



RYERSON STATION STATE PARK

RYERSON STATION DAM

DAMAGE CLAIM NUMBER SA1736

INTERIM REPORT

Pennsylvania Department of Environmental Protection

California District Office

February 16, 2010

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PART I

EXECUTIVE SUMMARY

This report entitled “Ryerson Station Dam, Ryerson Station State Park, Damage Claim Number SA1736”, contains the results of the Department of Environmental Protection’s (DEP) investigation of the Department of Conservation and Natural Resources (DCNR) claim of mine subsidence damage to the Ryerson Station Dam.

Ryerson Station Dam was constructed in 1960 near the town of Ryerson Station, Greene County, Pennsylvania. The dam created a 62-acre recreational lake called Duke Lake. From its construction until 2005, the dam was inspected numerous times and determined to be in relatively good condition, requiring only normal repairs and maintenance.

During late spring and early summer of 2005, significant movements and structural damage began to occur. In July 2005, conditions reached the point where DCNR and DEP Dam Safety officials concluded the lake should be drained and the dam should be breached to prevent further impounding of water in the reservoir. The dam was breached in August 2005.

Consol Pennsylvania Coal Company (CPCC) was conducting longwall mining operations in the vicinity in their Bailey Mine. DCNR contends CPCC’s underground mining operations are responsible for the damage that occurred in 2005. CPCC contends their mining operations are not responsible for damages to the dam, primarily because the dam was not undermined and the nearest longwall mining was a considerable distance away.

On November 3, 2008, DCNR filed a claim directly with DEP Secretary John Hanger. Secretary Hanger directed the California District Office, District Mining Operations, Office of Mineral Resources Management to fully investigate this claim under the provisions of the Bituminous Mine Subsidence and Land Conservation Act (BMSLCA) and accompanying regulations.

This report contains the findings and conclusions of this investigation. The DEP has concluded that longwall mining operations conducted by CPCC did result in ground movements which damaged the Ryerson Station Dam.

PART II

SECTION A - INTRODUCTION

This interim report contains the partial results of the Pennsylvania Department of Environmental Protection's (DEP) investigation of the Department of Conservation and Natural Resources' (DCNR) claim of mine subsidence damage to the Ryerson Station Dam.

Throughout this report, the Department of Environmental Protection will be referred to as DEP, the Department of Conservation and Natural Resources will be referred to as DCNR, and Consol Pennsylvania Coal Company will be referred to as CPCC. For a list of terms used in this report and other acronyms, please refer to the Glossary of Terms on page 121.

Figure II-1 is an aerial photograph showing Ryerson Station Dam, Duke Lake, and surrounding areas. All references to the dam are made as if the observer is standing on the dam and facing downstream. Therefore, the right side of the dam is the east side; similarly the left side of the dam is the west side (please refer to Photo II-1 and II-2). Photos II-3 through II-7 show various views of the dam taken at different times.



Figure II-1 : Aerial photograph showing Ryerson Station Dam, Duke Lake, and surrounding areas

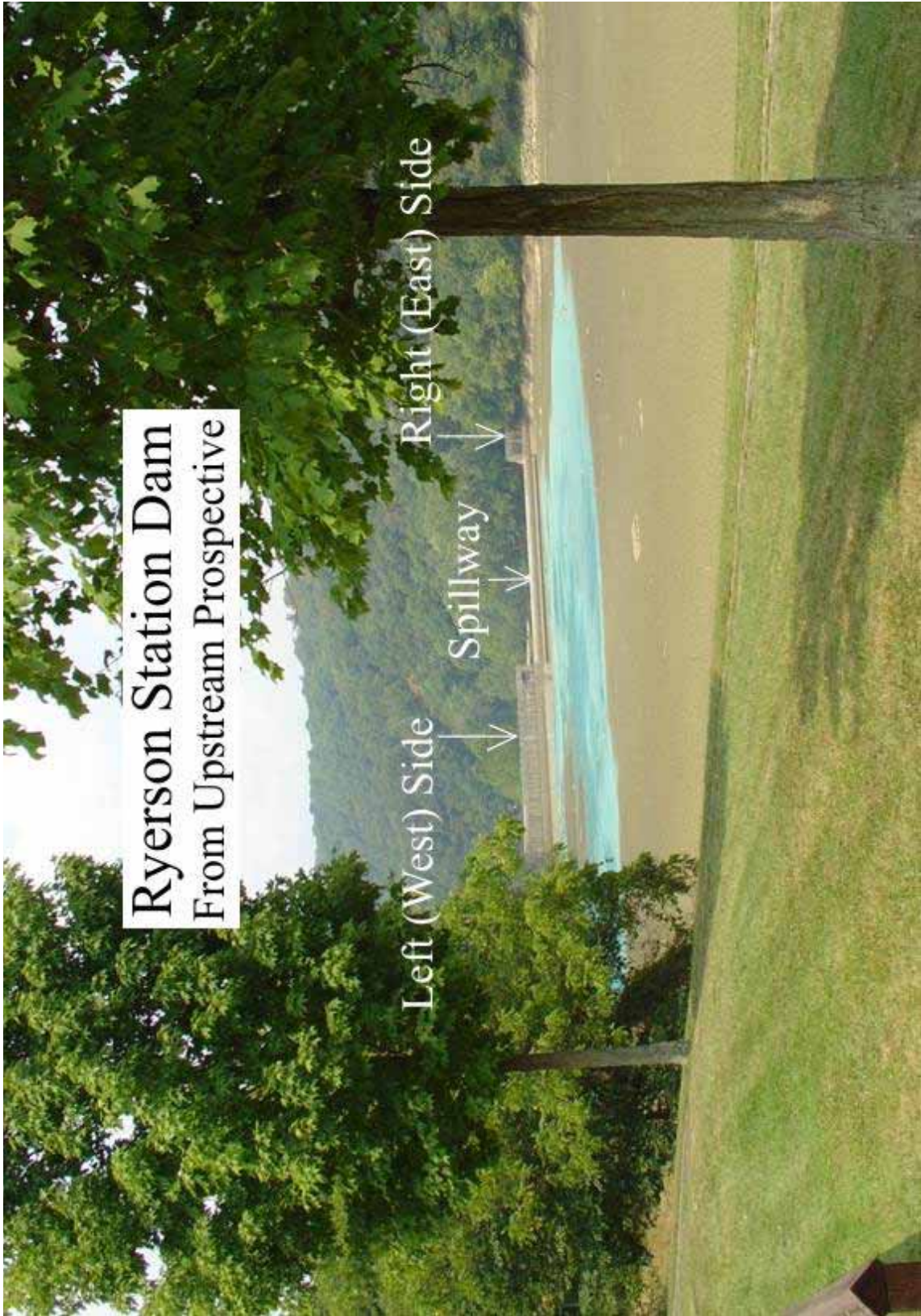


Photo II-1 : DEP photograph with areas of the dam labeled.

Ryerson Station Dam From Downstream Prospective



Photo II-2 : DEP photograph with areas of the dam labeled.



Photo II-3 : DEP photograph, taken July 20, 2005, shows the spillway of the dam prior to the breaching of the dam.



Photo II-4 : DEP photograph, dated August 11, 2005, shows a view of Ryerson Station Dam from the left (west) side.



Photo II-5 : DEP photograph, dated August 11, 2005, shows a view of Ryerson Station Dam spillway and the right (east) side.



Photo II-6 : DEP photograph, dated August 11, 2005, shows a view of Ryerson Station Dam spillway and the left (west) side.



Photo II-7 : DEP photograph, dated August 26, 2005, shows a view of Ryerson Station Dam after the breaching of the dam was completed.

PART II

SECTION B – SUMMARY OF RYERSON STATION DAM INSPECTION REPORTS

This section discusses the location and construction of Ryerson Station Dam and Duke Lake. It gives an overview of the past performance of the dam according to the annual and semi-annual inspection reports performed by the park personnel, DEP Division of Dam Safety, and DCNR's consultant since the construction of the dam. See Appendix 1 for a detailed review of these inspection reports.

Description of Ryerson Station Dam and Duke Lake

Ryerson Station Dam is located in Ryerson Station State Park. The park is located approximately one mile upstream from the town of Ryerson Station in Richhill Township, Greene County, Pennsylvania.

The subsurface investigation for the dam was done by Berger Associates, Inc. of Harrisburg, PA. The dam was designed in 1957 by Swindell-Dressler Corporation of Pittsburgh, PA. The dam's construction was completed in 1960 by Seabright Construction Company.

Ryerson Station Dam is a 515-foot long concrete gravity structure. There is a 200-foot long section that is the primary and emergency spillway of the dam. The dam height is approximately 30 feet at the spillway and 42 feet at the non-overflow section. The width of the dam is 6 feet at the crest of the non-overflow section and approximately 30 feet at the base of the dam (see Photo II-2).

The crest level of the non-overflow section of the dam is at an elevation of 979.4 feet. The reservoir of the dam is typically maintained at an elevation of 967.6 feet. This leaves a freeboard of 11.8 feet from the crest level to the top of the dam. At normal pool level, the dam created a 62-acre recreational lake which is called Duke Lake.

Past Performance of Ryerson Station Dam

Ryerson Station State Park Dam was inspected numerous times from 1962 through 2005. The inspections were done on an annual and semi-annual basis by personnel from DCNR (engineers and maintenance staff), DEP Division of Dam Safety, and consultants.

1962-1969

The first inspection report describing concerns regarding the dam was in 1962. The remarks on this report suggested that there was a slip putting pressure on the west wing wall of the spillway, and evidence of several leaks in the joints of the spillway. From 1962 until 1969, the inspection reports mentioned leakage or seepage in the breast of the dam, a ponding area as a result of this seepage below the west wing wall, and a reoccurrence of a slip located between the park road and Duke Lake on the west side of the dam.

1970-1979

A vertical structural crack located in the right abutment, or east side of the dam, was first discovered in 1970. The crack extended from the downstream side across the top and down the upstream face of the dam. The inspection report noted seepage present through the vertical structural crack and a horizontal joint nearby. From 1970 until 1978, the annual inspection report noted seepage through the vertical structural crack and horizontal joint, minor spalling in the seepage areas, and erosion along the downstream face of the ogee section.

1979 Phase I Inspection Report

In April of 1979, the Phase I Investigation Report was created by D'Appolonia Consulting Engineers of Pittsburgh, PA for the U.S. Army Corps of Engineers. It was created to identify dams that may pose a hazard to human life or property. The assessment took into consideration the general condition of the dam based on visual inspections and a review of all available data. The assessment determined that Ryerson Station State Park Dam was in good condition. The structural crack was "not considered to be serious relative to the overall stability of the dam at this time". However, D'Appolonia felt it should be regularly inspected and monitored to document if further structural distress occurs, and necessary remedial work should be performed if such conditions are observed.

1980-1989

During this time frame, the damage reported in the annual and semi-annual inspections was becoming greater. In 1982, it was reported that there was a problem closing the gate valve on the dam. To remedy the situation, a scuba diver was sent down to inspect the valve. It was determined the stem guide was rusted and broken off and that the "as-built" drawings show the trash rack being six feet off the footer, yet the bottom of the lake was silted to within eight to ten inches of the top of the trash rack. After receiving instructions and drawings of the gate valve from the company that built it, the gate valve was able to be closed. In 1986 and 1987 seepage, cracking, and concrete deterioration problems at the dam increased. It was reported that there were areas of seepage in the ogee weir, spillway walls, and structural cracks through the joints near the left, or west, spillway wall. It was also reported that minor amounts of new surface cracking had developed in the spillway walls and left abutment. Concrete deterioration was noted in three locations near the joints of the left spillway wall. In addition to the problem reported in 1986 and 1987, it was reported that there was a possible displacement of the vertical structural crack. This was being monitored at four locations along the crack. In 1988 and 1989 the seepage, cracking, and deterioration of the dam was similar to those of previous years.

1990-1999

The park superintendent reported a “substantial increase in the flow through the long vertical crack near the right abutment” in 1990. From 1990-1992, the inspection reports indicated seepage in the vertical crack and the horizontal construction joint, concrete spalling of the horizontal construction joints and of the ogee weir, and cracking in the downstream left and right spillway sidewalls. In 1993, water flowing at approximately 100 gallons/day was observed emanating from the vertical structural crack. Four new cracks similar to the structural crack, but smaller, were noted along the left dam crest. One of the cracks extended across the top and completely down both sides and the other three extended across the top and down approximately five feet on both sides of the dam. The area along the downstream side of the left abutment wall was reported “spongy” in 1995. The report also stated there is a small area about 100 feet downstream of the left abutment that was wet. It further was stated the wetness in these areas was not new, however it was not mentioned in any prior inspection reports. A new wet area located at the inside corner of the left abutment at the first horizontal joint above the ground was noted in the 1998 inspection. In 1999, in addition to the previously mentioned wet areas on the left side of the dam, the ground just to the right of the structural crack and several feet up along the abutment was observed to be “soft and spongy” for the first time.

2000-2004

According to the Annual Inspection Report (AIR), there were approximately ten areas of concern relating directly to the dam or surrounding areas in 2000. Minor spalling of the spillway, abutment walls, downstream face of the left abutment wall, and ogee section was reported. An opening of the structural crack was noted, and the ground to the right of the structural crack was soft and spongy. Seepage was occurring through an old 12-inch corrugated metal pipe on the outside spillway wall and joints of the spillway wall. Lastly, an eroded area of the upstream bank was listed as a concern. The 2001 AIR lists the same areas as potential problems with the addition of a new cracked/broken section of concrete at the top of the left upstream side of the dam. The 2002 AIR lists all the same damage as the previous two years with the exception that the number of spalls on the ogee section increased from two to three. In 2003, the major areas of concern were the water seeping from a small diameter plastic tube near the bottom of the downstream face of the structural crack, an increase in the wetness of the area along the toe of the center portion of the left abutment wall, and ongoing erosion along the banks of the lake. In 2004, the dam conditions remained unchanged except for the trash rack being almost completely covered with silt and several spalls and cracks were observed on the downstream face of the left abutment wall. On September 17, 2004, the park manager reported “...approximately 2 feet of water going over the spillway weir from heavy rainfall. During this time, some seepage was observed through the left abutment at a joint at elevation 967. This seepage had never been observed before. This area should be monitored.” The 2004 inspection report stated that the dam “appears to be generally in good condition and well maintained”.

2005

The 2005 inspection reports, which were prepared by the same engineer as in previous years, stated that the dam “appears to be in serious condition at this time”. The condition of the dam appeared to be changing rapidly beginning in April 2005.

The Interim Annual Inspection in April of 2005 noted new seepage on the downstream left (west) side of the dam and increased seepage through the bottom two horizontal joints on the downstream right (east) side of the dam. It was noted that the amount of seepage from a wall drain on the right (east) side of the dam, approximately 10 gpm, was unusual and “... is more than anyone at the Park has ever seen”.

Park personnel reported that seepage on the left (west) side decreased and seepage on the right (east) side increased from the middle of June to the beginning of July of 2005. By the first week in July, the seepage on the right (east) side of the dam was “definitely increasing”. The seepage through the wall drain on the right (east) side increased to 35 gpm and more seepage was noted through the horizontal joints on the downstream face. At this time, it was also reported that a thin shear crack on the downstream face of the left (west) side of the dam near the spillway reported the previous year had become wider and the horizontal joint at this location separated.

From the middle to end of July the rate of seepage through the wall drain on the right (east) side of the dam increased to 60 gpm, and eventually 80 gpm. The ground surface was reported to be completely “saturated and flooded”. A new shear crack was reported on this side of the dam near the spillway. In August of 2005, it was determined by DEP Division of Dam Safety that a 100 foot section of the 200-foot spillway must be removed. The breaching of the dam began August 11, 2005. The inspection report stated “The rapidly changing conditions observed at this dam just don’t happen without some major change in subsurface or other external conditions. This dam has been sitting here since 1960 performing admirably. It did have some minor cracks and seepage over the years (not unusual for concrete dams this old). Something dramatic is happening to change the internal stresses on this structure and seepage paths around and through this structure. A preliminary assessment would indicate dramatic changes in the external forces on this dam.”

The inspection report states the following regarding the breach of the dam. “On July 28, 2005, just 2 days after this inspection, the PA DEP – Dam Safety ordered a complete draw down of the lake behind the dam (Duke Lake). This was because of a significant increase in seepage and additional cracking observed on the right downstream side of the dam. On July 29, 2005, Dam Safety suggested that the dam be breached as soon as possible for safety reasons. By August 25, 2005, the dam breach was complete, consisting of a 100’ wide x 16’ deep rectangular opening through the center of the 200’ wide spillway” (see Photos II-8 and II-9).



Photo II-8: DEP photograph, taken August 11, 2005, as Ryerson Station Dam began to be breached.



Photo II-9: DEP photograph, taken August 26, 2005, shows the dam breached.

PART II

SECTION C – CPCC’S BAILEY MINE

Permitting

The Bailey Mine is a large underground coal mine located in portions of Washington and Greene Counties in Pennsylvania. CPCC extracts the Pittsburgh Coal Seam using the longwall mining method at the Bailey Mine. The DEP first issued a coal mining activity permit (CMAP No. 30841316) for the Bailey Mine in 1984. Since then the permit has been revised many times.

CPCC submitted a permit revision application to the DEP on December 20, 1996 to add additional acreage for mining. The permit revision application was accepted for review on January 8, 1997, and was assigned Revision No. R71. Following a complete review, the revision was issued on February 24, 2000. Revision 71 added 11,120 acres to the permit area and 4,126 acres to the subsidence control plan area (the area where coal could be removed). The Ryerson Station State Park is located within this subsidence control plan addition.

The DEP thoroughly reviewed CPCC’s application. In accordance with regulations, an Informal Public Conference (IPC) was held on May 15, 1997 for the purpose of taking comments on the application from the public. The IPC was attended by concerned citizens, representatives of various environmental groups, as well as representatives of Texas Eastern which owns a compressor station yard adjacent to the dam and various large, high pressure gas lines which traverse the proposed permit area. The comments and DEP’s responses are part of the public record. The primary concerns expressed at the IPC consisted of the environmental impacts, safety, water loss, and more particularly Texas Eastern’s concern for their compressor yard and gas pipelines.

In answer to one of the comments at the IPC, the DEP explained its method of calculating the support area for protected surface features. The support area consists of a rectangular area in which no more than 50 percent of the coal may be removed. This rectangular area is defined in the mine by projecting a 15° angle of draw from the surface to the coal seam beginning 15 feet from the sides of the surface feature. For a structure located on a slope of 5% or greater, the support area on the downslope side of the structure is extended an additional distance determined by multiplying the thickness of the overburden by the percentage expressed as a decimal of the surface slope. Historically, this method of calculating a support area has been successful in protecting structures from mine subsidence. The support pillars were sized using the U.S. Bureau of Mines model for pillars referred to as ALPS.

Longwall mining is a method whereby large rectangular blocks of coal (called panels) surrounded by a series of parallel tunnels (called entries) are mined in a continuous full extraction process. The panels are typically up to approximately 10,000 feet long and 1,100 feet wide. Nearly 100% of the coal in the panel is mined. The coal in the panel is mined using a “shearer” to cut the coal; the coal falls on a conveyor and is removed from

the mine. A series of “shields” supports the roof immediately behind the shearer protecting the miners and the equipment. As the coal in the panel is removed, the strata behind the shields collapse filling the void. The collapsed roof is referred to as gob or gob area. As the strata collapses, its downward movement works its way to the surface causing the surface to fall. This movement caused by the mining that is manifested on the surface is referred to as subsidence. Under customary subsidence theory, subsidence manifests on the surface as a large trough whose areal extent and depth are determined by the mining height, the type and thickness of rock strata over the panel, the distance from the surface to the coal seam (referred to as the cover), and the geometry of the panel (length and width). In addition, the subsidence extends on the surface beyond the edges of the panel by an angular amount referred to as the “angle of draw.”

Mining of Panels

The mining in the area of the Ryerson Station State Park/Dam area consists of a series of panels laid out in succession from north to south from the 1I Panel to the 8I Panel. Each panel, in turn, was mined from east to west. The 1I Panel began in November 2003, and the 3I Panel finished in June 2005. The 6I Panel was eliminated from projections, as well as more than half of the 5I Panel due to the overlying presence of Duke Lake, The Ryerson Station Dam, the Texas Eastern Compressor Station, the North Fork of Dunkard Fork, gas transmission lines and various surface structures. The 4I Panel is the closest mined panel to the Ryerson Station Dam. It was divided into two smaller panels: the 4I East and 4I West Panels. By splitting the 4I Panel, additional support was provided for the dam and also some high pressure gas lines owned by Texas Eastern. The 4I East Panel began on June 15, 2005, and finished on August 1, 2005, while the 4I West Panel began on August 9, 2005, and finished on November 16, 2005. Increases in the leakage from the dam began in April 2005, during the mining of the 3I Panel, but the more pronounced leakage and cracks in the dam occurred in July 2005 when mining was occurring in the 4I Panel.

The following table contains depths of cover ranges for the four closest longwall panels to the Ryerson Station Dam.

Bailey Mine Panels: Depth of Cover		
Panel	Low	High
3I	350 feet	750 feet
4I	335 feet	715 feet
5I	320 feet	720 feet
7I	345 feet	845 feet

See Exhibit 3 for the location of the mined longwall panels, dates of mining, and various surface structures and features

PART II

SECTION D – OBSERVATIONS AND EVENTS AT RYERSON STATION DAM

This section discusses the observations and events occurring at Ryerson Station Dam and Duke Lake from the spring of 2005 until the fall of 2006, including increased seepage, cracking and spalling of the dam, shifting of sections of the dam, heaving of Bristoria Road, and movements of the dam documented by DCNR's contractor, Gannett Fleming. The photographs and charts used in this section came from the DEP, DCNR, Gannett Fleming's Report Volume I-V, and CPCC's April 12, 2005 video.

