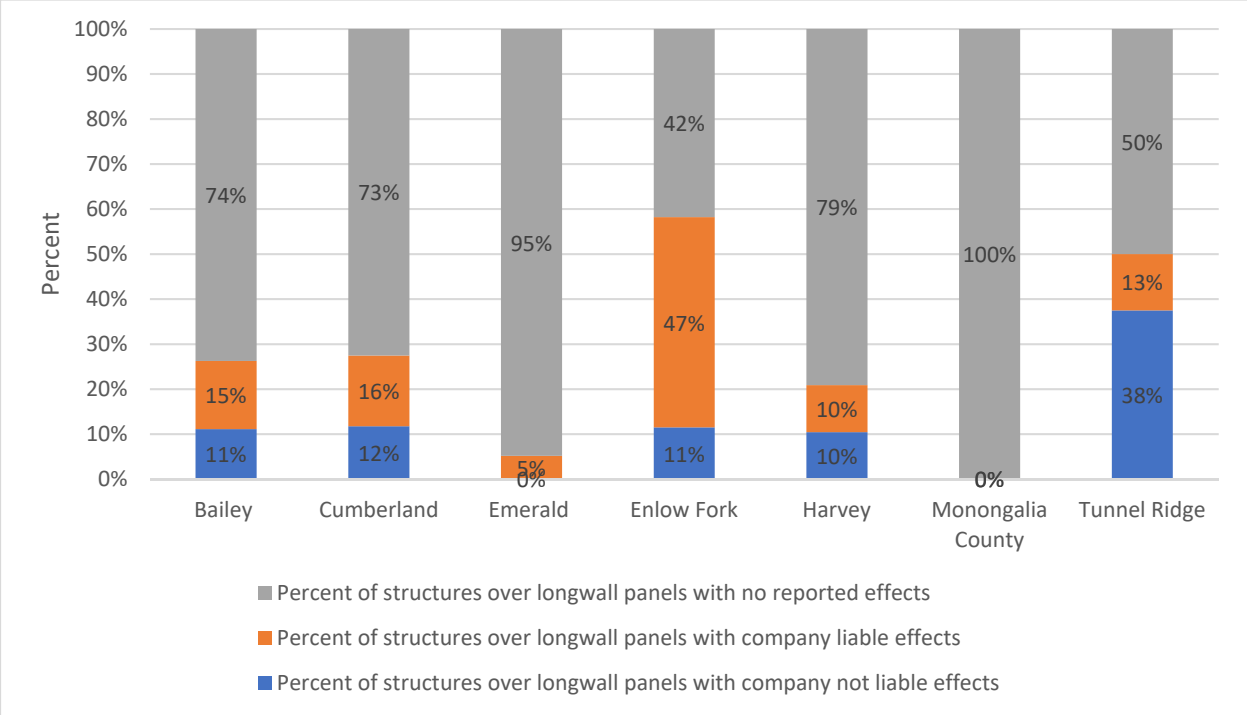

Figure 4-4. Percent of structures over longwall panels that are company liable.

The most common final resolution category for longwall structures that were found to be company liable was an "Unspecified Agreement" (Table 4-10). Pre-mining agreements were not as common, showing that most agreements between the companies and the landowner occurred after mining had passed under the structures. "Company Purchasing Property" was also a common resolution category. They majority of company purchased property occurred over the

Enlow Fork Mine. The number of days it took to reach a final resolution was 201, which is longer than the average for all types of mines.

Table 4-10 Determination of liability for longwall mines based on final resolution category recorded in BUMIS as of 20 August 2018.

Final Resolution		Number	Average Time to Resolution (Days)
Class	**Category**		
Company Not Liable (Unaffected/No Liability)	Damage Claim Form Not Returned to CDMO	12	167
	No Liability	14	144
	Not Due to Underground Mining	15	302
	Withdrawn	2	553
Company Liable (Assigned/Assumed Liable)	Agreement (Pre-Mining)	12	13
	Agreement (Unspecified)	113	263
	Closed/Info Appended to Another Case	0	0
	Company Purchased Property	76	11
	Compensated	10	197
	Undisclosed Settlement	10	283.4
	Repaired	7	268
	Resolved	1	7
TOTAL		272	201

4.D.1.a - Structural Damage Examples

Part of the evaluation of subsidence impacts is characterization of the range of potential impacts. In this subsection, photos from the field subsidence agent files are used to illustrate this range. Damage to a structure can occur in a variety of ways including but not limited to, cracks, uneven settlement, and foundation movement. The severity of the damages varies among structures. Some damages can be repaired by the homeowner. In other cases, the damage is so severe that repairs exceed the structure's value. Figure 4-5 show the damage to a home that was undermined by the Enlow Fork Mine in 2015. The mine operator purchased this property 12 days before it was first undermined. The dwelling was located directly over a longwall panel.