Increased Seepage through Wall Drains

DCNR reported increased amount of seepage from a wall drain on the left (west) side of the dam in April of 2005. From June through July of 2005, DCNR reported that the seepage through a drain on the other side of the dam, the right (east) side, increased from approximately 20 gallons per minute (gpm) to 80 gpm. Please refer to Appendices 2 and 3, timelines from the Gannett Fleming Volume I Report.

Increased Seepage of Right (East) Side of Dam as Reported in Gannett Fleming Timelines:

June 15, 2005	20 gpm
July 13, 2005	35 gpm
July 18, 2005	45 gpm
July 26, 2005	60 gpm
July 28, 2005	80 gpm



Photo II-10 : DEP photograph showing the location of the drain being referenced in this section.



Photo II-11 : DEP photograph, taken July 20, 2005, shows seepage from wall drain on the right (east) side of the dam.

Increased Seepage on the Left (West) Side Near the Base of Ryerson Station Dam

On April 12, 2005, according to the timelines found in the Gannett Fleming Report (See Appendix 2), DCNR first reported increased seepage and water near the base of the left (west) side of the dam. In Photo II-12, taken by DEP on April 18, 2005, it is apparent that there is seepage in this area.



Photo II-12 : DEP photograph, taken April 18, 2005, shows the seepage in this area.

Opening of Structural Crack on the Right (East) Side of Ryerson Station Dam

On July 13, 2005, DCNR reported that the vertical structural crack on the right (east) side of the dam opened up. Photo II-13 is from the CPCC video taken April 12, 2005. While the crack does appear to have reopened at this point, it is evident that the damage is more severe in Photo II-14 taken by the DEP on July 30, 2005.



Photo II-13 : CPCC video, taken April 12, 2005.



Photo II-14 : DEP photograph, taken July 30, 2005, shows the damage to this area has become more severe.

Movement and Damage to the Left (West) Side of Ryerson Station Dam

Although the first report of this damage was in the 2004 Annual Inspection Report, DCNR reported that this crack got “much wider” on July 13, 2005 according to the timelines found in the Gannett Fleming Report (See Appendix 1). The photographs below show cracking near the spillway wall and cracking of the second horizontal joint from the crest of the dam. Photo II-15 and II-16, from the April 12, 2005 CPCC video, shows the damage to this area was minimal. Photo II-17, taken by DEP on April 18, 2005 shows the damage was still minimal at this time. Photo II-18 through II-20, taken by DEP on August 11 and 12, 2005, shows the damage was much greater at these times.

According to the Gannett Fleming Report, between August 2005 and November 2006, the left (west) non-overflow section of the dam experienced vertical movement. The left side of the left (west) non-overflow section raised vertically 0.3 inches transitioning to the 1.2 inches at the right (east) end of the section at the spillway.



Photo II-15 and II-16 : CPCC video, taken April 12, 2005, shows little to no damage in this area at this time.



Photo II-17 : DEP photograph, taken April 18, 2005, shows minimal cracking in this area



Photo II-18 : DEP photograph, taken August 11, 2005, shows the cracking in this area has become more severe.



Photo II-19 : DEP photograph, taken August 11, 2005, shows separation of the second horizontal joint from the crest of the dam.



Photo II-20 : DEP photograph, taken August 12, 2005, shows separation of the second horizontal joint from the crest of the dam.

Increased Seepage on the Right (East) Side Causing Soft/Wet Areas in Ground Surface

The photographs below were taken from Bristoria Road facing the spillway. Photo II-21 was taken from the April 12, 2005 CPCC video and shows minimal water, if any, collecting near the base of the dam. Photo II-22 and II-23 were taken by DEP on July 20, 2005, prior to the breaching of the dam, and shows a large amount of water pooling in the area near the base of the dam.

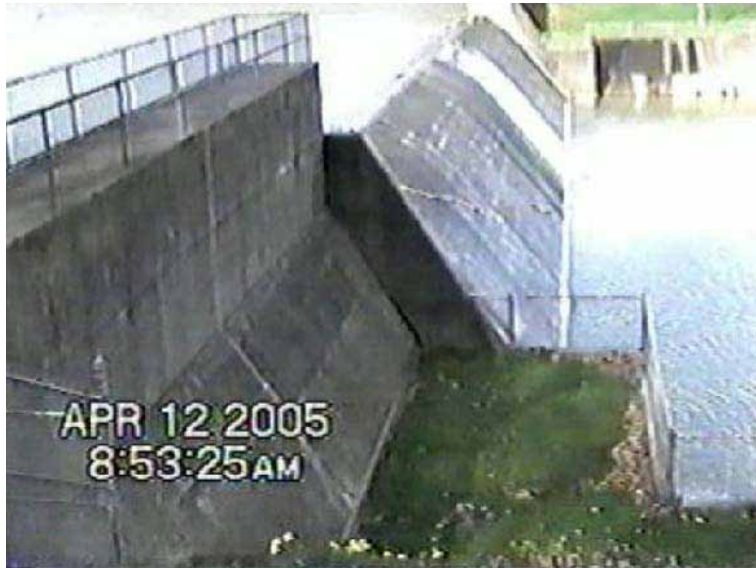


Photo II-21 : CPCC video, taken April 12, 2005, showing little to no water accumulation at base of the dam



Photo II-22 and II-23 : DEP photograph, taken July 20, 2005, shows a large amount of water pooling in the area near the base of the dam.

Increased Seepage on the Right (East) Side of Ryerson Station Dam from Drain

Below are photographs of the 12 inch drain located near the base of the dam on the right (east) side of the dam (See Photo II-24). In Photo II-25, taken from the April 12, 2005 CPCC video, there is little to no drainage coming from the drain or the immediate area around the drain. Photo II-26 is a photograph taken by DEP on July 20, 2005, prior to the breaching of the dam. In this photograph it is apparent that the seepage from this drain has increased.



Photo II-24 : Photograph showing the location of the drain referenced above.



Photo II-25 : CPCC video, taken April 12, 2005, shows there is little to no drainage coming from the drain or the area around the drain.



Photo II-26 : DEP photograph, taken July 20, 2005, shows the seepage in this area has increased.

Shifting and Separation of Construction Joints in the Right (East) Side of Ryerson Station Dam

The photographs below show the first joint down from the crest of the dam on the right (east) side of the dam. In Photo II-27, from the CPCC video taken April 12, 2005, the vertical and horizontal joints line up. In Photo II-28, taken by the DEP on July 30, 2005, it is apparent that the vertical joints no longer line up in this area. Photo II-29, taken on July 30, 2005, is a close-up of a separation between the horizontal joints. Photo II-30, taken August 12, 2005, is another close-up of the separation of the construction joints.



Photo II-27 : CPCC video, taken April 12, 2005, shows the vertical and horizontal joints line up.



Photo II-28 : DEP photograph, taken July 30, 2005, shows the vertical and horizontal joints no longer line up in this area.



Photo II-29 : DEP photograph, taken August 12, 2005, shows a separation in the horizontal construction joint on the right (east) side of the dam.



Photo II-30 : DEP photograph, taken August 12, 2005, shows a separation in the horizontal construction joint on the right (east) side of the dam.

Buckling of Bristoria Road Adjacent to Ryerson Station Dam

On July 28, 2005, the Ryerson Station State Park Ranger reported buckling of Bristoria Road where the right (east) side of the dam extends under the road (please refer to Figure II-2). Photo II-31, from the April 12, 2005 CPCC video, shows little to no disturbance to the road in this area. The vertical distance between the road surface and the bottom of the guardrail is more or less uniform. Photo II-32 through II-35 show the buckling of Bristoria Road. Note the distance from the road to the bottom of the guardrail is much less in this area at this time.

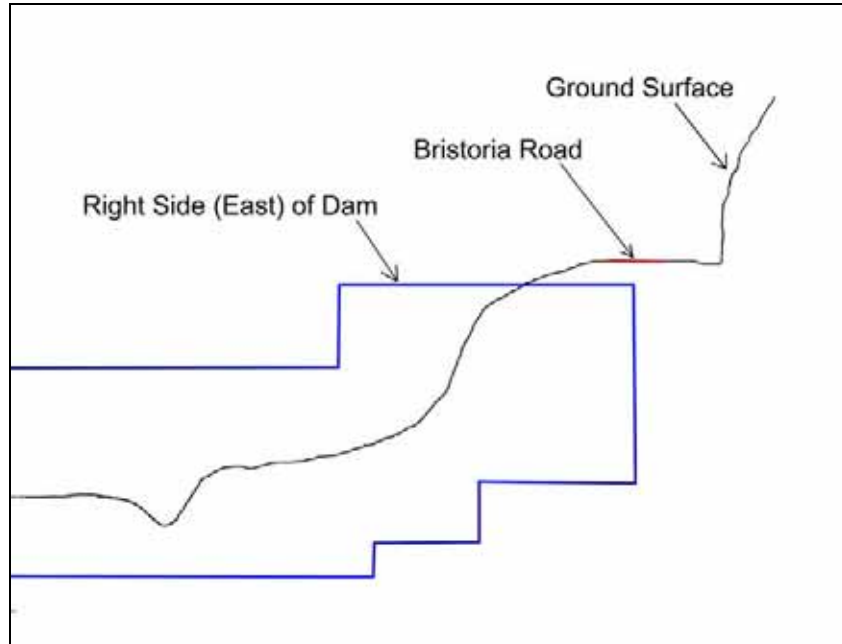


Figure II-2 : This figure depicts the location of Bristoria Road in relation to the right (east) side of Ryerson Station Dam which extends approximately to the centerline of Bristoria Road.

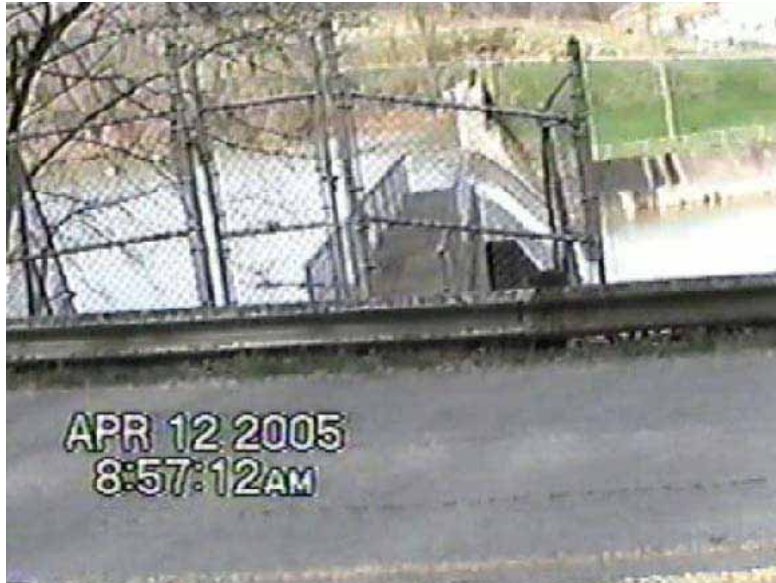


Photo II-31 : CPCC video, taken April 12, 2005, shows little to no disturbance to the Bristoria Road in this area.



Photos II-32 : DEP photograph, taken August 1, 2005, shows the buckling of Bristoria Road. Note the distance from the road to the bottom of the guard rail is much less in this area.



Photo II-33 : DEP photograph, taken July 30, 2005, shows another view of the buckling of Bristoria Road.



Photo II-34 : DEP photograph, taken August 11, 2005, shows the heaving of Bristoria Road.



Photo II-35 : DEP photograph, taken August 16, 2005, shows the heaving of Bristoria Road.

Cracks and Spalling on Right (East) Side of Ryerson Station Dam

The photographs below are of a crack and spalled area on the downstream side of the right abutment near the spillway. Photo II-36 is from the CPCC video taken April 12, 2005. It shows that there was little to no cracking in this area at the time of the video. Photo II-37 was taken by the DEP on August 3, 2005, prior to the breaching of the dam. This photograph shows that this portion of the dam was cracked and damaged between April 2005 and August 2005.



Photo II-36 : CPCC video taken April 12, 2005 shows little to no cracking in this area at the time of the video.



Photo II-37 : DEP photograph taken August 3, 2005 shows the damage in this area has become much more severe.

Horizontal and Vertical Movement of the Right (East) Side of Ryerson Station Dam

According to the Gannett Fleming Report, between August 2005 and November 2006, the non-overflow section to the right (east) side of the spillway experienced vertical and horizontal movements. The end of the dam closest to Bristoria Road moved up 1.2 inches transitioning to a vertical lift of 1.7 inches at the end of the non-overflow section adjacent to the spillway. During the same time period, the right (east) non-overflow section moved to the left (west) approximately 2 inches. Please refer to Figure II-3 and Figure II-4. These figures are from the Gannett Fleming Report – Volume II. Photo 2 and 3 depict damage as a result of the movement of the right non-overflow section of the dam.

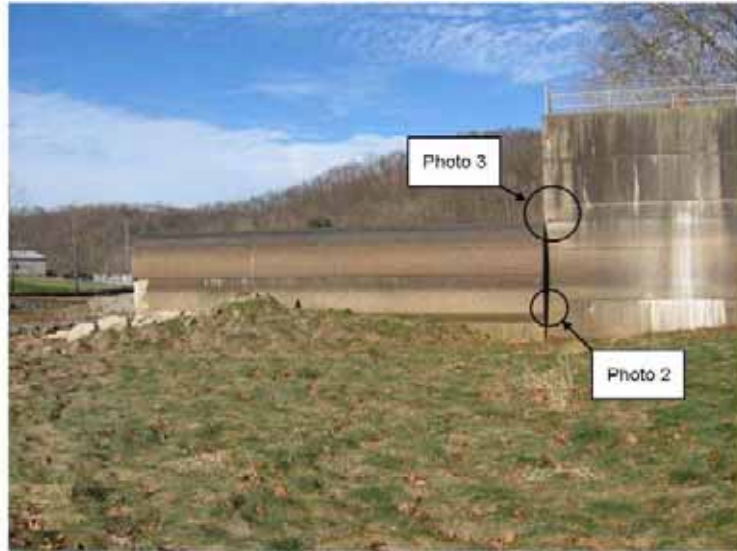


Photo 1. Upstream Face of Dam Near Right End (Photo December 2006)



Photo 2. Open Joint between Right Non-Overflow and Spillway (Photo December 2006)

Figure II-3 : From Gannett Fleming – Volume II



Photo 3. Sheared Concrete where Right Non-Overflow meets Spillway (Photo December 2006)

Figure II-4 : From Gannett Fleming – Volume II

PART II
SECTION E – BITUMINOUS MINE SUBSIDENCE AND LAND
CONSERVATION ACT CLAIM AND DCNR/CPCC LAWSUIT

On January 5, 2007, DCNR filed a Writ of Summons against CPCC in the Allegheny County Court of Common Pleas. Filing of a complaint was postponed to allow DCNR and CPCC an opportunity to work out a settlement. Unable to reach a settlement, DCNR filed a complaint against CPCC with the Court on January 31, 2008, alleging that the damage to the Ryerson Station Dam was caused by CPCC's mining operations. DCNR alleged, among other things, negligence, breach of contract (CPCC and DCNR had entered into a pre-mining agreement), misrepresentation and deceit, strict liability, nuisance, as well as claims under the Bituminous Mine Subsidence and Land Conservation Act (BMSLCA). CPCC filed preliminary objections on October 2, 2008. The Court granted CPCC's preliminary objections, and directed DCNR to file a claim with DEP pursuant to the Bituminous Mine Subsidence and Land Conservation Act ("BMSLCA" or "Mine Subsidence Act"). Common Pleas proceedings were stayed until the DEP claim was resolved

By letter dated November 3, 2008, to the Secretary of the Department of Environmental Protection, the Honorable John Hanger, DCNR filed its claim. It asked DEP to issue an order to CPCC requiring them to pay DCNR for damage to the dam and the "integral natural resources." By cover memo dated November 21, 2008, Secretary Hanger sent the claim to Scott Roberts, Deputy Secretary for the Office of Mineral Resource Management and Edward Motycki, Chief, Mine Subsidence Section in the California District Mining Office, directing them to fully investigate the claim under the BMSLCA. A claim was opened on November 25, 2008, and was assigned claim number SA1736.

PART II

SECTION F – DEP’S CLAIM REVIEW PROCESS

Investigation Team Assembly

Edward J. Motycki, P.E., Mining Engineering Manager, California District Office
Gregory Prentice, Compliance Manager, California District Office
Stacey Malarkey, Subsidence Investigator, California District Office
Joseph Floris, Structure Repair Specialist, California District Office
Matthew B. Cavanaugh, Mining Specialist, California District Office
Gregory Shuler, P.G., Geologist, Bureau of Mining and Reclamation
Joseph Schultz, P.E., Civil Engineer Consultant, Division of Dam Safety
William Franz, P.E., P.G., Civil Engineer Consultant, Division of Dam Safety

In June 2009, William Franz dropped off the team due to his departure from DEP.

Site Investigations

From April 2005 until December 2009, the DEP’s Investigation Team conducted numerous site visits to the Ryerson Station Dam and surrounding areas.

Internal Document Collection

November 3, 2008

DCNR filed a damage claim for Ryerson Station Dam and Duke Lake pursuant to the Mine Subsidence Act. The claim was directed to DEP’s Secretary John Hanger.

November 21, 2008

California District Mining Office received notice of the claim from DEP Secretary John Hanger and instructions to fully investigate the claim.

December 3, 2008

DEP received a letter from CPCC regarding the procedural history of the claim stating Consol Energy Inc. is not the proper party to this administrative proceedings and that there is nothing unique about DCNR’s Subsidence Act claim.

December 16, 2008

DEP received a letter from DCNR in response to the issues raised in the December 3, 2008 letter from CPCC. This letter addressed concerns DCNR had about dismissing Consol Energy Inc. from the claim. DCNR said they would provide analyses performed by geologic and mining experts to support the claim of damage.

December 19, 2008

DEP sent letters to CPCC and DCNR stating the DEP received the claim of subsidence damage and has developed an investigation plan. The DEP requested that CPCC and DCNR send any additional information in their possession that may be relevant to this claim to DEP. Such relevant information could include but not be limited to analyses, reports, surveys, monitoring data, etc. DEP requested this information be returned within thirty days of the receipt of the letter. The investigation plan was attached to this letter.

January 20, 2009

DEP received the initial submission from DCNR in response to the December 19, 2008 letter. This submission included hard copies and electronic copies of the expert reports from Bruce Hebblewhite, PhD, The Mine Subsidence Engineering Consultants, and Richard E. Gray, PG. Also included were seven discs with electronic copies of the following information: DCNR's application to Secretary Hanger, DCNR's letters to DEP regarding this claim, the Gannett Fleming Report Volumes I-V, park maps, mining maps, park documents, inspection reports, timelines, photographs, GeoTDR for DEP sponsored study titled "Effects of Underground Mining Interstate 70", a report titled "Final Report on Response to Apparent Ground Movement at Duke Energy's Holbrook Compressor Station", scientific articles, documents provided to DCNR from CPCC, and videos of Ryerson Park taken by CPCC on April 12, 2005 and May 5, 2005.

January 21, 2009

DEP received a technical response from CPCC that discussed background information, basic subsidence principles, ground movement predictions calculated from Surface Deformation Prediction System (SDPS), CPCC's response to DCNR's theory of "unconventional" subsidence, and CPCC's initial comments on the Gannett Fleming Report. Additional supporting documents were also submitted with the technical response which included photographs, maps, drilling logs, monitoring data, geologic information, and timelines. CPCC also included a report from GAI Consultants, Inc. that analyzed survey data collected at the Bailey Mine Longwall Panels 5I and 7I.

April 9, 2009

DEP received a supplemental submission from DNCR. This supplemental submission included the Gannett Fleming's Final Data Report, which included all the data collected after its March 2007 report and a copy of a paper published in Geo-Strata magazine on the I-70 subsidence monitoring.

Information Requested and Provided by DCNR and CPCC

May 29, 2009

DEP sent a letter to DCNR stating that the review of the various reports and documents submitted by DCNR was completed. As a result of this review, the DEP's Investigation Team developed a number of questions and requested answers to these questions within thirty days.

June 2, 2009

DEP sent a letter to CPCC stating that a review of the various reports and documents submitted by CPCC was completed. As a result of this review, the DEP's Investigation Team developed a number of questions and requested answers to these questions within thirty days.

July 2, 2009

DEP received a response from DCNR to the questions asked in the May 29, 2009 letter. In this letter, DCNR answered the questions and included a copy of the Gannett Fleming June 2009 Monitoring Data Report.

July 2, 2009

DEP sent a letter to CPCC granting a request to extend the deadline for submitting answers to the questions asked in DEP's June 2, 2009 letter. CPCC was granted an extension until August 3, 2009.

August 4, 2009

DEP received a response from CPCC to the questions asked in the June 2, 2009 letter. In this letter, CPCC answered the questions and requested a meeting with DEP's Investigation Team to clarify their answers to the questions.

Individual Meetings with Both Parties

September 25, 2009

DEP's Investigation Team met with representatives from CPCC. The meeting was held in DEP's California District Office.

October 13, 2009

DEP received electronic copies of information requested during the September 25, 2009 meeting with CPCC.

October 29, 2009

DEP's Investigation Team met with representatives from DCNR. The meeting was held in the Eberly Hall of California University of Pennsylvania.

October 29, 2009

DCNR provided a letter to DEP regarding the legal standards that govern how evidence in this claim should be considered.

November 12, 2009

DEP sent a letter to DCNR and CPCC stating the final investigation report will be completed in January 2010.

November 16, 2009

DEP received a letter from DCNR regarding the discussion that took place in the October 29, 2009 meeting. In this letter DCNR stated they had concerns over the procedures that DEP appeared to be following in determining the outcome of this claim.

December 3, 2009

DEP received a letter from DCNR addressing inquiries regarding the boring logs/geologic information and the concrete structure noted in the Underwater Consultants report.