Figure 4-5. Structural damage to a dwelling undermined by Enlow Fork panel E27 (Photographs from the PADEP files).

Figure 4-6 is an example of structural damage occurring to the interior of a home from the Bailey Mine in 2013. The main support beam of the house rotated, and a bump occurred in the first-floor hallway. The property owners entered an unspecified agreement with the company for these damages. This dwelling was also located over the longwall panel but was in the corner of the panel where the surface slope created by the formation of the subsidence basin is normally the steepest.

Figure 4-6. Rotation of a support beam in the basement of a dwelling causing a bump in the first-floor hallway over the Bailey Mine (Photographs from the PADEP files).

Mitigation techniques to help prevent and lessen damage to structures were also employed in the 5th assessment. Timber cribs were sometimes used on outbuildings undermined to support the foundation (Figure 4-7). The timber cribs can move with the differential ground movement and be adjusted to keep the outbuilding level. Bracing has been used to support buildings expected to undergo lateral movement. Figure 4-8 shows a church with bracing placed on the back wall. The reported effects for both the outbuilding and the church were classified as being in interim resolutions at the end of the 5th assessment period.

Figure 4-7. Timber cribbing to support an outbuilding over the Bailey Mine (Photograph from the PADEP files).

Figure 4-8. Bracing along a church that was undermined by the Bailey Mine (Photograph from the PADEP files).

4.D.2 - Active Room-and-Pillar Mines

The 37-active room-and-pillar mines had 45 reported effects in the 5th assessment period, with only three determined to be company liable. The total amount of structures undermined by room-and-pillar mines (1,585; Table 4-11) were less than longwall mines (1,775; Table 4-8). For room-and-pillar mines, structures were classified into three zones, directly over the room-and-pillar mining, within the 200-ft buffer from the edge of mining, and outside the 200-ft buffer.

Table 4-11. Location of structures over room-and-pillar mines.

Mine Name	Over Room-and-Pillar	Inside 200-ft Buffer	Reported Effects Outside 200-ft Buffer
Acosta Deep	3	2	0
Barbara No 2	2	5	0
Barrett Deep	48	33	0
Beaver Valley	2	12	0
Brubaker	17	14	0
Brush Valley	73	34	0
Cass No 1	8	5	2
Cherry Tree	16	16	1
Clementine No 1	9	37	5
Coral Graceton	22	43	0
Cresson	1	2	0

Crooked Creek	13	5	0
Darmac 2	27	35	0
Dutch Run	15	9	2
Gillhouser	24	21	0
Harmony	9	9	0
Heilwood	47	40	4
Horning Deep	0	0	0
Knob Creek	37	20	0
Kocjancic	0	0	0
Logansport	13	12	4
Lowry Deep	5	5	5
Madison	28	18	1
Maple Springs	18	14	1
Mine 78	211	117	3
North Fork	14	22	0
Ondo	5	7	3
Parkwood	45	27	0
Penfield	2	4	0
Roytown	0	0	0
Starford	0	2	1
TJS 6	3	2	0
Toms Run	74	51	2
Tracy Lynne	7	21	4
Twin Rocks	29	35	3
Kimberly	4	7	0
Kingston-West	12	15	0
TOTAL	843	701	41

Forty-one (Table 4-11) of the forty-five room-and-pillar structural reported effects were outside of the 200-ft buffer (Figure 4-9). In addition, all three company liable effects were located outside of the 200-ft buffer. Lower percentages of reported effects inside the 200-ft buffer as opposed to outside this boundary, are consistent with trends in other assessment periods. Arguably these trends demonstrate that the designed pillars are supporting the overburden and preventing damaging subsidence. Extraction ratios for most of these mines range from 0.55 to 0.65 (random survey of 6-month mining maps). However, past assessments have found cases where groups of pillars failed to provide adequate support of the overburden, resulting in company liable effects on structures. There is no evidence of unplanned pillar failure causing damage to structures during the 5th assessment period.