Information Requested from Other Sources

As part of the background research for this review, DEP contacted other state and federal agencies, universities, and private industry professionals that deal with underground mining (longwall and room and pillar operations), surface mining, and non-coal mining, and asked if they had ever encountered or investigated a scenario that would be comparable to the circumstances that have occurred at the Ryerson Station Park.

A few replies from private industry professionals declared that they had not encountered any similar situations. The dearth of responses suggests that the recipients were unaware of any situations that would be comparable to the circumstances that occurred at Ryerson Station Park.

Summary of CPCC's Position

It is CPCC's position in this matter that their mining operations could not have caused the damage to the Ryerson Station Dam. CPCC's investigation has concentrated on the dam and its mining operations. It did not adequately address the observations by DEP of phenomena in the surrounding areas. To support its position, CPCC relies heavily on the results of the SDPS Model which predicts, among other things, vertical and horizontal movements over and adjacent to mined longwall panels. CPCC conducted field surveys (transverse and longitudinal) in the 5I and 7I Panels and compared the field measured results with the SDPS predicted results. The measured results compared reasonably well with the predicted results.

CPCC also notes that subsidence or other movements have not been observed by either CPCC or their experts at the distances involved.

Monitoring data prior to the draining of the lake is limited. CPCC set up survey monuments around the Texas Eastern compressor station prior to mining in the "I" panels. The initial survey measurements were taken in 1997. Subsequent measurements taken before, during, and after mining of the 4I Panel did not show movement. Since the monitored area is relatively close to the dam, CPCC concludes that the dam should not have moved either. They point to this as strong evidence that CPCC's mining activities did not cause damage to the Ryerson Station Dam.

CPCC also points to the fact that the DEP approved its permit revision application (No. 71) to support its contention that mining in the Bailey Mine could not have induced movements at the dam.

Summary of DCNR's Position

It is DCNR's position that the damage to the Ryerson Station Dam, as well as various other events observed in the area (buckled pipelines, bumps in the road, stream heaving, etc.), are the result of CPCC's longwall mining activities. DCNR hired Gannett Fleming to monitor the dam and other features and to evaluate two possible non-mining causes for the shifting of the dam.

The first possible cause was that structural loading on the dam caused the damage and movement. Loading conditions analyzed included normal pool with ice loading, record flood pool, and record seismic loading. Gannett Fleming concluded that none of these conditions could have caused the observed movement and damage at the dam. The other potential cause of the damage that Gannett Fleming investigated was instability in the steep hillside adjacent to the right abutment of the dam. Gannett Fleming concluded that the hillside was stable and did not affect the dam's competence.

One of the experts hired by DCNR was Dr. Bruce Hebblewhite from New South Wales, Australia. Dr. Hebblewhite has performed research into the cause of what he refers to as "far-field movements" attributable to longwall mining in New South Wales. In general, Dr. Hebblewhite claims that when longwall mining takes place in areas with steep hills, horizontal stress develops. This horizontal stress can cause valley closure at significant distances from the mined panels. Since the topographic setting at Ryerson Station Dam contains high steep hills, Dr. Hebblewhite concludes that the valley closure phenomenon he observed in New South Wales must have existed at Ryerson Station Dam. Dr. Hebblewhite also concludes that the damage to the dam, the heaving and bulging of roads, streambeds, etc. are consistent with the compressive forces from valley closures. DCNR accepts Dr. Hebblewhite's theories as applicable to the Ryerson Station Dam.

Another consultant hired by DCNR was Richard E. Gray of DiGioia, Gray & Associates, LLC. Mr. Gray submitted a report to DCNR titled, "Damage of Ryerson Station State Park Dam" dated January, 2009. Mr. Gray's report evaluated the cause of the movements which resulted in the sudden dam leakage in July 2005. Mr. Gray relied on the data in the Gannett Fleming Report in his evaluation, as well as the observations of DEP, ground movements monitored during the undermining of Route 70 in Washington County in 1999 and 2000, and observations in Australia by Dr. Hebblewhite and others. Mr. Gray states that it is his... "opinion within a reasonable degree of scientific certainty that mining increased the risk of and is the cause of the sudden increase in leakage of the Ryerson Station State Park Dam in July 2005."

DCNR engaged Mine Subsidence Engineering Consultants from New South Wales, Australia to review the observed impacts and movements at the Ryerson Station Dam and surrounding infrastructure, and to comment on these observations in relation to observed

impacts and movements that have occurred at a distance from the mined longwall panels of the Bailey Mine. Mine Subsidence Engineering Consultants reviewed the observations and monitoring data from the Ryerson Station Dam and vicinity and compared them to their observations in the southern and western coalfields of New South Wales, where documented movements occurred at considerable distances from mined longwall panels. Mine Subsidence Engineering Consultants concluded that movements and damage to the Ryerson Station Dam were caused by valley bulging coupled with high horizontal strains and closure of the valley sides, which are all attributable to mining.

DCNR relied upon the opinions of the various consultants to support its position that CPCC's mining caused the damage to Ryerson Station Dam.

PART III

CONCLUSIONS

The conclusion of the DEP's Investigation Team is that longwall mining conducted by CPCC at the Bailey Mine resulted in ground movements that damaged the Ryerson Station Dam in the spring and summer of 2005. Specific conclusions are:

1. The dam was competent and serviceable throughout its 45 year lifetime, requiring only typical repairs and maintenance prior to 2005, and was competent and serviceable in early 2005.
2. The Ryerson Station Dam experienced significant movement and damage beginning in the spring and into the summer of 2005.
3. Even after the dam was breached, movements at the dam were detected into 2006.
4. The timing of the movement and damage at the dam coincides with CPCC's mining at the Bailey Mine in Panels 3I – 7I.
5. Previous documented incidents show that longwall mining has the potential to cause mining induced movements and damage at distances beyond the areas where customary subsidence theory would predict such impacts.
6. Many phenomena that are consistent with mining induced ground movement, such as road heaving, pipeline buckling, and structure movements were observed in the vicinity of the dam, but outside of the area predicted by customary subsidence theory.
7. Empirical evidence suggests where ground movements have been observed beyond the area predicted by customary mine subsidence theory, the mining typically occurred below hilltops or ridges and the ground movements were manifested in stream valleys.
8. The Ryerson Station Dam is a massive concrete structure, which is anchored into bedrock. Only powerful earth forces could cause the movement and damage observed in 2005 and 2006.
9. The Ryerson Station Dam is a large rigid structure that acts like a strut across the valley. Unlike homes and other structures which are typical subjects of mine subsidence investigations, it cannot deflect and deform, and remain functional and structurally sound, because of its composition, location, and orientation.
10. The SDPS mine subsidence model is based upon customary subsidence theory. The model cannot predict remote horizontal movements, and does not take topography into account to a significant degree.

11. No other cause for the movement and damage experienced by the Ryerson Station Dam in the spring and summer of 2005 exists; dam instability and hillside instability have been excluded as potential causes.
12. Longwall mining in the 3I and 4I panels resulted in ground movements which damaged the Ryerson Station Dam.

See PART IV, DISCUSSION, for details regarding the above conclusions.

Part IV

SECTION A - BACKGROUND

The Ryerson Station Dam is a 515 foot long concrete gravity dam completed in 1960. The dam was competent and serviceable throughout its 45 year lifetime, requiring only typical repairs and maintenance until 2005. It was competent and serviceable in early 2005. However, beginning in mid-April of 2005, DCNR staff began noticing problems with the dam. On April 12, 2005, DCNR noticed increased seepage of water on the left or west side of the dam, including seepage through a construction joint located just above the ground surface. Initially DCNR decided to monitor the situation and develop a plan to collect the seepage, including a drawdown of the lake after Labor Day.

At this time CPCC was conducting longwall mining in the 3I panel of the Bailey Mine. This panel had just completed mining in an area north of Ryerson Station Dam, mining from the east to the west, and by April 12, 2005 mining was more than 6000 feet to the west of the dam. Since the closest the 3I panel came to the dam was more than 2,100 feet to the north and the active longwall face was mining further away from the dam, underground mining was quickly ruled out as a cause of damage. See Exhibits 1, 2, and 3 for location and progress of the 3I Panel with respect to the Ryerson Station Dam.

From June 15, 2005 through July 28, 2005, DCNR noted increases in seepage on the right side of the dam. Seepage increased from 20 gpm to 80 gpm; the most significant increases occurred during the second half of July. Also during this time period, the dam sustained significant structural damage. Beginning July 28, 2005, the water in the lake was drained, and shortly thereafter, a decision was made to remove a 100 foot section of the dam to prevent water from impounding in the reservoir. Work to remove this 100 foot section began on August 11, 2005, and was essentially completed by August 24, 2005. The dam was breached to protect the public downstream.

Longwall mining in the 3I Panel was completed on June 6, 2006 at its western end, and mining equipment was moved to set up the next panel to be mined, the 4I Panel. The 4I Panel was completed in two sections. The first section was located to the northeast of the dam and is referred to as the 4I East Panel. Longwall mining in this panel began on June 13, 2005. Longwall mining progressed in a westerly direction, and was completed on August 1, 2005. The second section was located northwest of the dam and is referred to as the 4I West Panel. The 4I West Panel longwall mining began on August 9, 2005 and was completed on November 17, 2005. See Exhibits 1, 2, and 3 for locations and progress of the 4I Panels.

While the 4I Panels were closer to the Ryerson Station Dam than the previous 3I Panel, DEP staff, applying customary subsidence theory, initially believed that CPCC's mining was too far away from the dam to cause the movement and damage observed. The closest corner of the 4I East Panel was approximately 890 feet from the nearest edge of the right side of the dam. In mine subsidence engineering, the term "angle of draw" is used to represent an angle, measured from the vertical at the edge of a longwall panel to a point on the surface where the subsidence is considered to be zero. DEP typically uses

15 to 25 degree angles of draw to evaluate support areas for structures that require protection from mine subsidence. In the case of the Ryerson Station Dam, for mine subsidence to have extended from the closest point of the 4I East Panel to the dam, an angle of approximately 66 degrees would have been required. In addition, a thorough examination of the steep hillside on the right side of the dam revealed no signs of ground movements or hillside slippage which would be expected if mine subsidence from the 4I Panel extended this considerable distance to the dam. For these reasons, at that time DEP could not connect the movements at the dam with CPCC's longwall mining operations.

Upon completion of the 4I West Panel, the 5I Panel to the west of the dam was mined between November 23, 2005 and March 28, 2006. The next panel mined was the 7I Panel, which was located south and southwest of Duke Lake. The 7I panel operated from late April 2006 to November 30, 2006. Locations and progress of these panels are also shown on Exhibits 1, 2, and 3. In addition, further details regarding events and observations during the above period can be found in Appendices 2 and 3.

PART IV

SECTION B – DCNR/GANNETT FLEMING MONITORING

DCNR contracted with Gannett Fleming to conduct a monitoring program at the dam and surrounding areas beginning in August 2005. This program consisted of inspections, installation of crack gauges, physical surveys to monitor vertical and horizontal surface movements of select points of interest, borings into the dam, installation of inclinometers and extensometers, and periodic monitoring and documentation.

Gannett Fleming's findings are summarized in the report titled "Ryerson Station State Park Dam, Greene County, Pennsylvania, Volume II, Survey and Instrumentation Monitoring Results, March 2007," and the supplemental report titled "Ryerson Station State Park Dam, Greene County, Pennsylvania, 2007 and 2008 Survey and Instrumentation Monitoring Results, February 2009."

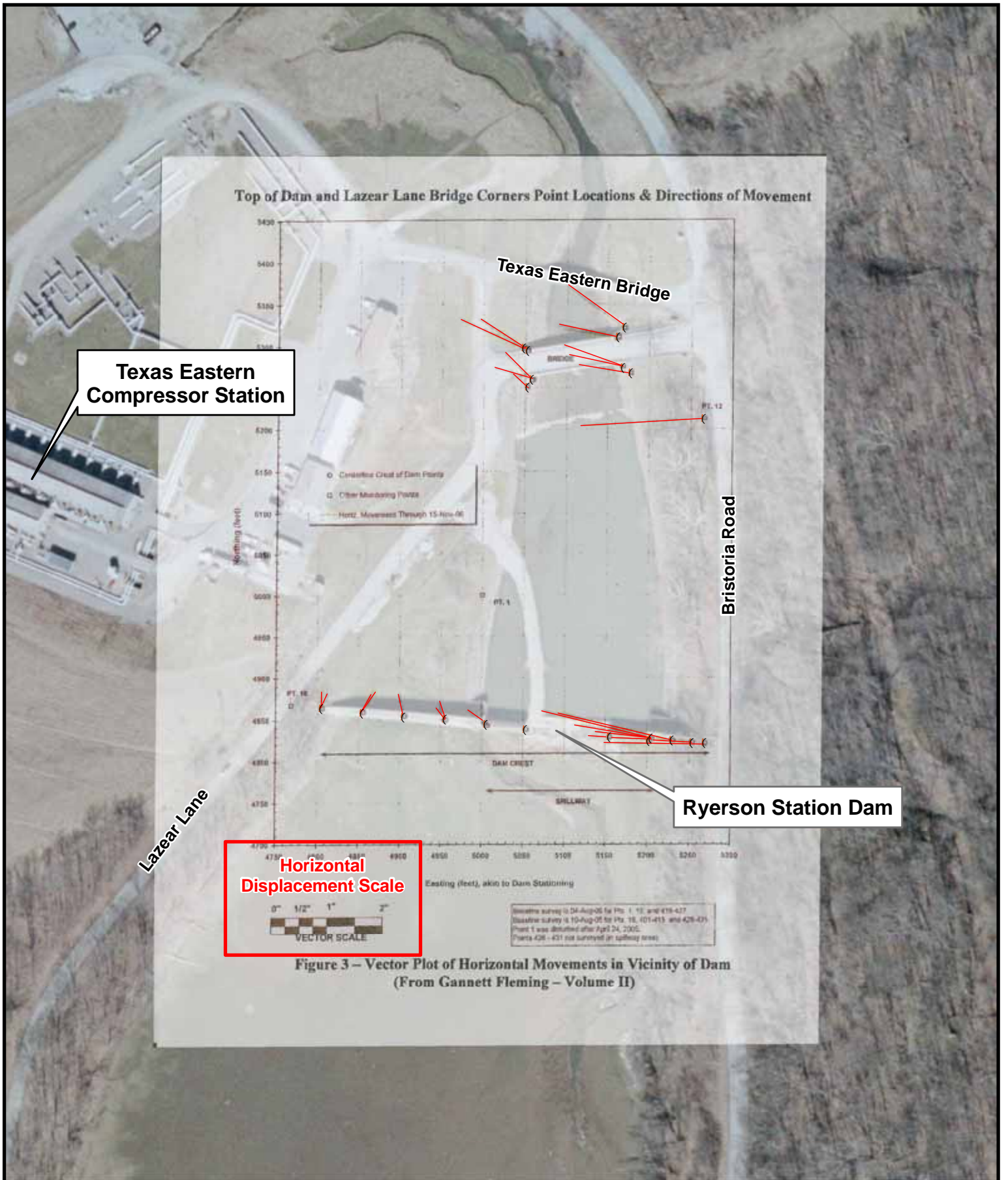
Because movements and structural damage began occurring months before Gannett Fleming's monitoring program was initiated in August 2005, movements occurring before August 2005 were not documented or recorded. These pre-monitoring movements are likely to have been the most extensive and damaging movements the dam experienced, based upon visual inspections. These inspections and observations by DEP staff indicated that the right (east) side of the dam had shifted to the west, and there were also indications of uplifting of sections of the dam.

Gannett Fleming's monitoring of the dam showed that from August 2005 through November 2006, the right or east end of the dam moved vertically upward by approximately 1.5 inches, and moved horizontally to the left by approximately 2 inches. They also concluded that the non-overflow crest of the left side of the dam moved up on the right end approximately 1.2 inches. Gannett Fleming stated that the measured movements generally occurred during two approximate time periods, August 2005 when monitoring began through September 2005, and from July through September 2006.

Figure IV-1 shows a plot of horizontal movements at the dam and the general vicinity. From this plot it can be seen that horizontal movements were also measured at the park bridge. Note the general direction of movement is to the northwest, which is away from the 4I Panel, and towards the center of the stream valley.

Gannett Fleming placed 16 crack gauges on the dam in various locations (see Figure IV-2). All the crack gauges were either placed across existing cracks or dam construction joints. The gauges are all located on either the crest or downstream face of the dam.

Crack gauges 1 and 2 are located across the vertical structural crack. Gauge 1 is located approximately one-half the distance from the ground to the crest. It indicated the crack opened approximately 1/4 inch from August until September of 2005, then was stable until opening slightly more between July and September of 2006. Gauge 2, located on the crest, indicated that the crack opened 1/4 inch from August through October 2005 and then was stable until opening another 1/8 inch between July and September of 2006.





<p>Legend</p> <p> Horizontal Displacement</p>		<p>Map Scale: 1" = 150'</p> <p>Feet</p> <p>0 75 150 300</p>
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Figure IV-1: Top of Ryerson Station Dam and Lazear Lane Bridge Corners Vector Plot of Movements Through November 15, 2006 (Gannett Fleming - Volume II) Laid Over Aerial Imagery from the PAMAP Project.

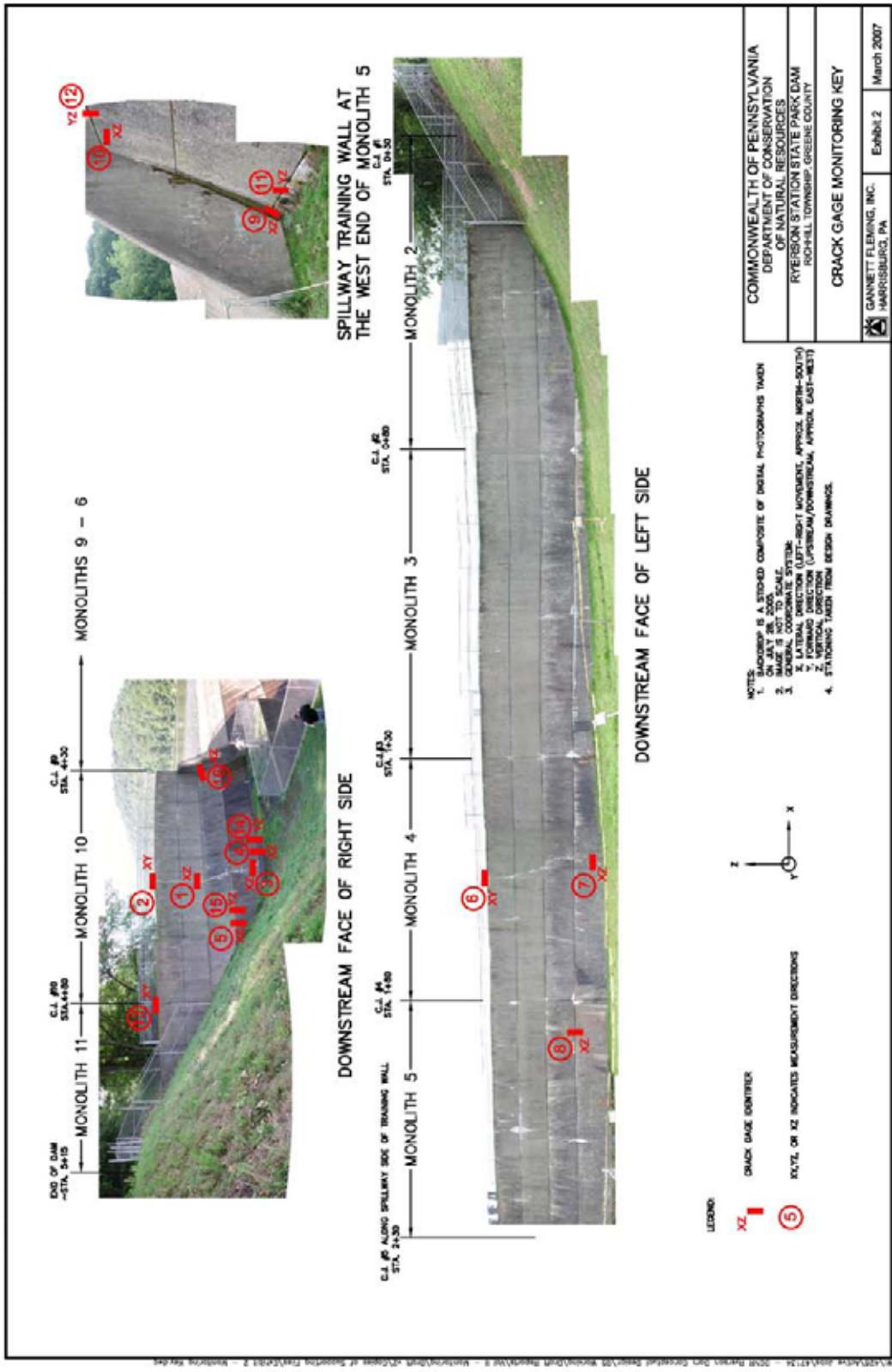


Figure IV-2: Crack Gage Locations (Gannett Fleming Volume II).

Crack gauge 4 is located across the fourth horizontal construction joint near the middle of the right non-overflow section. Gauge 4 showed the most movement of all the crack gauges installed. It indicated that the concrete above the horizontal joint moved to the left or west, approximately 1/2 inch from August through September of 2005. It was relatively stable until moving another 1-1/4 inch between July and September of 2006.

Crack gauges 10 and 12 are located near the spillway end of the left non-overflow section. They both indicated movements of approximately 1/8 inch since installed in August 2005. Crack gauge 13 is horizontally mounted across a monolith joint on the dam crest near the right end of the dam. It was relatively stable until July through September of 2006. At this time it opened approximately 1/8 inch.

In addition to monitoring the dam, Gannett Fleming also conducted land surveys along State Route 21 for vertical and horizontal movement as the 5I Panel was being mined (See Fig. IV-3). The portion of Route 21 that was monitored mostly lies to the south of the 5I Panel, with a small section of the road crossing over the southeast corner of the panel. Baseline monitoring did not begin before the 5I panel began mining on November 23, 2005. Monitoring of vertical movements began on December 1, 2005; monitoring of horizontal movements began on January 20, 2006. Figure IV-3 shows the location of the monitoring points in this area.