The three company liable effects outside of the 200-ft buffer were identified. One occurred in the Tracy Lynne Mine, approximately a mile from active mining in the 5th assessment. However, this

structure was located over room-and-pillar mining that occurred during the 3rd assessment period.

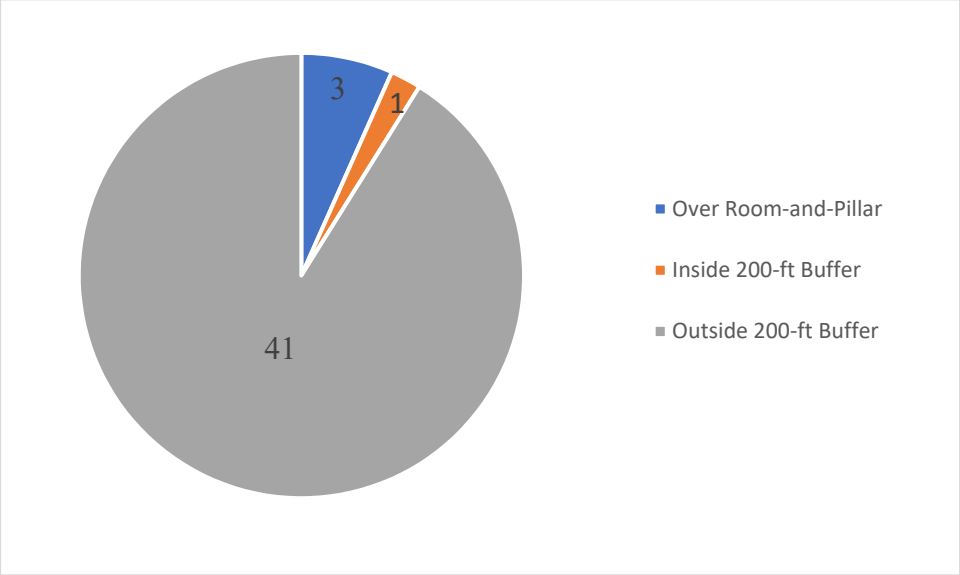

Figure 4-9. Location of reported effects for all room-and-pillar mines.

Thirty-nine of the 45 reported effects have reached a final resolution, only six are still in interim resolution. The most numerous final resolution category was that the reported effect is "Not Due to Underground Mining" (Table 4-12). Damage claims were not returned to the CDMO 41.7 % of the time. Reasons for not returning the claims were not identified. All three of the company liable effects were "Repaired." The number of days to determine a final resolution is less than the longwall mines.

Table 4-12. Determination of liability for room-and-pillar mines based on final resolution category recorded in BUMIS as of 20 August 2018.

Final Resolution		Number	Average Time to Resolution (Days)
Class	**Category**		
Company Not Liable (Unaffected/No Liability)	Damage Claim Form Not Returned to CDMO	15	106
	No Liability	2	27
	Not Due to Underground Mining	18	103
	Withdrawn	0	0
	Referred to BAMR	1	30
Company Liable (Assigned/Assumed Liable)	Agreement (Pre-Mining)	0	0
	Agreement (Unspecified)	0	0
	Closed/Info Appended to Another Case	0	0
	Company Purchased Property	0	0
	Compensated	0	0
	Landowner Negotiations	0	0
	Repaired	3	53
	Resolved	0	0
TOTAL		39	64

4.D.3 - Active Pillar Recovery Mines

The five pillar recovery mines operating in the 5th assessment period undermined 242 structures (Table 4-13) and produced only one reported effect. Pillar recovery allows for pillars to be extracted in certain areas of the room-and-pillar mine. Table 4-8 shows that there were no structures over any area where pillar extraction occurred.

Table 4-13. Location of structures per room-and-pillar mining operation.

Mine Name	Over Room-and-Pillar	Over Pillar Recovery	Inside 200-ft Buffer
4 West	87	0	52
Crawdad	24	0	12
Nolo	21	0	30
Prime 1	0	0	0
Quecreek 1	6	0	10
TOTAL	138	0	104

The one pillar recovery reported effect was determined to be company not liable. This structure was over a room-and-pillar development section of the 4 West Mine. It was approximately 280-ft from the closest pillar recovery section. Table 4-14 shows that the damage claim form was never returned to the state.

Table 4-14. Determination of liability for pillar recovery mines based on final resolution category recorded in BUMIS as of 20 August 2018.