Since most of the Route 21 monitoring area lies outside of the customary predicted area of influence from panel 5I, movements would not be anticipated with the exception of the portion of the road near the southeast corner of the panel. Some monitoring points near this corner of the panel moved as customary subsidence theory would predict, however the majority of the monitoring points moved horizontally away from the panel, toward the North Fork of Dunkard Fork.

Horizontal movements of representative points which moved away from the panel (contrary to customary subsidence theory) are shown below:

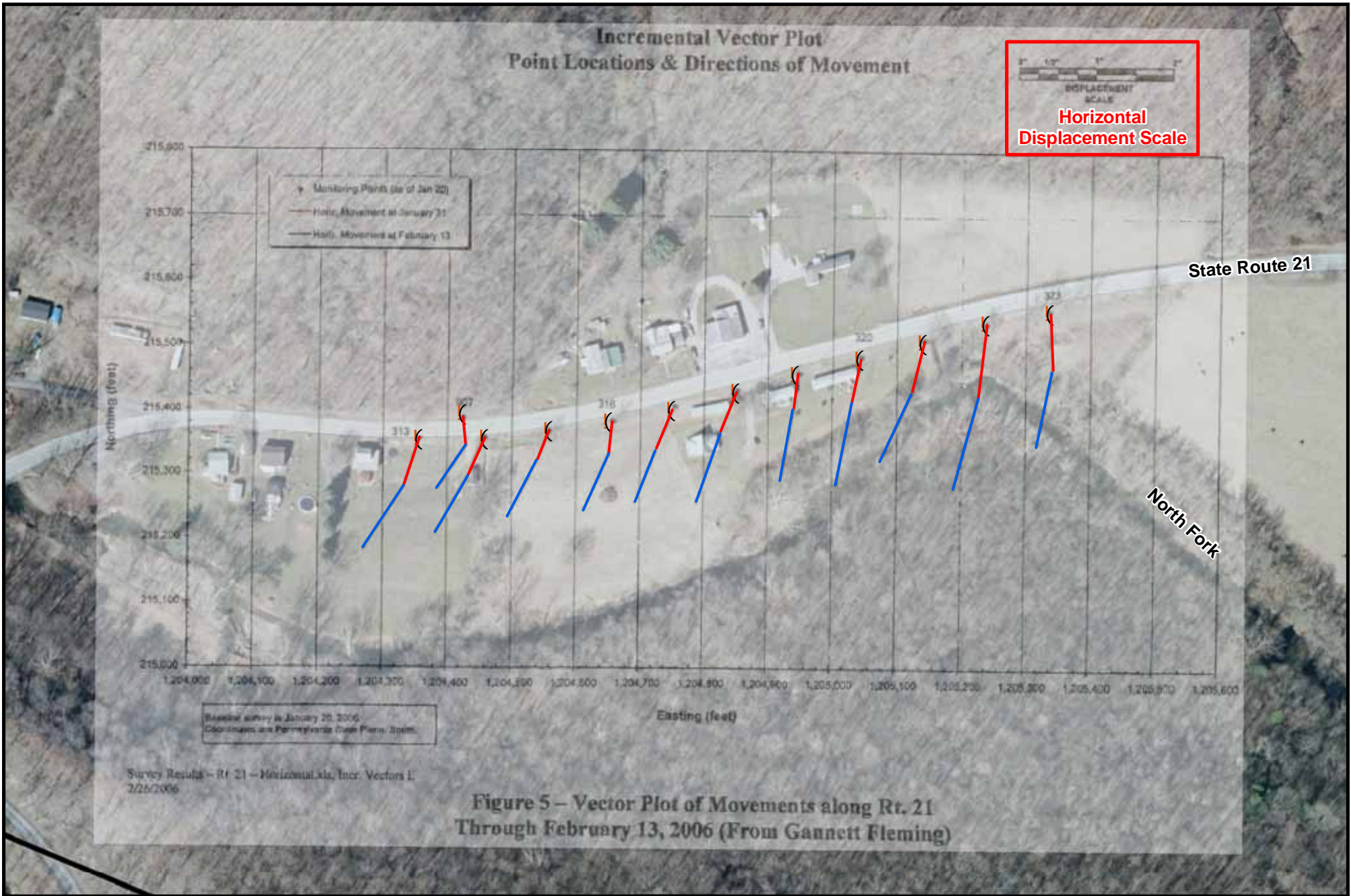
Horizontal Movements From January 20 to February 13, 2006 (from Gray, 2009)

MONITORING POINT	APPROXIMATE DISTANCE FROM PANEL 5I	HORIZONTAL MOVEMENT
323	650 feet	1.4 inches
322	700 feet	2.1 inches
320	580 feet	1.4 inches
316	1100 feet	1.2 inches
313	1250 feet	1.6 inches

Exhibits 1 and 2 show the location of representative monitoring points and their relationship to CPCC's longwall panels in the area. The vector plots of movements in Figure IV-4 show a consistent trend of horizontal movement away from the panel, and toward the stream valley, based on land movement surveys conducted on January 31 and February 13, 2006.

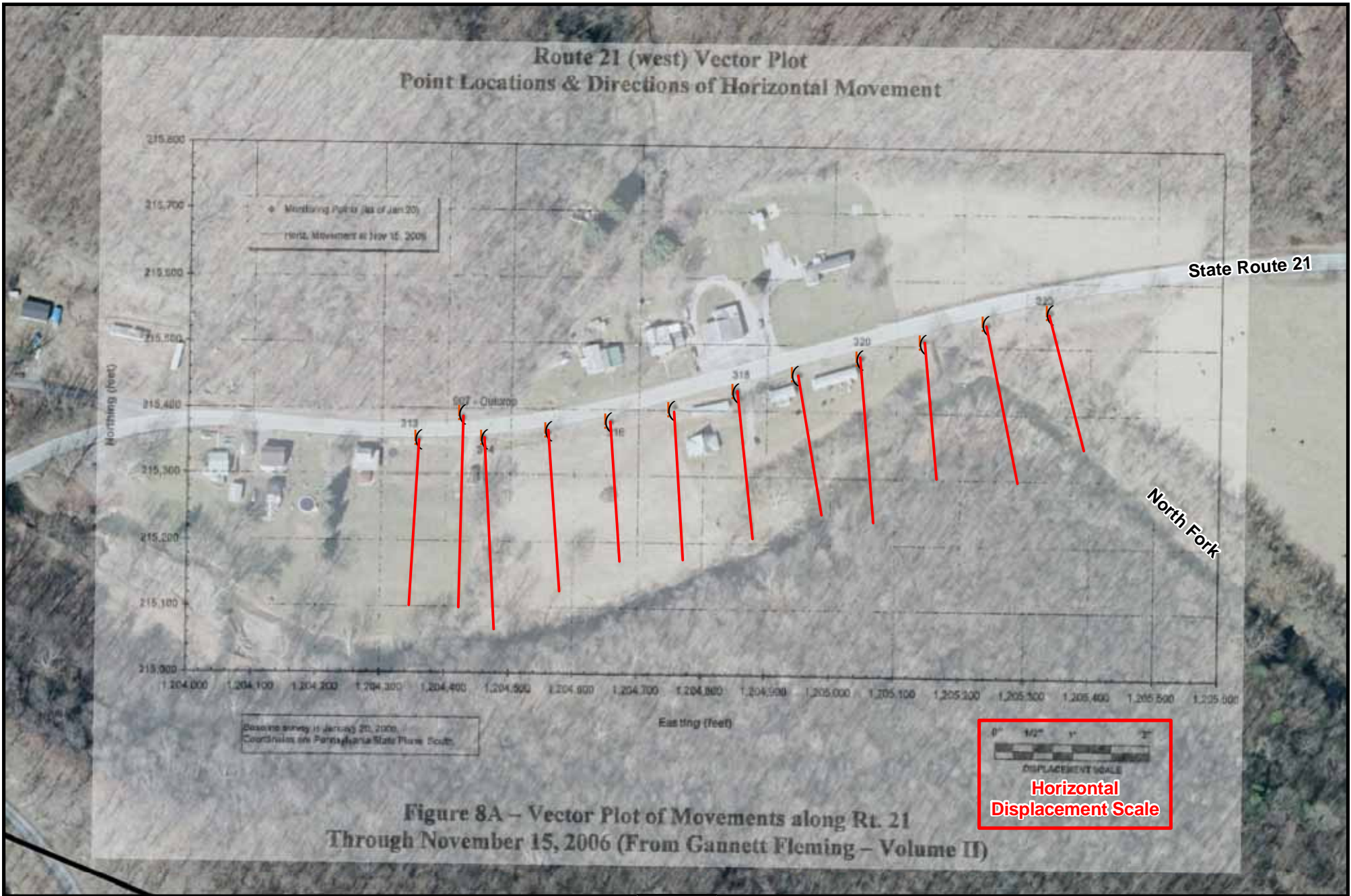
The same points shown on Figure IV-4 also experienced further movements away from Panel 5I after February 2006 and toward the stream valley as seen in the final vector plots of movement shown in Figure IV-5. These additional movements were measured on November 15, 2006, after the completion of Panel 7I which is located to the south and across the stream valley (see Exhibits 1 and 2). Figure IV-6 shows additional monitoring points along Route 21 with final vector plots of movement through November 15, 2006.

Gannett Fleming also conducted monitoring in the vicinity of the swimming pool area of Ryerson Station State Park, and other areas as the 7I panel was being longwall mined south of Duke Lake. While monitoring points above and in proximity to the panel generally moved consistent with customary subsidence theory, the monitoring points in the swimming pool area consistently experienced horizontal movement away from the panel, and toward Duke Lake – contrary to customary subsidence theory. Movement exceeded 3 inches. Some monitoring points also experienced upward movement. For example, points 918, 919, 925, and 926 moved upward approximately 1.4 inches, while point 921 moved upward approximately 2 inches. Figure IV-7 is a vector plot of the total horizontal movements in the swimming pool area. Although this data is shown through November 15, 2006, most of the movements shown and described above occurred between late May and late June of 2006.



Legend Horizontal Displacement — As of 01/31/2006 — As of 02/13/2006		Map Scale: 1" = 200' <div style="text-align: center;"> <p>0 100 200 400</p> <p>Feet</p> </div>
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Figure IV-4: Route 21 (west) Vector Plot of Movements Through February 13, 2006 (Gannett Fleming - Volume II) Laid Over Aerial Imagery from the PAMAP Project.



Legend

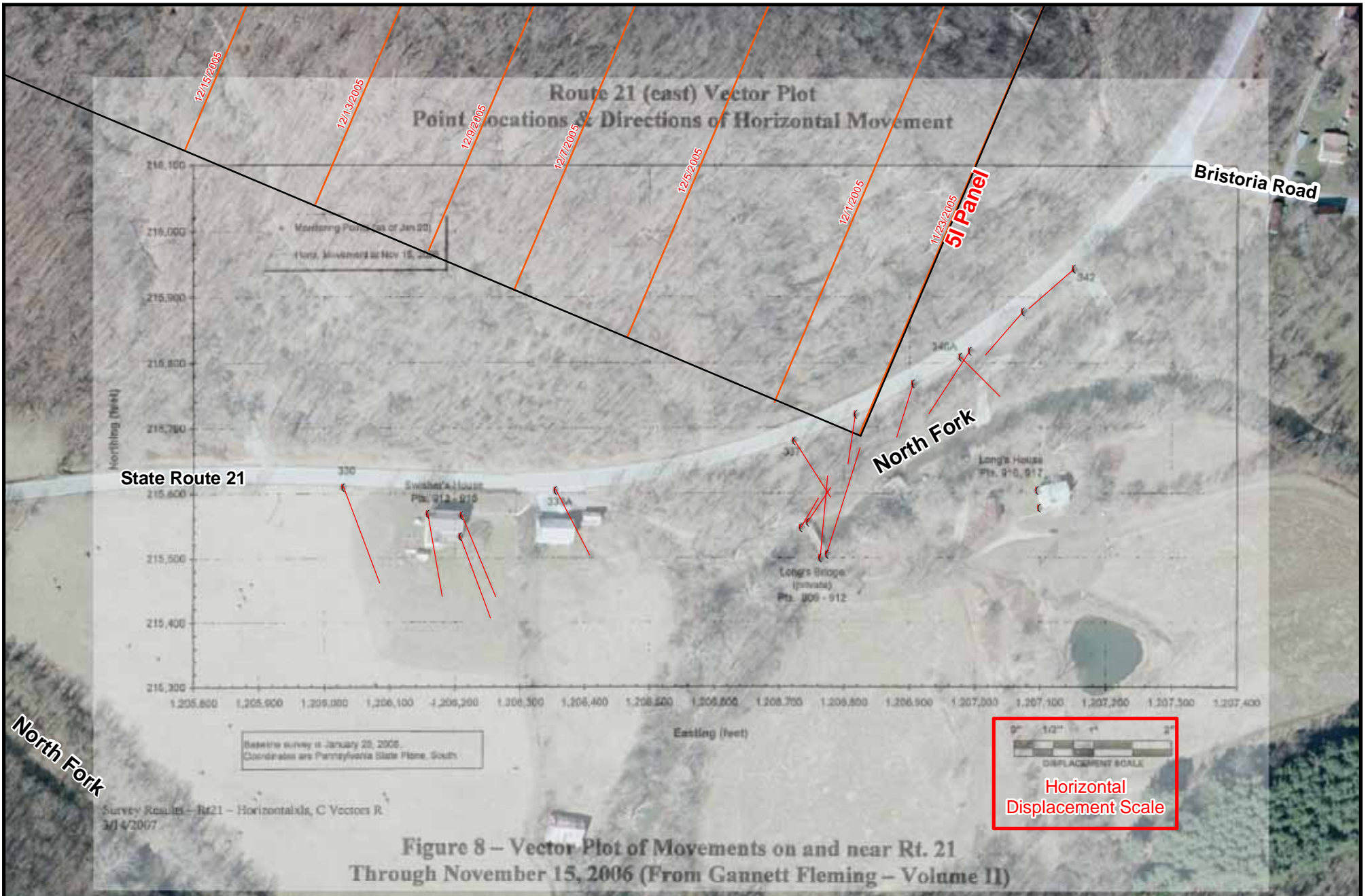
(—) Total Horizontal Displacement As of 11/15/2006

Map Scale: 1" = 200'

0 100 200 400

Feet

Figure IV-5: Route 21 (west) Vector Plot of Movements Through November 15, 2006 (Gannett Fleming - Volume II) Laid Over Aerial Imagery from the PAMAP Project.



Legend
 ← Horizontal Displacement

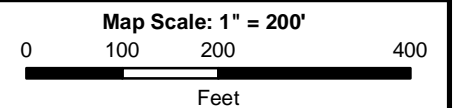
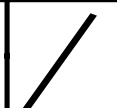


Figure IV-6: Route 21 (east) Vector Plot of Movements On and Near State Route 21 Through November 15, 2006 (Gannett Fleming - Volume II) Laid Over Aerial Imagery from the PAMAP Project.

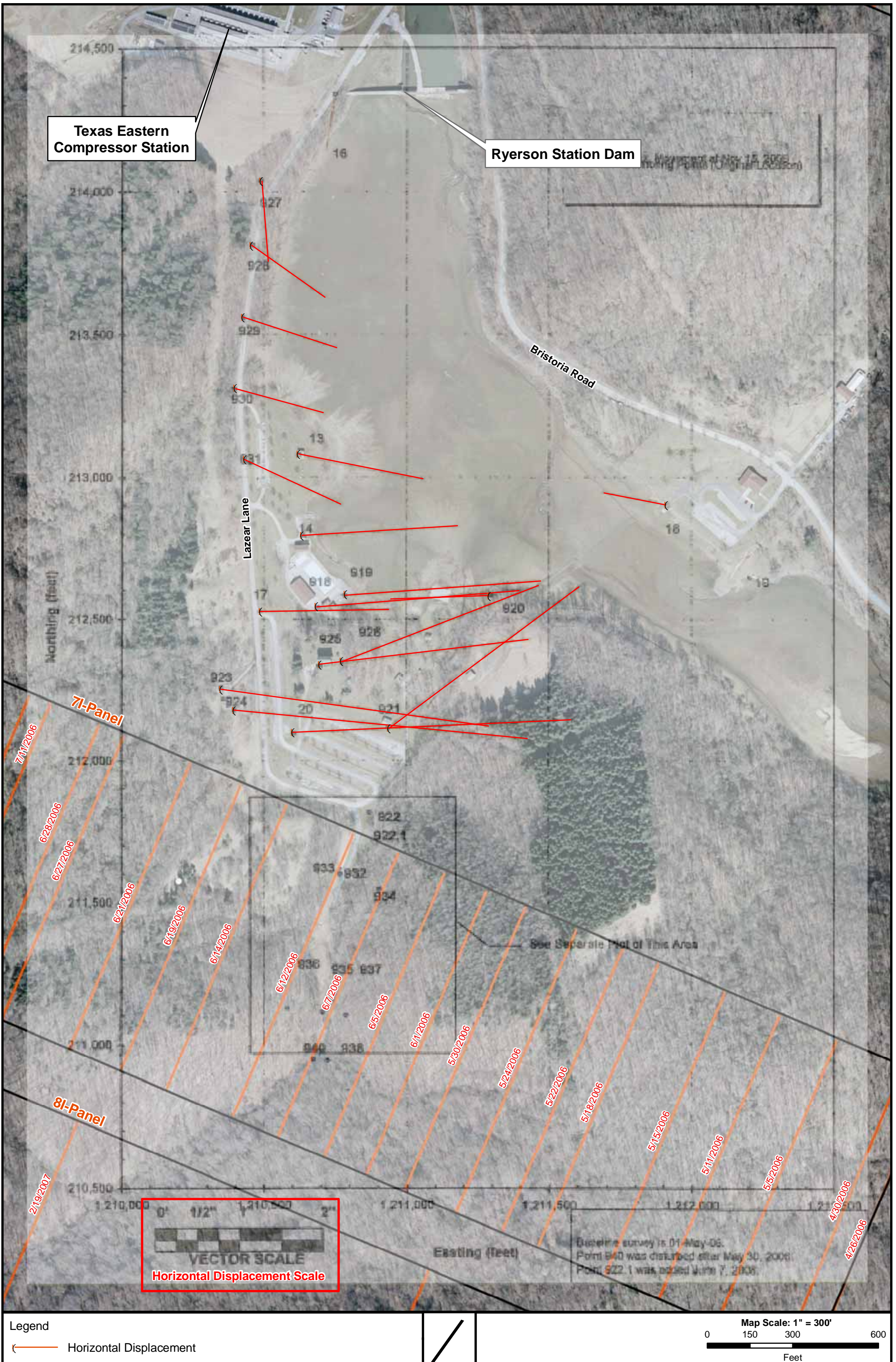


Figure IV-7: Swimming Pool Area Vector Plot of Movements Through November 15, 2006 (Gannett Fleming - Volume II)
Laid Over Aerial Imagery from the PAMAP Project.

PART IV

SECTION C – CPCC MONITORING

CPCC also performed monitoring in the vicinity of the Ryerson Station Dam. The data collected was subsequently reviewed and documented in a report by GAI Consultants, specifically Robert W. Bruhn and Thomas A Gray. GAI Consultants also performed subsidence analyses using the SDPS (Surface Deformation Prediction System) program developed at Virginia Polytechnic and State University, and compared predicted and actual results.

A portion of CPCC's monitoring consisted of monitoring points in and around the 5I Panel. The monitoring plan included a transverse survey line across the panel width and a survey line that circled south and west of the panel along Route 21, and also up Buckland Road.

CPCC's transverse survey line was located approximately 840 feet from the western end of the panel. The survey points were located directly over the panel and gate entries. The pre-mining survey was performed on November 18, 2005. CPCC performed nine surveys between December 5, 2005 and May 10, 2006, as the 5I Panel was being mined. The maximum subsidence was surveyed to be 4.47 feet. The angles of draw on the north and south edges of the panel were 14.7 degrees and 18.2 degrees, respectively.

Horizontal movements were measured to be up to 1.28 feet and were generally largest near the center of the panel and smallest towards the gate roads. GAI Consultants concluded that the horizontal displacements outside the angle of draw were essentially nil. GAI Consultants also concluded that the horizontal movements measured outside the survey trough... "appeared to be nonsystematic, directionally random, and within the realm of survey error."

GAI Consultants stated that the subsidence trough predicted by SDPS approximated the measured trough reasonably well. However, it indicated that horizontal displacements predicted by SDPS were directed toward the longitudinal centerline of the panel whereas the actual measured horizontal displacements were directed downslope, roughly perpendicular to the surface topographic contours of the slope.

The perimeter survey followed Route 21 from the east around the 5I Panel to the intersection with Buckland Road. The survey points continued up Buckland Road to the west end of the panel. The survey points also continued west on Route 21 for about 700 feet from the intersection with Buckland Road. In total, 84 survey points were located south and east of the 5I Panel.

GAI Consultants note that the elevation changes generally hovered around zero. Exceptions included several monuments which were over or near the 5I gate entries and one 0.061 foot uplift reading in mid-February 2006 where the panel was 1200 feet away. GAI Consultants concluded that the readings were within the limits of survey error and were not different than zero.

With regard to horizontal displacements, with the exception of what GAI describes as a few anomalous readings, GAI Consultants concluded that the monuments' displacement "appeared, overall, to be non-systematic and within the realm of survey error."

CPCC set up a survey line with 14 monuments; six located north and outside the 7I Panel along the west bank of Duke Lake. The other points are located above the 7I Panel. CPCC conducted a pre-mining survey on May 4, 2006, and twelve additional surveys between May 5, 2006 and August 1, 2006.

Measured maximum subsidence was 4.5 feet over the panel. The monuments located outside the subsidence trough did not exhibit measurable uplift or subsidence.

Horizontal displacements were found inside the subsidence trough but not outside the subsidence trough. Displacements were greatest near the center of the panel and less toward the panel edges.

The subsidence profile measured by the 7I panel surveys compared reasonably well with the SDPS predicted profiles, according to GAI.

PART IV
SECTION D – DEP OBSERVATIONS 2005-2006

During the second half of 2005 and throughout 2006, DEP staff monitored areas adjacent to the advancing 4I West longwall panel for signs of physical damage or ground movement.

During this time, DEP staff observed, monitored, and documented a number of unusual events in the general vicinity of the Ryerson Station Dam. These events are considered significant by the Investigation Team in understanding the full impacts of mining in the area, and ultimately whether CPCC's longwall mining activities resulted in movement and damage to the dam. Exhibits 1, 2, and 3 show the location of each event in relation to CPCC's longwall panels. Each of these incidents is typically associated with ground movement caused by longwall mine subsidence. A summary of the DEP's observations is presented on the following pages.

Site 1 - Bristoria Road Bumps (Log Cabin Area)

On January 31, 2005, PennDOT reported bumps forming on Bristoria Road, just northwest of the Bristoria Road Bridge (See Figure IV-8). CPCC's longwall mining in the 3I panel was approximately 2,150 feet northeast of the site on January 31, 2005. PennDOT milled and repaired the bumps on February 7, 2005. PennDOT observed that bumps reformed in the same location on April 14, 2005, as mining of the 3I Panel was approximately 3,980 feet to the northwest. PennDOT milled and repaired the bumps on April 14, 2005. DEP observed the bumps reformed again on August 15, 2005, as mining of the 4I Panel was approximately 580 feet to the east.

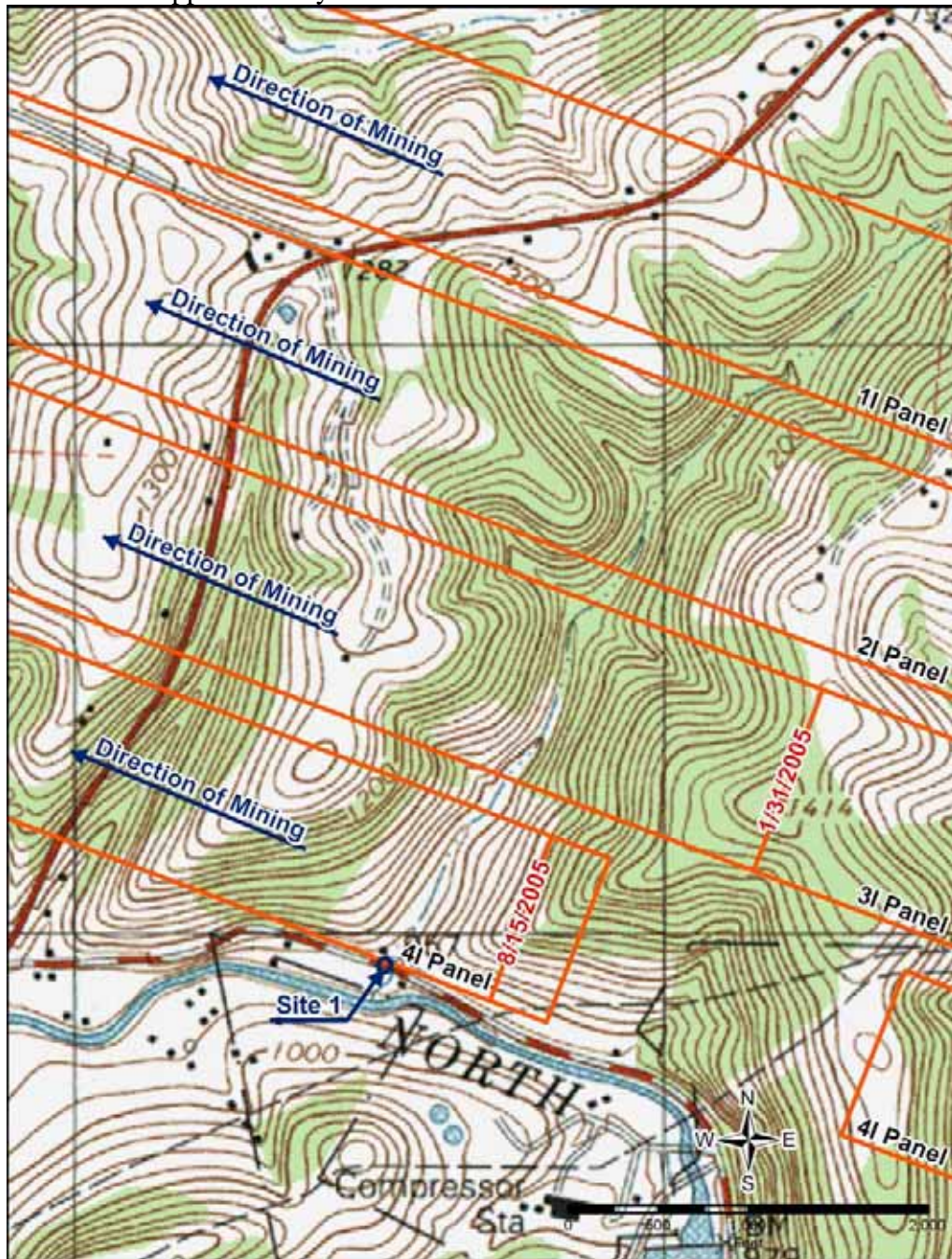


Figure IV-8: Location of Site 1, Bristoria Road Bumps.



Photo IV-1a: DEP Photograph taken August 15, 2005 showing road bumps within southbound lane of Bristoria Road.



Photo IV-1b: DEP Photograph taken on August 15, 2005 showing road bumps crossing both lanes of Bristoria Road.

Site 2: Bristoria Road Bridge (Log Cabin Area)

On August 17, 2005, the DEP observed evidence of movement of Bristoria Road Bridge crossing Tributary 3596 to the North Fork of Dunkard Fork (See Figure IV-9). Longwall mining was being conducted in the 4I Panel approximately 480 feet to the east of the bridge on August 17, 2005.

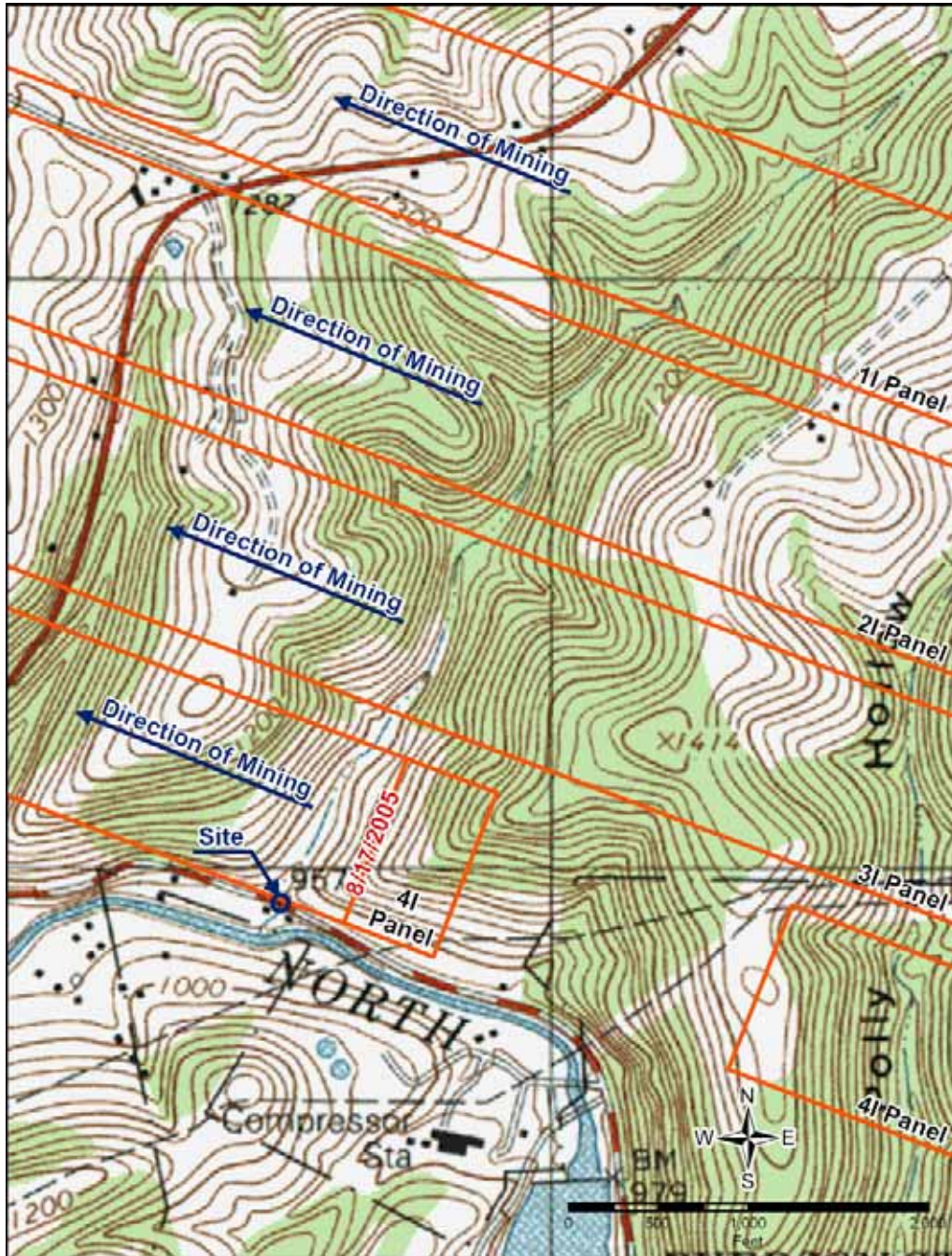


Figure IV-9: Location of Site 2, Bristoria Road Bridge.



Photo IV-2a: DEP Photograph taken on August 22, 2005 showing view of Bristoria Road Bridge from the northwest.



Photo IV-2b: DEP Photograph taken on August 22, 2005 showing movement of the western end of Bristoria Road Bridge.



Photo IV-2c: DEP Photograph taken on August 22, 2005 showing cracks in southwest corner of Bristoria Road Bridge.



Photo IV-2d: DEP Photograph taken on September 26, 2005 showing movement within southeast corner of Bristoria Road Bridge.

Site 3: Gas Line Heave (Logan Cabin Area)

On August 17, 2005, the DEP observed a gas line located near Tributary 3596 of North Fork of Dunkard Fork (See Figure IV-10) had begun to heave out of the ground in a semi-circular pattern (See Photo IV-3a). Longwall mining in the 4I Panel was approximately 515 feet to the east of the location of the gas line heave on August 17, 2005. On August 19, 2005, DEP observed that the gas line heave had heaved more. It now had a V-shape and was crimped (See Photo IV-3b). The 4I Panel was mining approximately 350 feet to the east of the heave site on August 19, 2005.

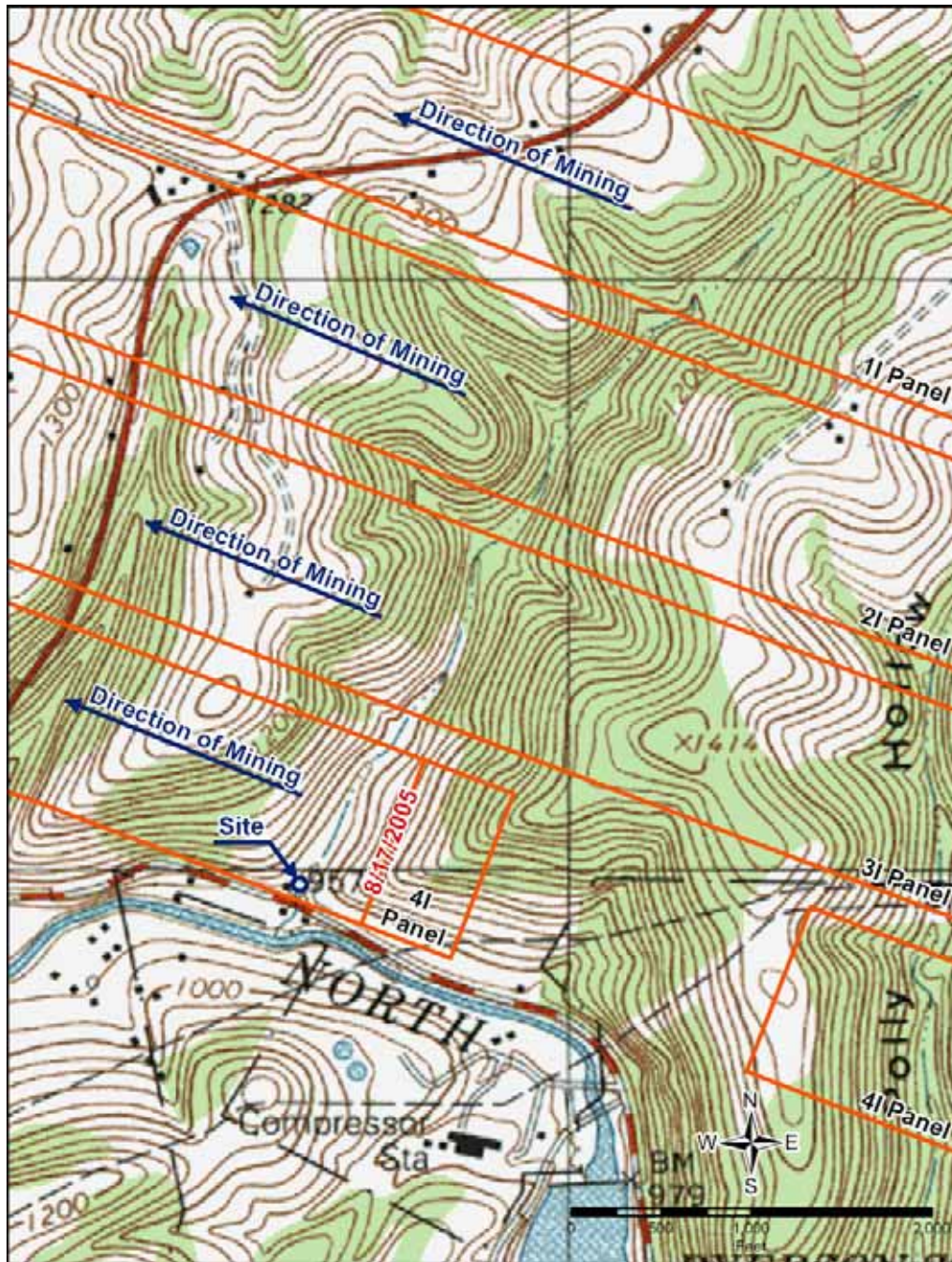


Figure IV-10: Location of Site 3, gas line heave.



Photo IV-3a: DEP Photograph taken on August 17, 2005 showing gas line beginning to heave out of ground.



Photo IV- 3b: DEP Photograph taken on August 19, 2005 showing gas line heave 2 days after it was discovered by DEP.

Site 4: Ground Heave (Log Cabin Area)

On August 17, 2005, DEP observed a ground heave near the pipeline heave (See Figure IV-11). Mining of the 4I Panel was approximately 515 feet to the east of the site on August 17, 2005.

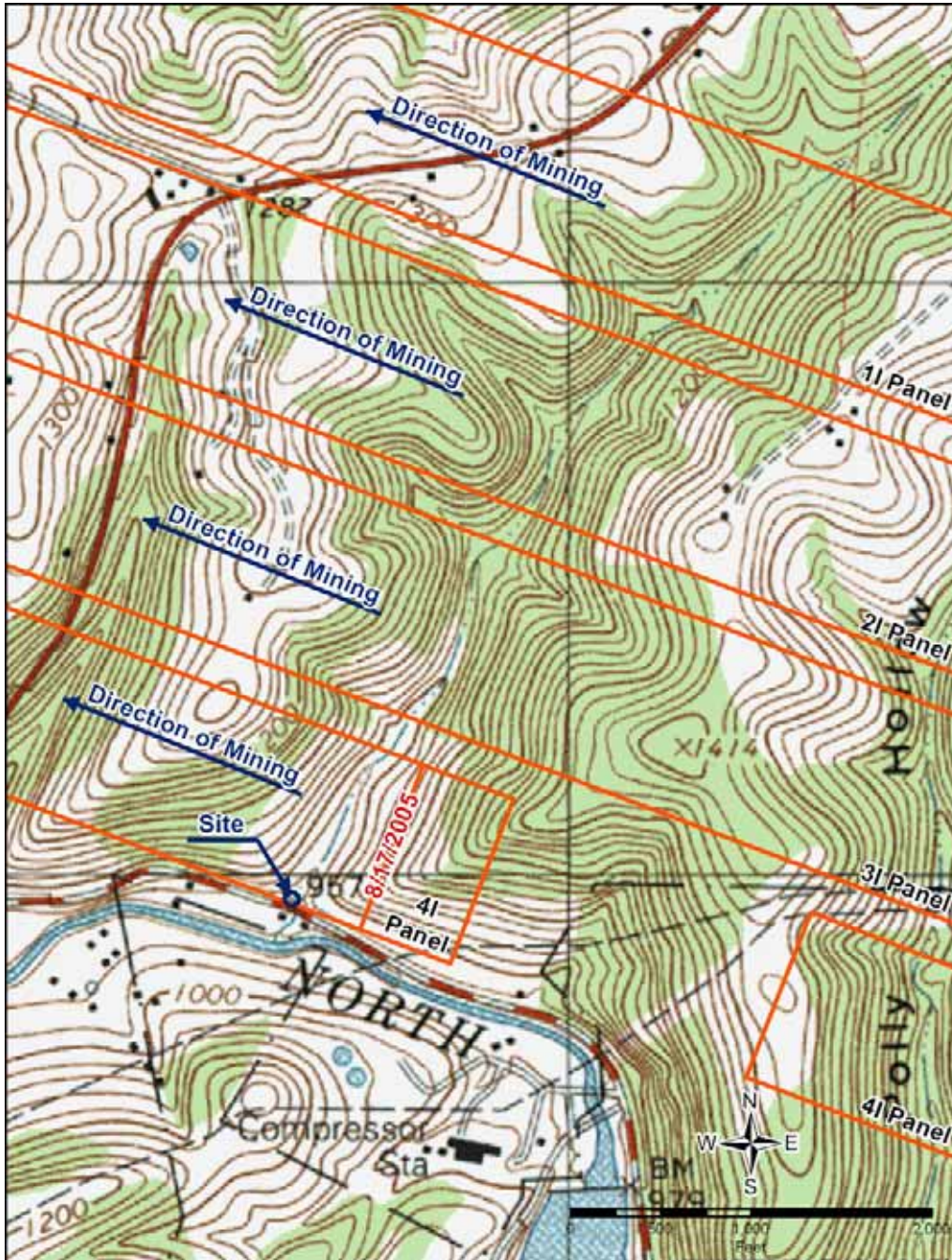


Figure IV-11: Location of Site 4, ground heave.



Photo IV-4a: DEP Photograph taken on August 17, 2005 showing ground heave.



Photo IV-4b: DEP Photograph taken on August 17, 2005 showing ground heave with gas line heave in background.

Site 5: Lazear Lane Bridge

On September 8, 2005, DEP observed movement of both guide rail moorings on the eastern end of Lazear Lane Bridge (See Figure IV-12). A separation formed between the moorings and the ground around them (See Photo's IV-5a, IV-5b, and IV-5c). Movement was observed as the 4I Panel was being mined approximately 3,400 feet to the northwest of the site.

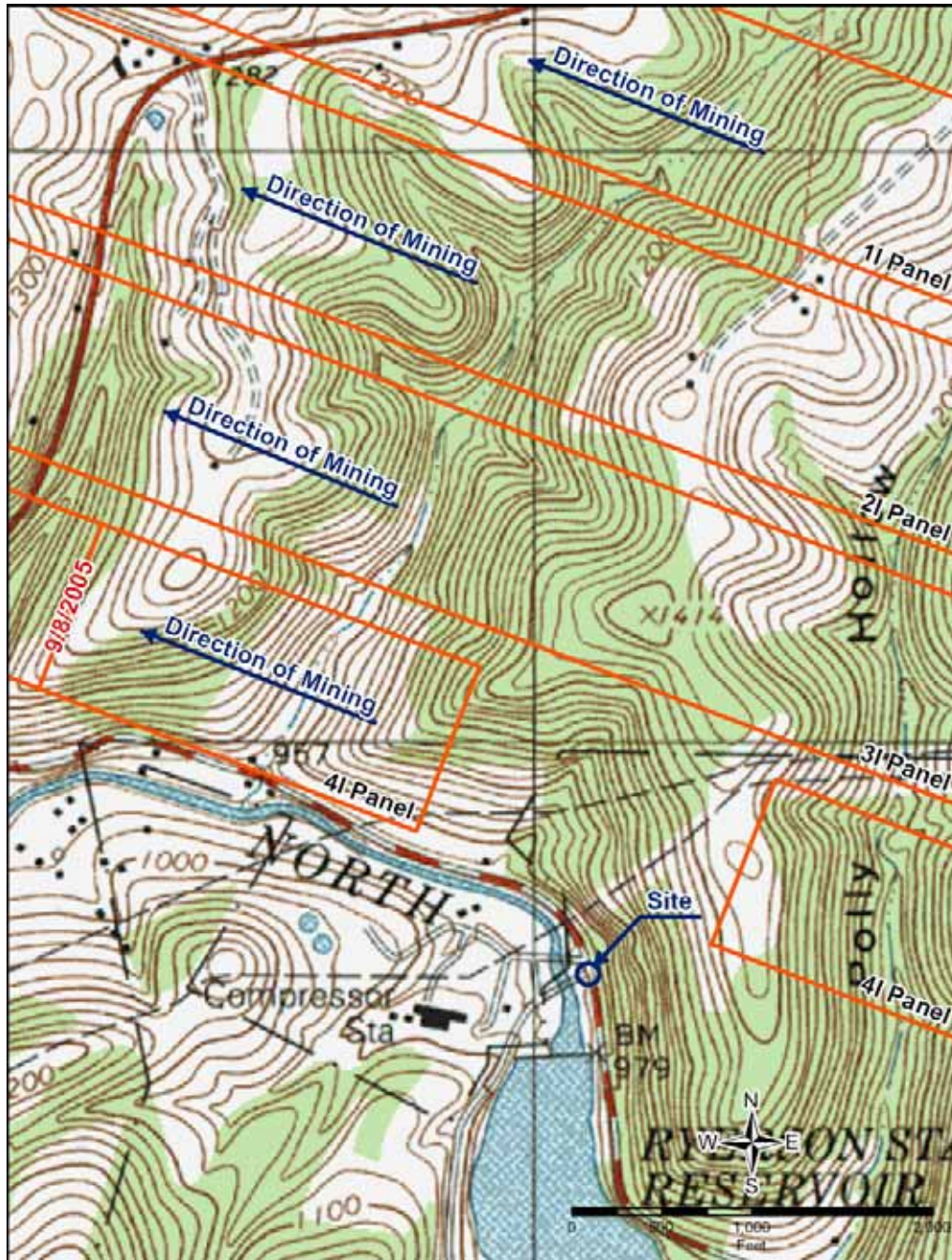


Figure IV-12: Location of Site 5, guide rail moorings on Lazear Lane Bridge.