Final Resolution		Number	Average Time to Resolution (Days)
Class	**Category**		
Company Not Liable (Unaffected/No Liability)	Damage Claim Form Not Returned to CDMO	1	115
	No Liability	0	0
	Not Due to Underground Mining	0	0
	Withdrawn	0	0
Company Liable (Assigned/Assumed Liable)	Agreement (Pre-Mining)	0	0
	Agreement (Unspecified)	0	0
	Closed/Info Appended to Another Case	0	0
	Company Purchased Property	0	0
	Compensated	0	0
	Landowner Negotiations	0	0
	Repaired	0	0
	Resolved	0	0
TOTAL		1	115

4.D.4 - Inactive Mines

There were five inactive mines with structural report effects during the 5th assessment period. Subsidence impacts over room-and-pillar mines permitted since the passage of Act 54 are relatively rare. Subsidence impacts over longwall and pillar recovery mining sections, most frequently, occur shortly after undermining. Therefore, when large number of report effects occur after mining has ceased, it warrants further investigation.

Sixty-four reported effects were associated with five inactive mines during the 5th assessment period. During the 3rd and 4th assessment, there were a combined 19 reported effects from inactive mines, all occurring in the 4th assessment period. Therefore, the number of reported effects from inactive mines tripled from the 4th to the 5th assessment. The Maple Creek Mine had the most reported effects with 55 (Figure 4-10). Fifteen of which were determined to be company liable, ten company not liable, and 30 are still in interim resolution.

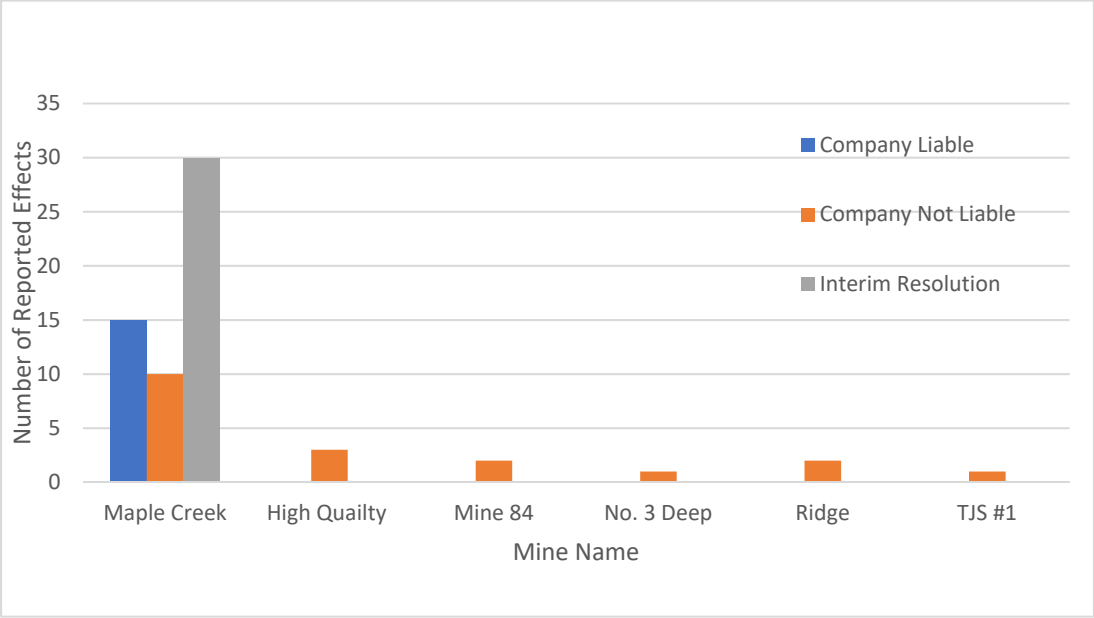

Figure 4-10. Reported effect per inactive mine and their resolution category as of 20 August 2018.

The Maple Creek Mine was a room and pillar and longwall mining operation that was last active in the 3rd assessment period (2003). However, within this mine are areas where pillar retreat mining occurred. The map in Figure 4-11 shows the location of all reported effects. These impacts were not located over the longwall areas of the mine. Land movements associated with longwall mining almost always occur within months of panel extraction and this is consistent with the lack of impacts near longwall panels. The mechanics of why so many unexpected reported effects occurred in Maple Creek is not known. Further investigations are recommended.