Photo IV-5a: DEP Photograph taken on September 8, 2005 showing guide rail moorings on eastern end of Lazear Lane Bridge.



Photo IV-5b: DEP Photograph taken on September 8, 2005 showing ground separation at southeastern guide rail mooring of Lazear Lane Bridge.



Photo IV-5c: DEP Photograph taken on September 9, 2005 showing close-up of ground separation at southeastern guide rail mooring of Lazear Lane Bridge.



Photo IV-5d: DEP Photograph taken on September 8, 2005 showing ground separation at northeastern guide rail mooring of Lazear Lane Bridge.



Photo IV-5e: DEP Photograph taken on September 9, 2005 showing close-up of ground separation at northeastern guide rail mooring of Lazear Lane Bridge.

Site 6: Route 21 Road Bump (Route 21/Bristoria Road Intersection Area)

On September 12, 2005, DEP observed a road bump forming in the eastbound lane of Route 21 approximately 150 feet northeast of the Route 21 and Bristoria Road intersection (See Figure IV-13). Mining of the 4I Panel was approximately 740 feet to the northeast of the site on September 12, 2005.

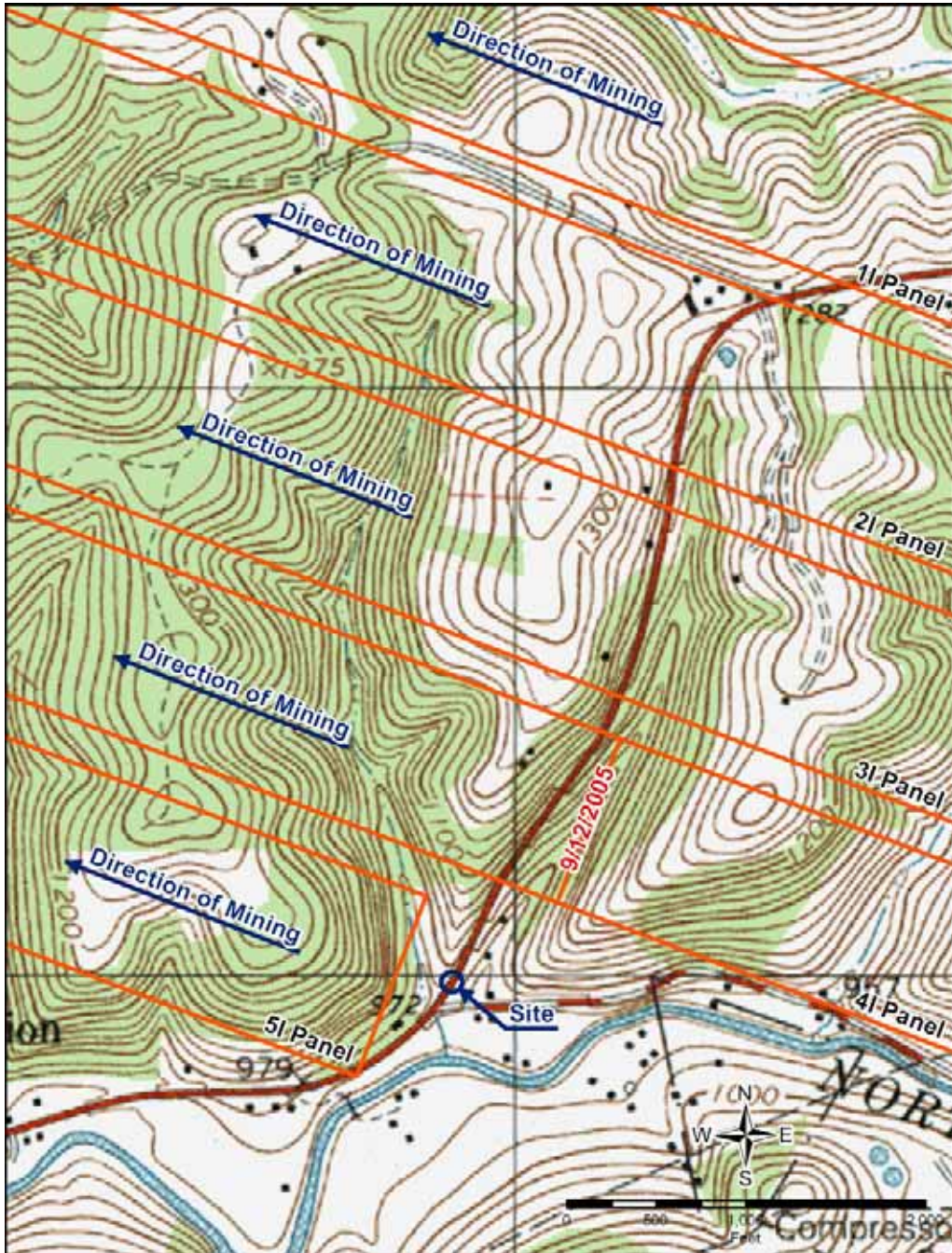


Figure IV-13: Location of Site 6, road bump near Route 21 and Bristoria Road intersection.



Photo IV-6a: DEP Photograph taken on September 15, 2005 showing milled and patched road bump in eastbound lane of Route 21.



Photo IV-6b: DEP Photograph taken on September 15, 2005 showing side view of milled and patched road bump in eastbound lane of Route 21.

Site 7: Route 21 Road Bump (Route 21/Bristoria Road Intersection Area)

On September 13, 2005, DEP observed a second road bump forming in the westbound lane of Route 21 approximately 100 feet northeast of the Route 21 and Bristoria Road intersection (See Figure IV-14). Mining of the 4I Panel was approximately 730 feet to the northeast of the site on September 13, 2005.

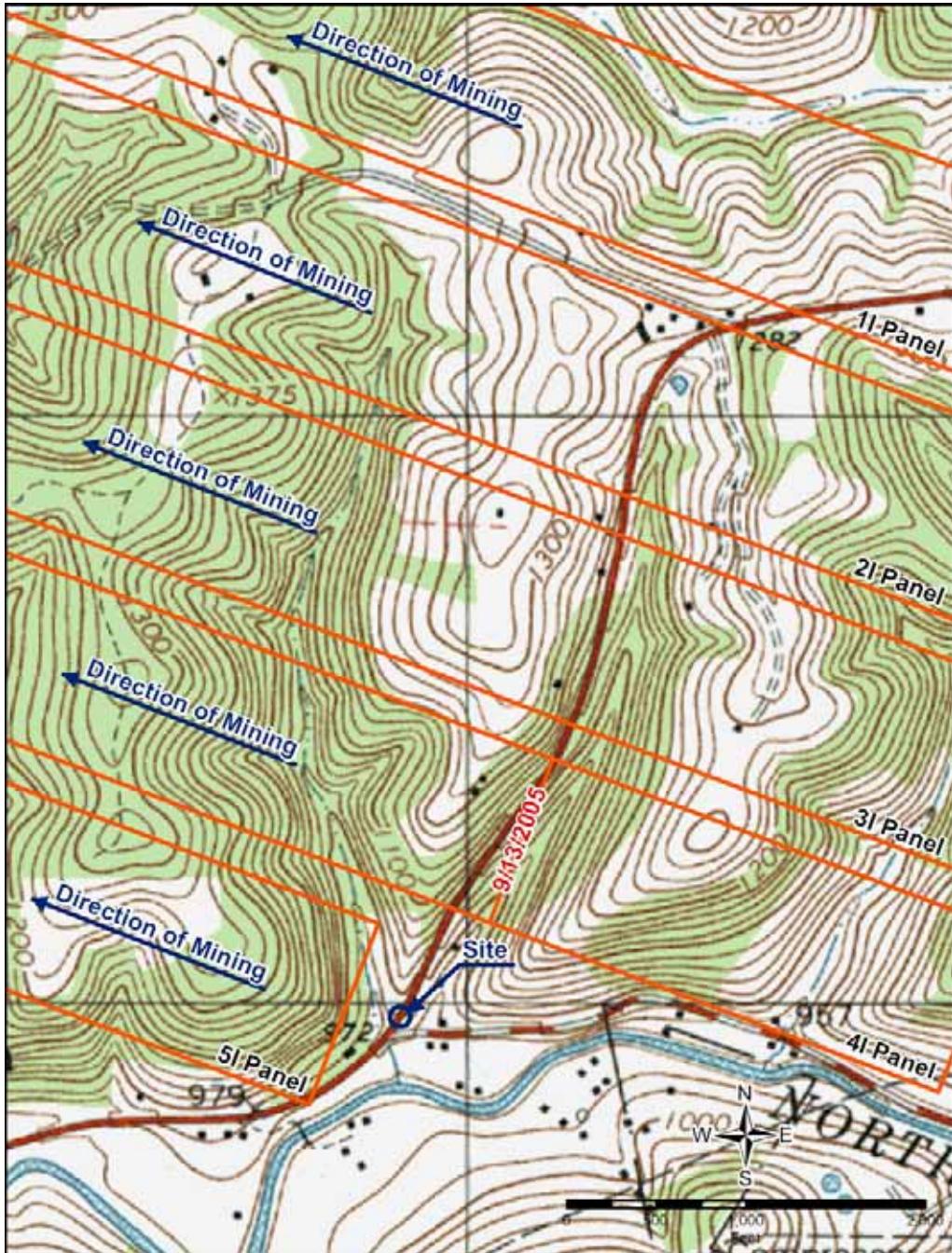


Figure IV-14: Location of Site 7, road bump near Route 21 and Bristoria Road intersection.



Photo IV-7a: DEP Photograph taken on September 15, 2005 showing milled and patched road bump in westbound lane of Route 21.



Photo IV-7b: DEP Photograph taken on September 15, 2005 showing side view of milled and patched road bump in westbound lane of Route 21.

Site 8: Route 21/Bristoria Road Cracks (Route 21/Bristoria Road Intersection Area)
On September 15, 2005, DEP observed fresh cracks and movement within the pavement of Route 21 at the Route 21 and Bristoria Road intersection (See Figure IV-15). Mining of the 4I Panel was approximately 780 feet to the northeast of the site.

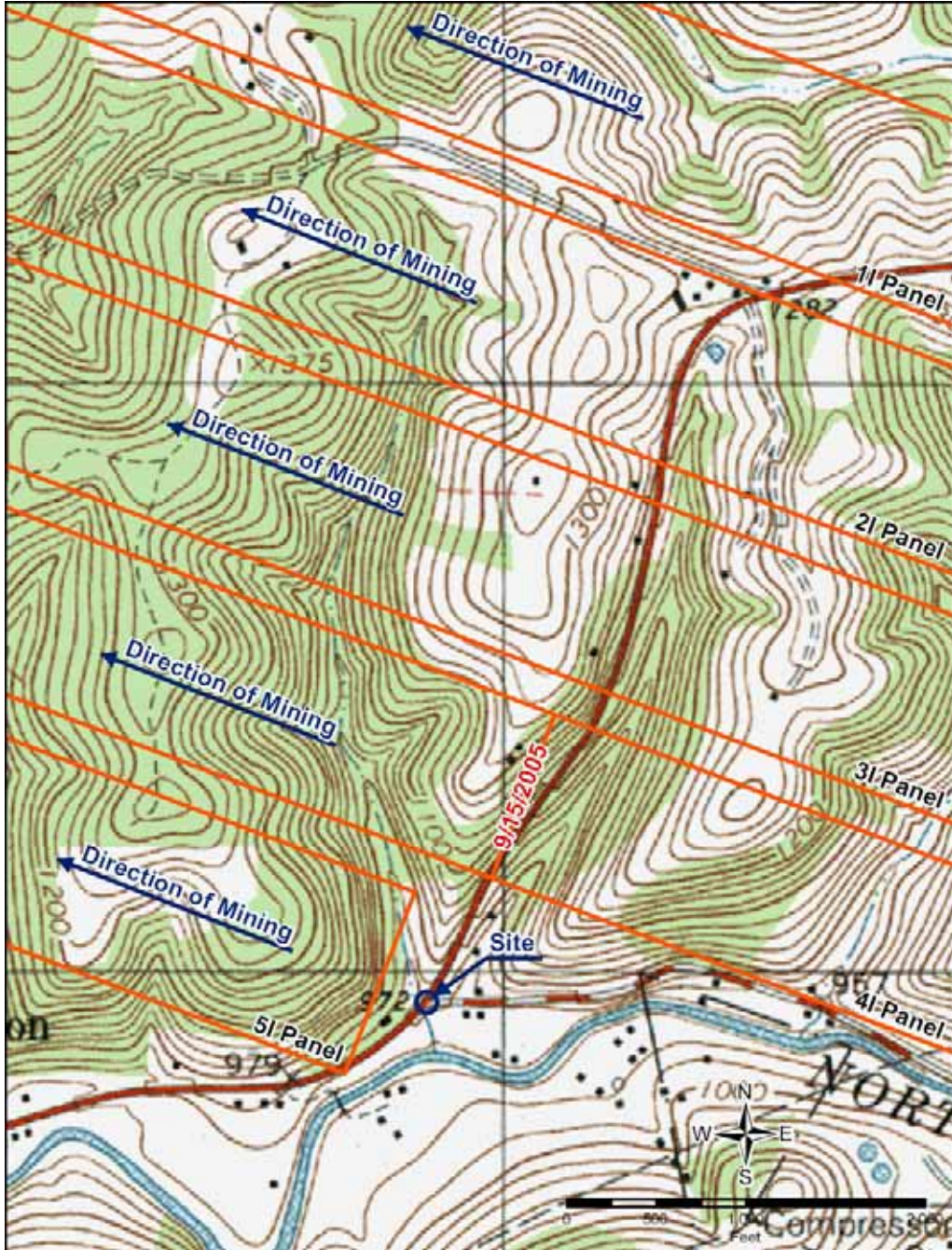


Figure IV-15: Location of Site 8, road cracks near Route 21/Bristoria Road intersection Area.



Photo IV-8a: DEP Photograph taken on September 19, 2005 showing cracks within westbound lane of Route 21.



Photo IV-8b: DEP Photograph taken on September 19, 2005 showing close-up of cracks and movement in westbound lane of Route 21.

Site 9: Bottinelli Residence (Route 21/Bristoria Road Intersection Area)

On September 15, 2005, DEP observed new, albeit minor damage at the Bottinelli residence located near the intersection of Bristoria Road and Route 21 (See Figure IV-16). Mining of the 4I Panel was approximately 630 feet north of the site on September 15, 2005.

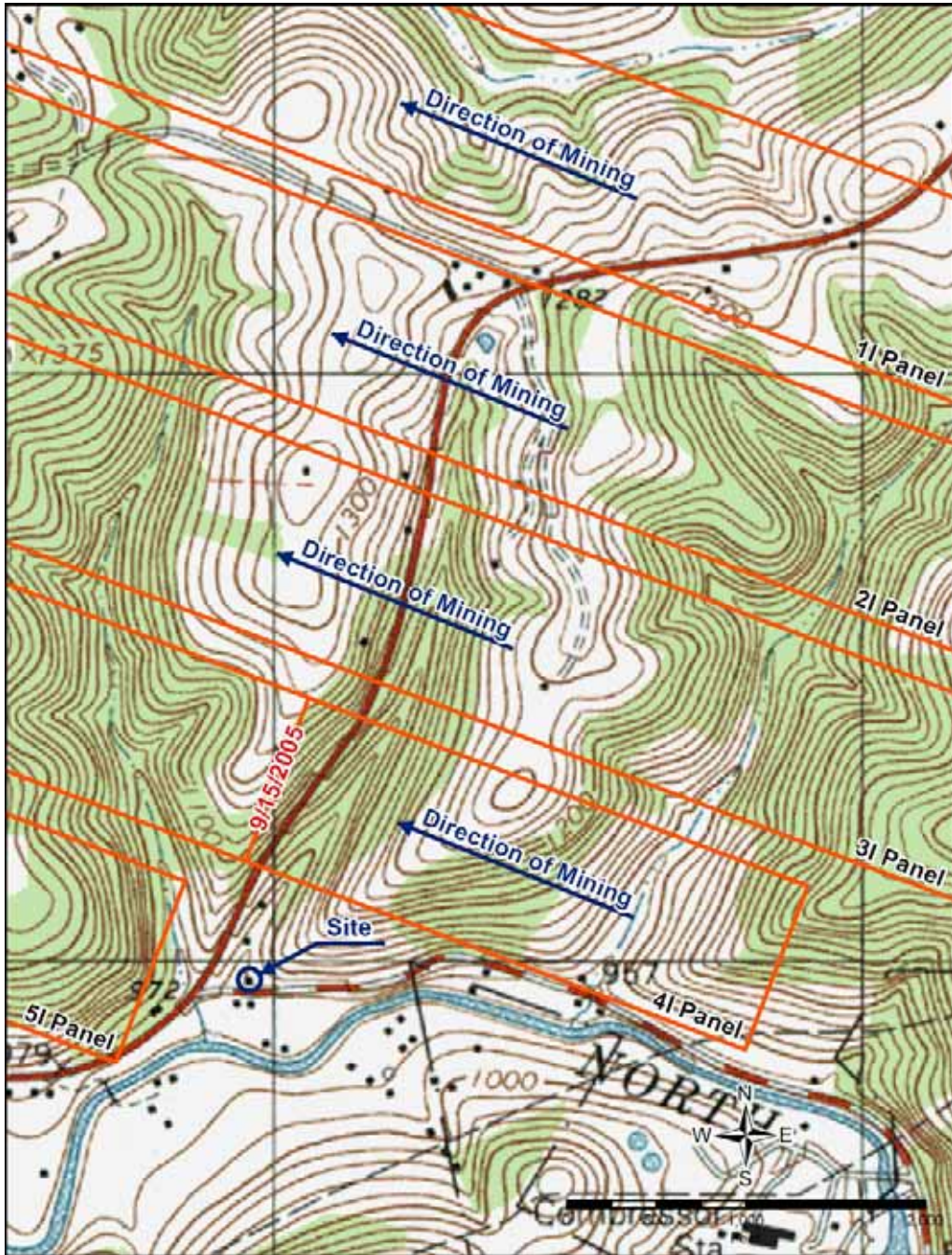


Figure IV-16: Location of Site 9, Bottinelli Residence near Route 21/Bristoria Road Intersection Area.



Photo IV-9a: DEP Photograph taken on September 15, 2005 showing minor cracks in Bottinelli Residence.



Photo IV-9b: DEP Photograph taken on September 15, 2005 showing close-up of minor cracks in Bottinelli Residence.

Site 10: Route 21 Guide Rail

On September 16, 2005 the DEP observed movement of the southeastern guide rail mooring along a section of the eastbound lane of Route 21 (See Figure IV-17). The 4I Panel was mining approximately 1,950 feet to the northeast of the site on September 16, 2005.

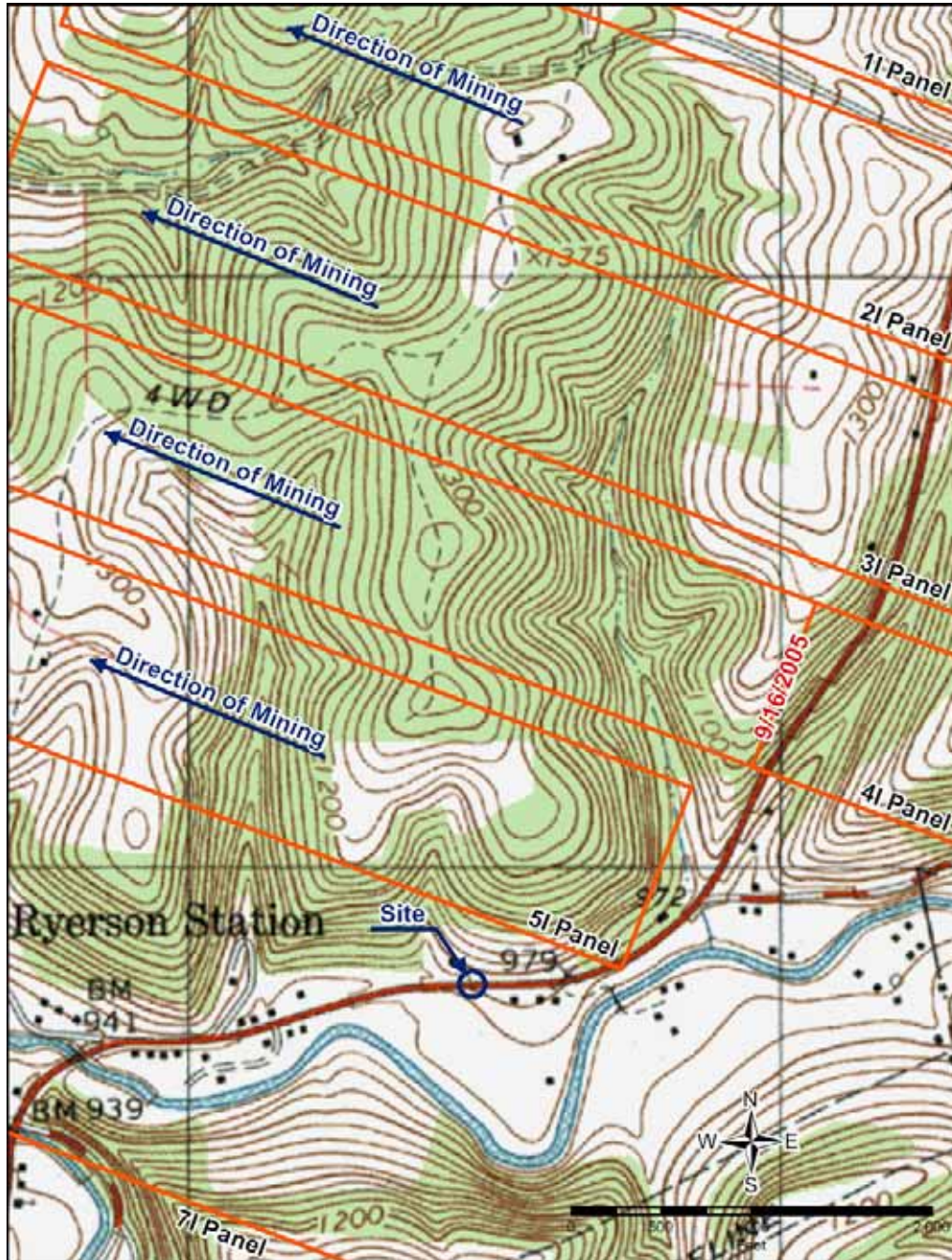


Figure IV-17: Location of Site 10, Route 21 guide rail mooring site.



Photo IV-10a: DEP Photograph taken on September 16, 2005 showing southeastern guide rail mooring.



Photo IV-10b: DEP Photograph taken on September 16, 2005 showing ground separation around southeastern guide rail mooring.

Site 11: North Fork of Dunkard Fork Streambed Heave (Route 21/Bristoria Road Intersection Area)

On September 16, 2005, the DEP observed a heave in the streambed of North Fork of Dunkard Fork, just below the intersection of Bristoria Road and Route 21 (See Figure IV-18), as mining in the 4I Panel was approximately 1,030 feet to the north of the heave site.

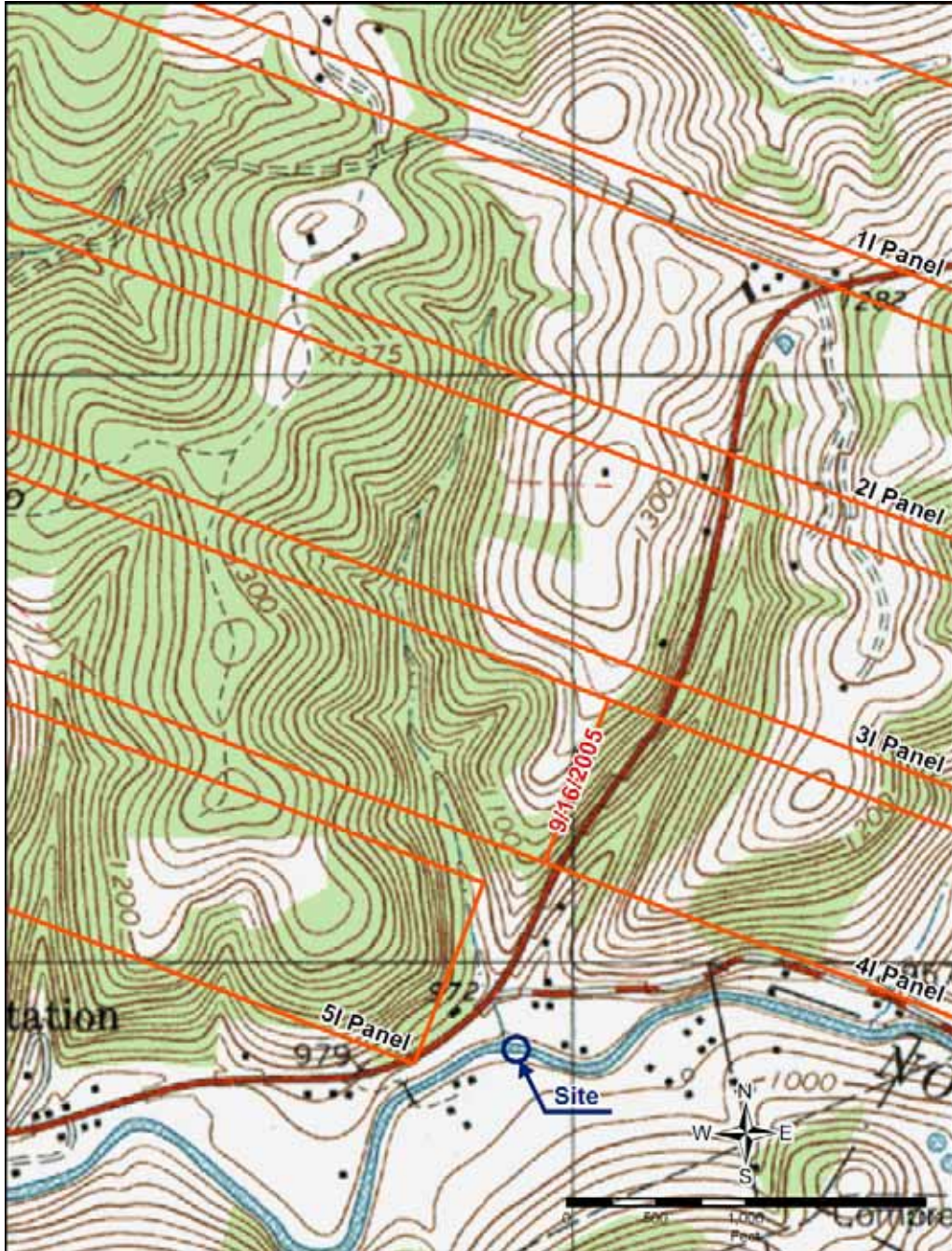


Figure IV-18: Location of Site 11, streambed heave observed in the North Fork of Dunkard Fork.



Photo IV-11a: DEP Photograph taken on September 16, 2005 showing streambed heave looking upstream.



Photo IV-11b: DEP Photograph taken on September 16, 2005 showing heaved and cracked rocks within streambed.



Photo IV-11c: DEP Photograph taken on September 18, 2005 showing heaved and cracked rocks within streambed.



Photo IV-11d: DEP Photograph taken September 16, 2005 showing heaved and cracked rocks within streambed.



Photo IV-11e: DEP Photograph taken September 16, 2005 showing crack in bedrock within streambed.

Site 12: Texas Eastern Pipeline

On September 19, 2005, DEP observed a Texas Eastern pipeline crossing the North Fork of Dunkard Fork (See Figure IV-19) heaved out of the stream channel (See Photo's IV-12a, IV-12b, IV-12c, and IV-12d). Cracking and heaving of the stream banks (See Photo IV-12e), as well as sagging of a pipeline marker cable crossing the stream (See Photo IV-12f) was also observed in the vicinity of the pipeline heave. Mining of the 4I Panel was approximately 2,760 feet to the northwest of the site on September 19, 2005.

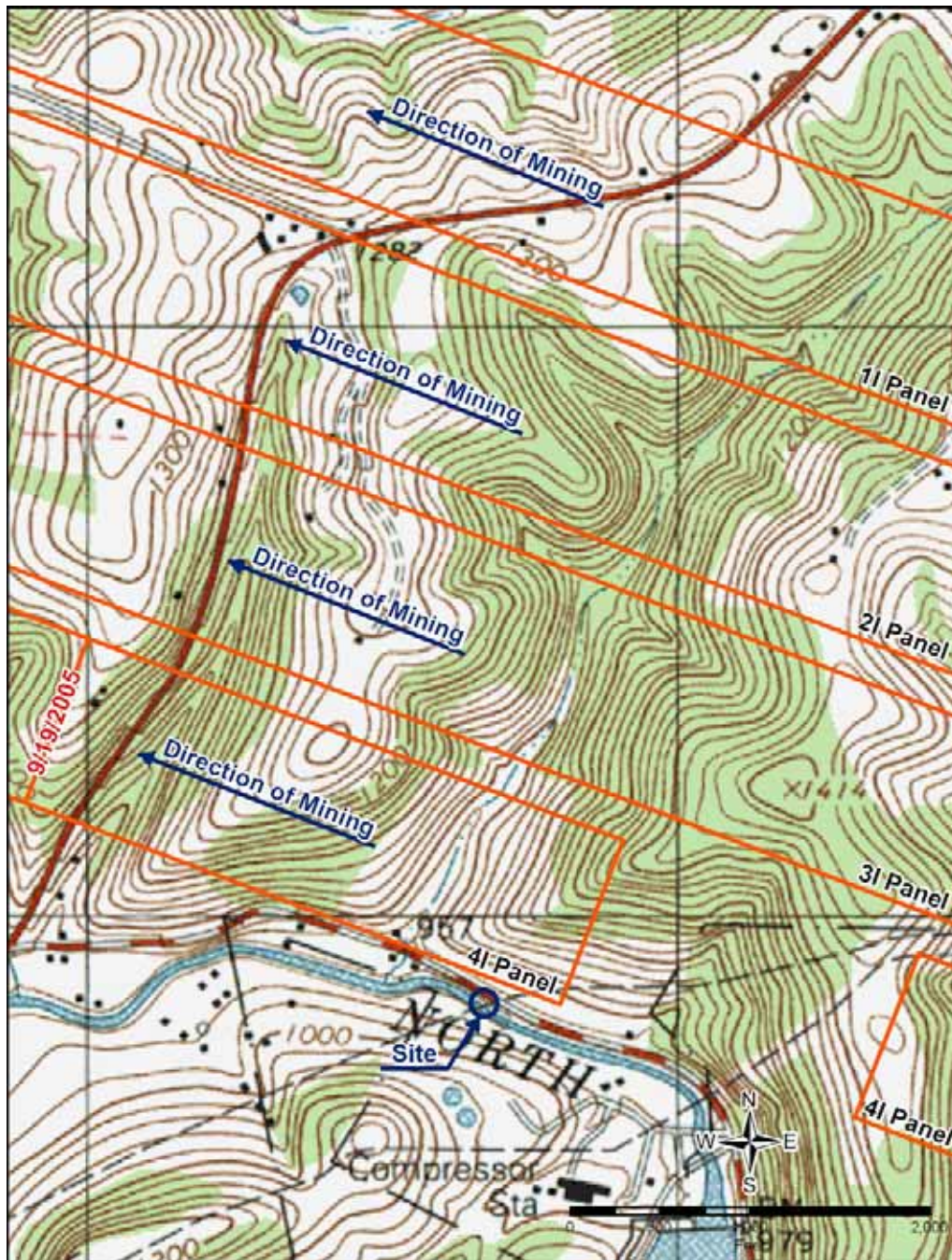


Figure IV-19: Location of Site 12, Texas Eastern pipeline heave crossing North Fork of Dunkard Fork.



Photo IV-12a: DEP Photograph taken on September 19, 2005 showing Texas Eastern pipeline heave looking downstream.



Photo IV-12b: DEP Photograph taken on September 19 2005 Texas Eastern pipeline heave looking upstream.



Photo IV-12c: DEP Photograph taken on September 19 2005 showing close-up of Texas Eastern pipeline heave looking upstream.



Photo IV-12d: DEP Photograph taken on September 19 2005 showing Texas Eastern pipeline heave crossing streambed.



Photo IV-12e: DEP Photograph taken on September 19 2005 showing ground crack associated with pipeline heave.



Photo IV-12f: DEP Photograph taken on September 19 2005 showing sag in pipeline marker cable crossing streambed.

Site 13: Texas Eastern Compressor Station

On September 20, 2005, Texas Eastern reported horizontal movement of pipelines 1 and 25 at their Holbrook Compressor Station (See Figure IV-20). Mining in the 4I Panel was approximately 3,800 feet to the northwest of the Texas Eastern site on September 20, 2005.



Figure IV-20: Location of Site 13, Texas Eastern Holbrook Compressor Station.



Photo IV-13a: DEP Photograph taken on September 21, 2005 showing movement of a Texas Eastern pipeline.



Photo IV-13b: DEP Photograph taken on September 21, 2005 showing ground movement around Texas Eastern pipeline.



Photo IV-13c: DEP Photograph taken on September 21, 2005 showing ground movement around a Texas Eastern pipeline.



Photo IV-13d: DEP Photograph taken on October 4, 2005 showing movement of a Texas Eastern pipeline.



Photo IV-13e: DEP Photograph taken on October 4, 2005 showing a Texas Eastern pipeline being exposed for repairs.



Photo IV-13f: DEP Photograph taken on October 4, 2005 showing a Texas Eastern pipeline being exposed for repairs.

Site 14: Equitrans Pipeline PDB92 Heave

On September 26, 2005, the DEP observed a section of Equitrans Pipeline PDB92, located along the North Fork of Dunkard Fork (See Figure IV-21), beginning to heave out of the ground (See Photo IV-14a). Longwall mining of the 4I panel was approximately 2,300 feet to the northeast of site on September 26, 2005.

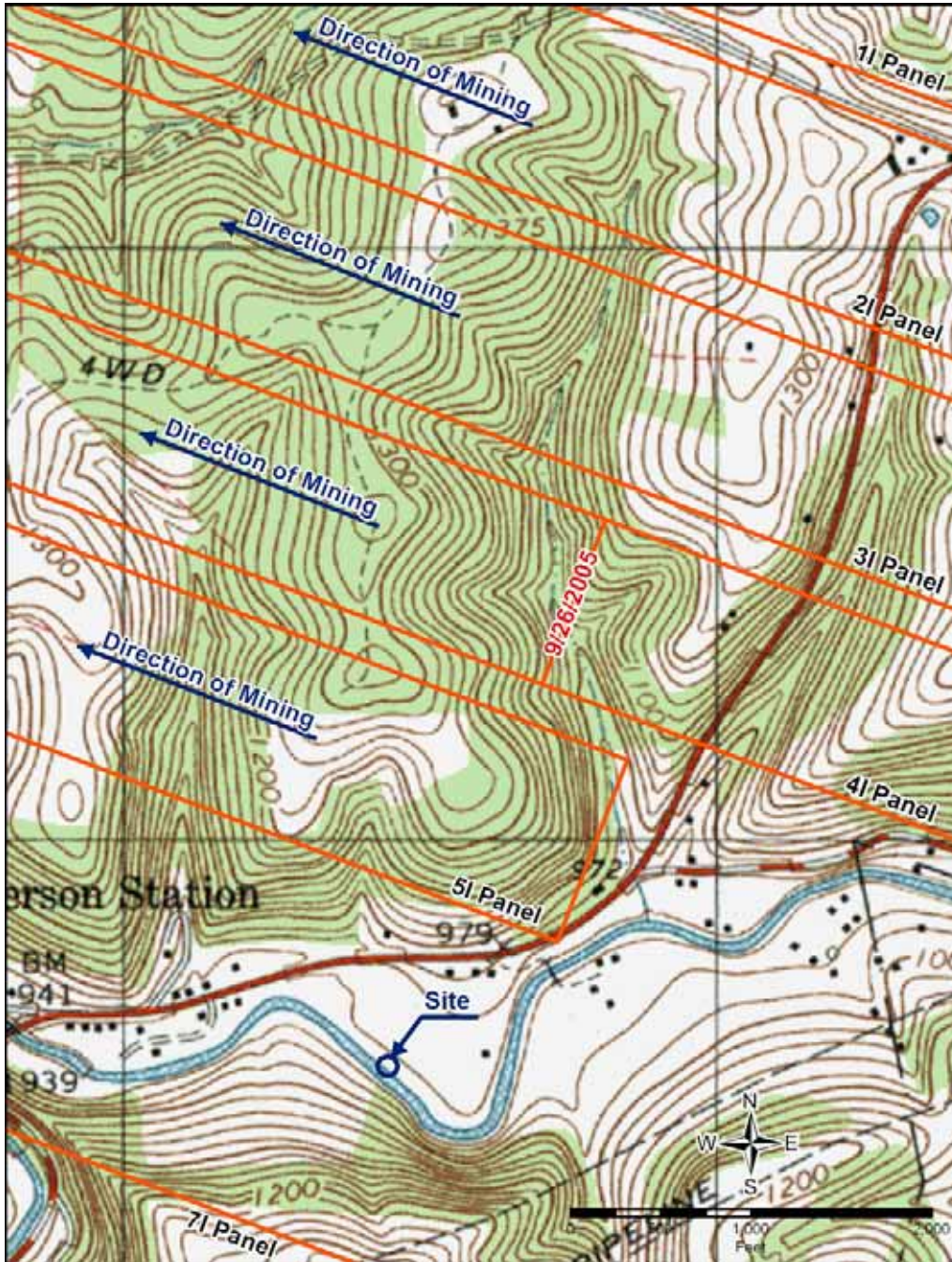


Figure IV-21: Location of Site 14, Equitrans Pipeline PDB92 heave.



Photo IV-14a: DEP Photograph taken on September 26, 2005 showing pipeline heave upon discovery by the DEP.



Photo IV-14b: DEP Photograph taken on February 2, 2006 showing pipeline heave approximately 4 months after discovered by DEP.



Photo IV-14c: DEP Photograph taken on October 3, 2006 showing pipeline heave approximately 1 year after discovered by DEP.



Photo IV-14d: DEP Photograph taken on February 7, 2008 showing pipeline heave.

PART IV
SECTION E – CASES OF REMOTE MOVEMENT REPORTED BY CPCC

The DEP Investigation Team was interested in learning about other cases regarding ground movements associated with longwall mining that may have occurred beyond the expected angle of draw or area of influence of a longwall panel. For this reason, in a letter sent to CPCC dated August 3, 2009, DEP asked the following question:

Is CPCC aware of any instances, either in Western Pennsylvania or elsewhere, where ground movements or structure damage occurred beyond the generally recognized areas of influence associated with longwall mining? If yes, please provide details of each instance.

CPCC responded to this letter, citing five cases. Following is a brief summary of its response for each case:

Case 1 Loveridge Mine, Northern West Virginia

CPCC reported that monitoring indicated movements at a 49 degree angle of draw, which is greater than the generally accepted angle of draw for that area. The data was collected to monitor potential impacts on an earthen impoundment. CPCC stated the earthen impoundment was not damaged “despite the apparent presence of ground movement at an anomalous location.” Additional information provided for this case indicated the furthest monitoring point to experience movement was 936 feet from the longwall stop point.

Case 2 Bailey Mine, 9C Panel

CPCC reported monitoring in connection with the mining of the 9C panel at the Bailey Mine detected small ground movements at 43 degrees from the panel edge. It indicated no damage was reported.

Case 3 Bailey Mine, 2I Panel

CPCC reported monitoring in connection with the mining of the 2I panel at the Bailey Mine detected small ground movements at 39 degrees from the panel edge. It indicated no damage was reported.

Case 4 Bailey Mine, 5I Panel

CPCC reported monitoring at the request of DEP related to the 5I panel indicated possible movement of 40 to 49 degrees which was beyond the anticipated angle of draw. This movement was along State Route 21. They stated the movements were mostly horizontal, were erratic, were not consistent in direction or with vertical movement, and were recorded after mining within Panel 5I was completed.

Case 5 Buchanan Mine, Panel 11-NE, Southwest Virginia

CPCC reported monitoring in connection with the mining of Panel 11-NE indicated movements at an angle of draw of 37 degrees, which was beyond the generally accepted angle of draw for that area. The movement was attributed to a thick sandstone unit which cantilevered over the panel, with very deep overburden of approximately 1,370 feet.

While CPCC's written response indicated no visible evidence of surface movement or damage was observed in the area where movement was detected, the report provided for this case indicated otherwise. The report describes a gradually progressing heave of approximately 0.28 feet (3.36 inches) developed 630 feet from the panel. The report states there may have been several contributing factors to the development of this heave, with the valley bottom location and a thick near surface sandstone unit mentioned specifically.

The discussion section of the report states, "Since both the level and the transit data indicate the presence of a gradually progressing heave zone beyond the 11-NE headgate-side panel edge, the event cannot be explained as being due to measurement error. However, the presence of such heave beyond panel edge is site-specific and depends on many factors, among them: the thickness of surface soil, the proximity to the toe of a slope, and the presence and thickness of near surface units. The heave-related results of this survey should not be extrapolated to other areas. In this particular instance, the relatively close proximity to the inby hillside combined with the presence of relatively thick sandstone near the surface may have contributed to the heave."

The above cases are all examples of unexpected ground movements at distances beyond longwall mine subsidence's generally recognized area of influence for the specific location, and all of the areas mined are overlain by hill or ridge topography, and movement was associated with valleys. DEP considers these cases as direct evidence that ground movements at distances greater than expected can and do occur, and such movements cannot be predicted by existing subsidence prediction models. Specific similarities between these examples and phenomena observed near Ryerson Station in 2005 and 2006 are described below:

Case 1 is similar in location and topography to unexpected movements observed by DEP at Ryerson Station along Bristoria Road referred to by DEP as the "Log Cabin Area" (See Sites 1-4, Section IV-D of this report).

Case 2 relates to an area of Panel 2I just northwest of the Ryerson Station Dam, and involves the same stream valley as the events of the Log Cabin Area.

Case 4 relates to monitoring along State Route 21. The CPCC response refers to "possible" movements in this area. During a meeting on September 25, 2009, DEP

requested CPCC to elaborate on these movements. Subsequently CPCC presented more information indicating horizontal displacements were generally small (less than 0.05 feet, or 0.6 inches), and concludes the movements “appeared, overall, to be nonsystematic and within the realm of survey error”.