Figure 4-11. Map showing the locations of Maple Creek reported effects.

The number of days to reach a final resolution for these impacts is only slightly less than the active longwall mines, and much greater than the active room-and-pillar operations (Table 4-15). Although these mines are not now active, the companies that own the mines are still held responsible for any compensation, agreements, or repairs that must be done for mining that occurred after Act 54 implementation.

Table 4-15. Determination of liability for inactive mines based on final resolution category recorded in BUMIS as of 20 August 2018.

Final Resolution		Number	Average Time to Resolution (Days)
Class	**Category**		
Company Not Liable (Unaffected/No Liability)	Damage Claim Form Not Returned to CDMO	0	0
	No Liability	0	0
	Not Due to Underground Mining	16	233
	Withdrawn	3	114
Company Liable (Assigned/Assumed Liable)	Agreement (Pre-Mining)	0	0
	Agreement (Unspecified)	12	340
	Closed/Info Appended to Another Case	0	0
	Company Purchased Property	0	0
	Compensated	2	291
	Landowner Negotiations	0	0
	Repaired	0	0
	Resolved	1	2
TOTAL		34	196

There are 30 reported effects from inactive mines that have not reached a final resolution and are still in interim resolutions. All reported effects that are in interim resolution are from the Maple Creek Mine. Table 4-16 shows that it took an average of 196 days to reach the interim resolutions.

Table 4- 2. Number of Interim Resolutions for inactive mines and their average days.

Interim Resolutions	Average Time to Interim Resolution (Days)
30	196

4.E - Summary

Four hundred fifty-five structural reported effects occurred during the 5th assessment as a result of 49 active and six inactive operations undermining a total of 3,612 structures. The mines employed three mining methods, longwall, room-and-pillar, and pillar recovery. Two hundred forty-seven reported effects had a final resolution holding the mining company liable for the reported effect. Reaching a final resolution took an average of 162 days. The longwall mines had 92.7 % of the structural company liable effects. The most common resolution type was an unspecified agreement. While the most common structure undermined was a dwelling. The number of reported effects from the inactive mines was large compared to previous assessment periods.

Figure 4-12 compares the total number of reported effects from the last three assessment periods. The number of total structural reported effects increased from the 4th to the 5th assessment period

but was very similar to the 3rd assessment period. The number of reported structural effects that were company liable increased by only 3 % from the 4th to the 5th assessment period.

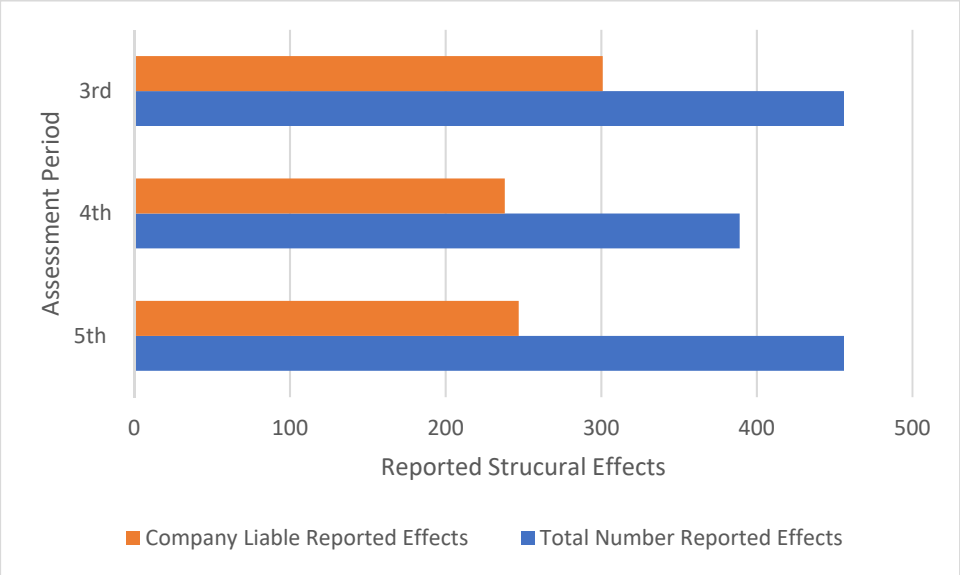

Figure 4-12. Comparison of reported effects from three Act 54 assessment periods.

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