This area was also monitored by Gannett Fleming during similar periods and Gannett Fleming reports generally consistent horizontal movements away from the 5I Panel and towards the North Fork of Dunkard Fork. This monitoring is discussed in more detail in Section IV-B and IV-C of this report.

PART IV

SECTION F – DEP CASE FILES AND EXPERIENCE

DEP culled through its files and experience with mine subsidence related matters for cases where possible remote ground movements associated with longwall mining may have occurred. After review, the following cases were identified as sites where ground movements from longwall mining likely occurred outside the area predicted by customary mine subsidence theory:

Sugar Run Problem Area– Maple Creek Mine

- Located approximately 1200 feet from nearest longwall mining in the Maple Creek Mine when damage was discovered.
- The longwall panel was mining under a hilltop/ridge in March 1988 when heaving occurred in the stream valley of Sugar Run approximately 1200 feet away (Figure IV-22).

Owens Run Problem Area– Bailey Mine

- Located approximately 800 feet from the nearest longwall mining in the Bailey Mine 6B panel when damage was reported to have occurred in September 1990.
- The 6B Panel mined under two hilltop/ridges, while the structure was located near the stream valley of Owen’s Run (Figure IV-23). Structure damage and stream heaving were noted.

Smith Creek Problem Area- Emerald Mine

- Located approximately 1100 feet from the nearest longwall mining in Emerald’s A Panel when damage was reported to multiple structures on December 3, 1993.
- The A Panel was mining under a hilltop/ridge, while the structures were located near the stream valley of Smith Run (Figure IV-24).
- Additional damage occurred when the adjacent A+ panel was being mined in August 1994, which mined to within 750 feet of the damaged structures.

Enlow Fork Problem Area – Enlow Fork Mine

- Located approximately 1720 feet from the nearest longwall mining in the Enlow Fork C-3 panel when damage was discovered.
- The C-3 Panel was mining under a hilltop/ridge, while the structure was near the stream valley of Enlow Fork (Figure IV-25).
- Minor but noticeable damage occurred to three structures over the period from March 15, 1999 to June 14, 1999.

Interstate 70 – Eighty Four Mine

- A study was completed by GeoTDR, Inc. for DEP to examine the effects of longwall mining by Eighty-Four Mining Company's Mine 84 under a 1.5-mile stretch of Interstate 70 in South Strabane Township, Washington County. Longwall mining occurred adjacent to the study segment beginning in November 1999 and under two sections of highway in the study segment in 2000. The study addressed effects of longwall mining conducted in Panel 3 South and Panel 4 South.
- This study evaluated surface subsidence effects as well as subsurface deformation within the overburden. The study showed instances where overburden deformation occurred over 1000 feet in front of the longwall face. The study noted one location where overburden movement occurred more than 443 feet from the edge of the longwall panel. This particular location was in a valley bottom, and movement resulted from mining the adjacent Panel 3 South, which undermined a hilltop setting (Figures IV-26 and IV-27).
- The study showed that subsurface movement occurs well beyond the limits of mining and the location of observed surface movement.

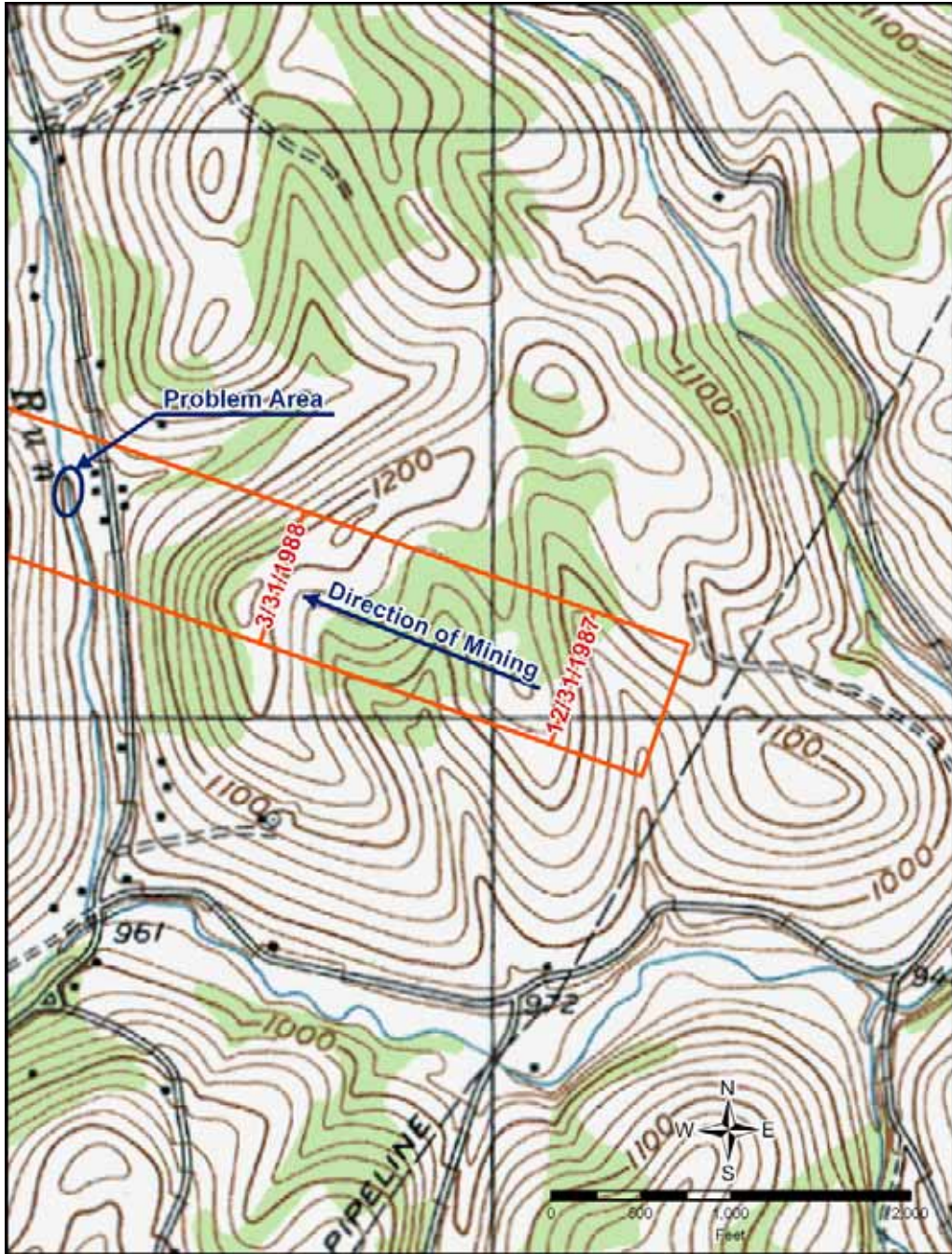


Figure IV-22: Location of Sugar Run Problem Area.

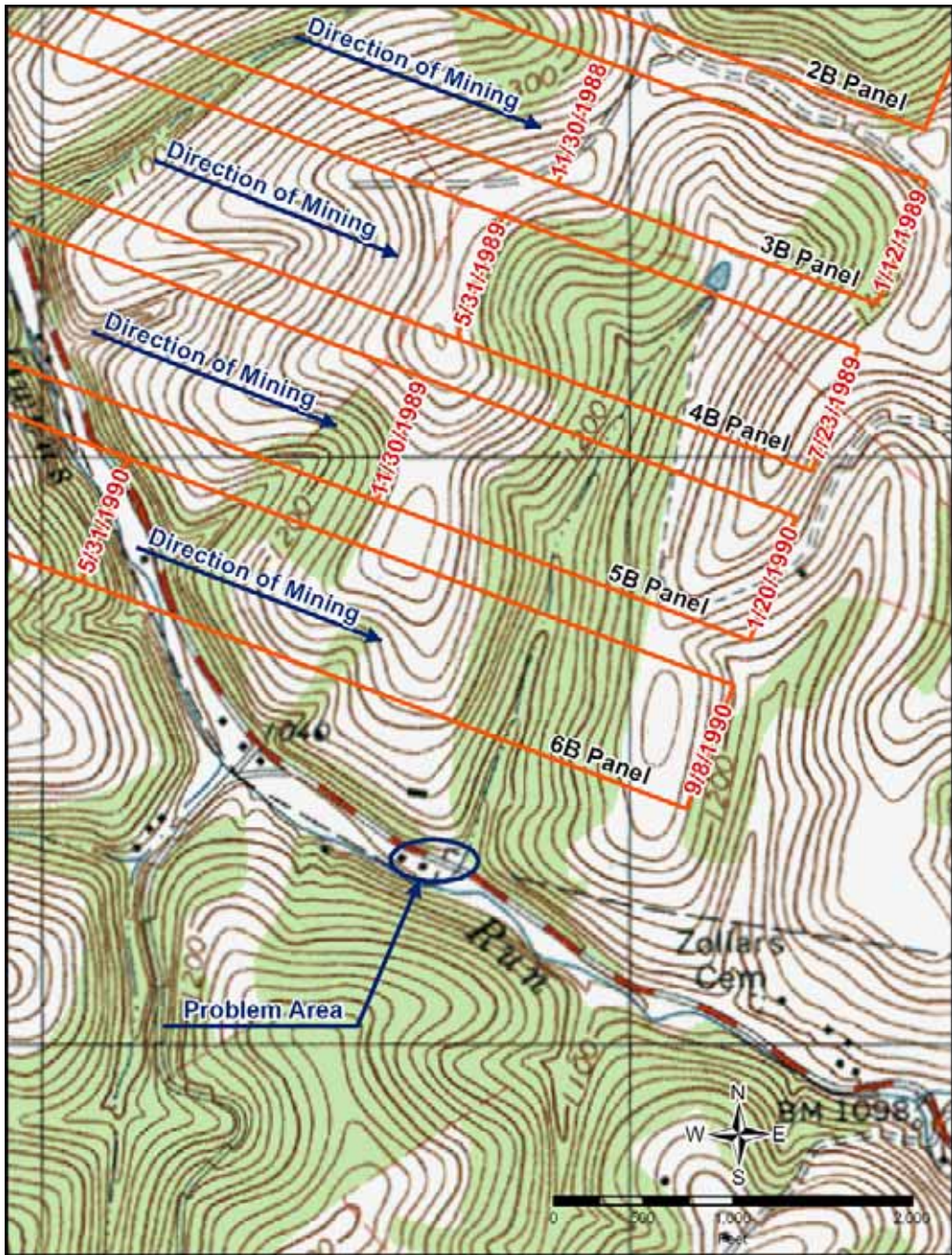


Figure IV-23: Location of Owens Run Problem Area.

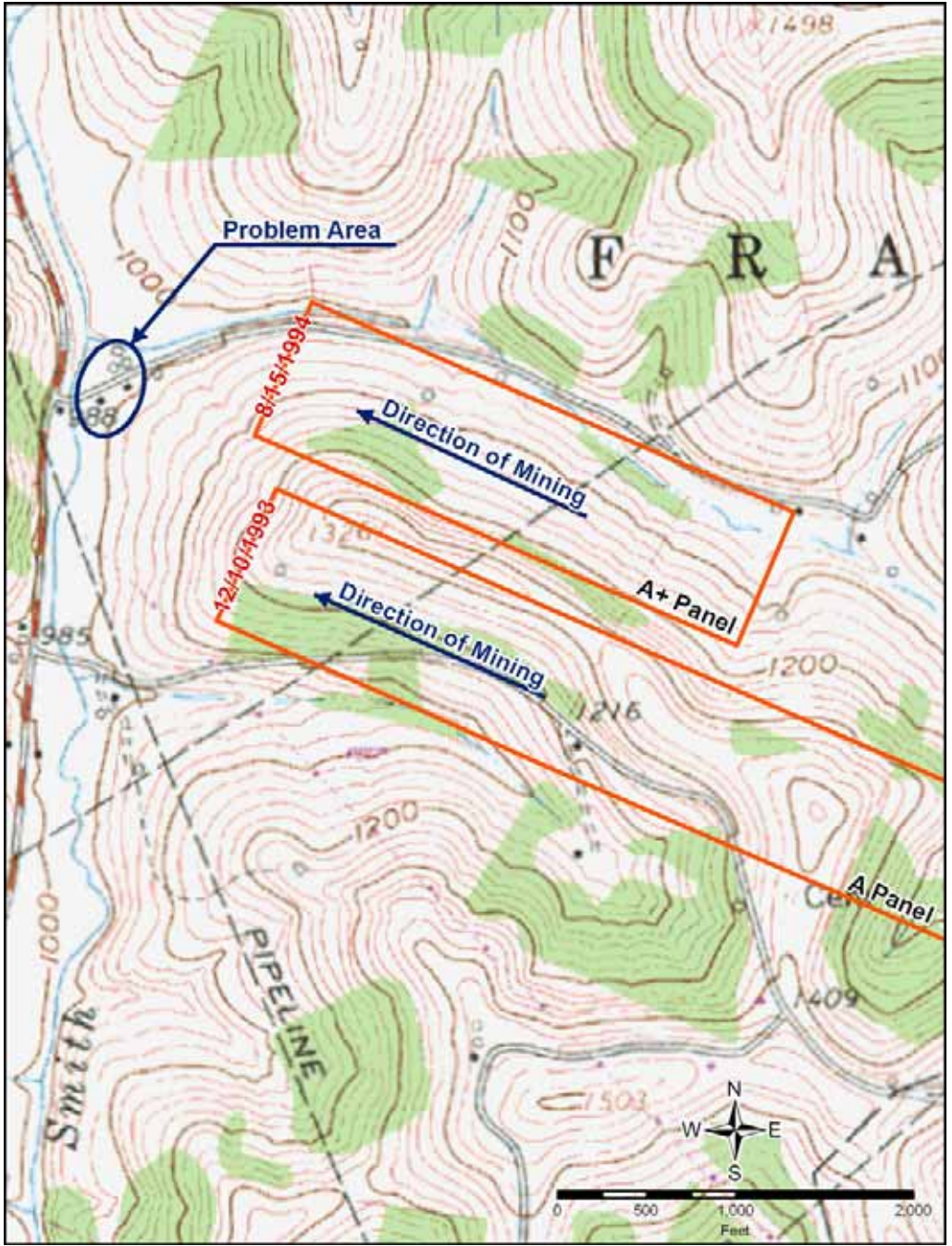


Figure IV-24: Location of Smith Creek Problem Area.

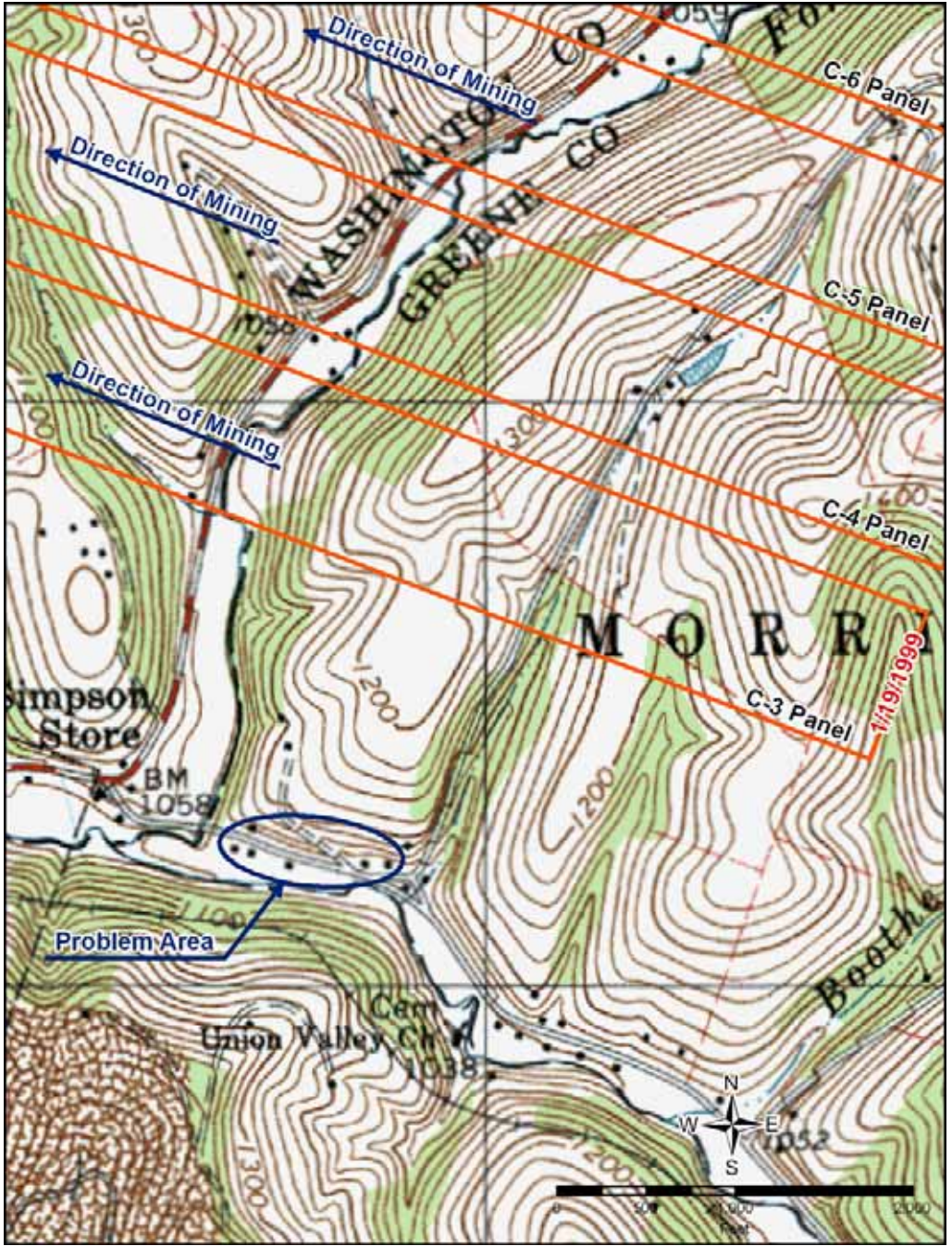


Figure IV-25: Location of Enlow Fork Problem Area.

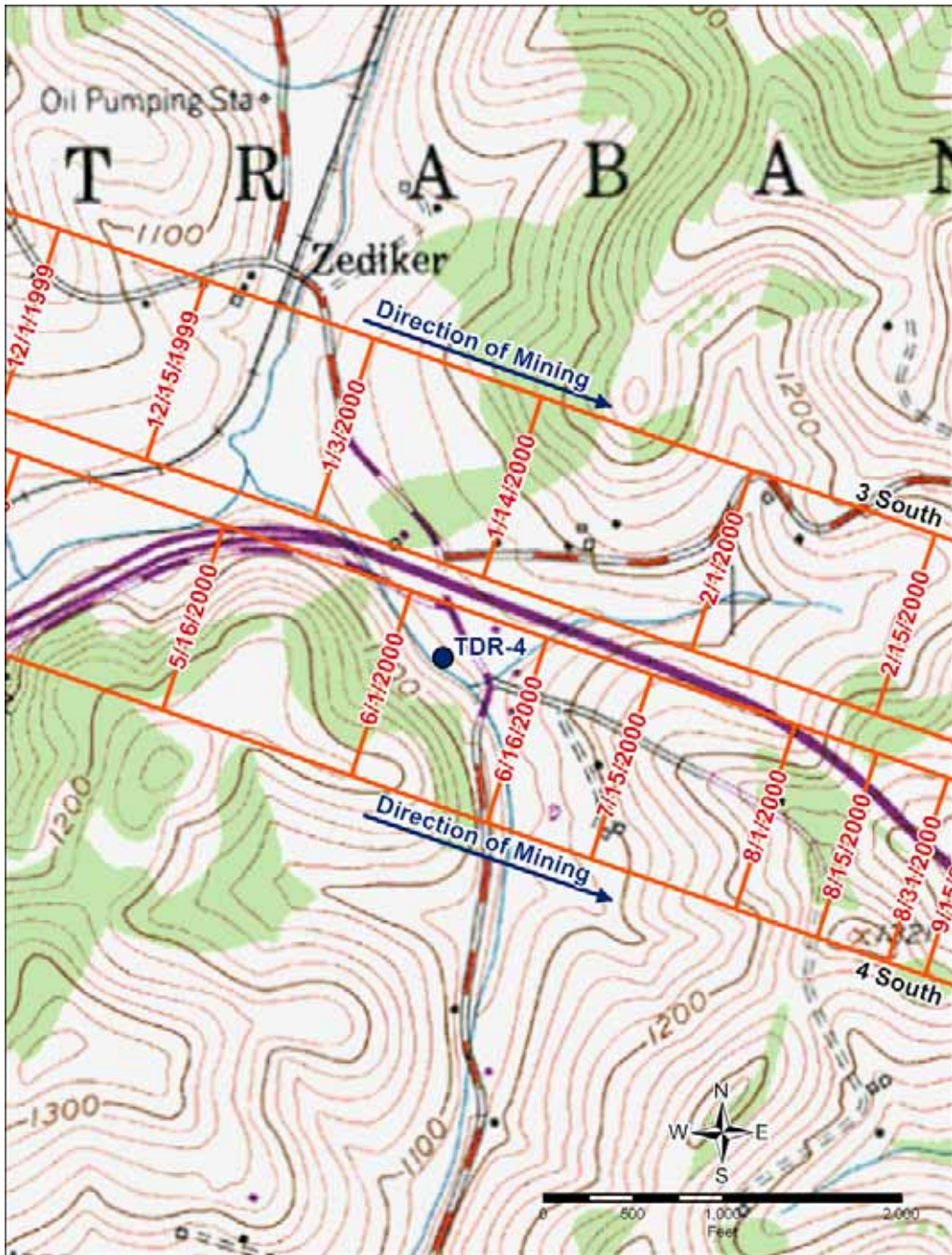


Figure IV-26: Location of Mine 84 Interstate 70 Study.

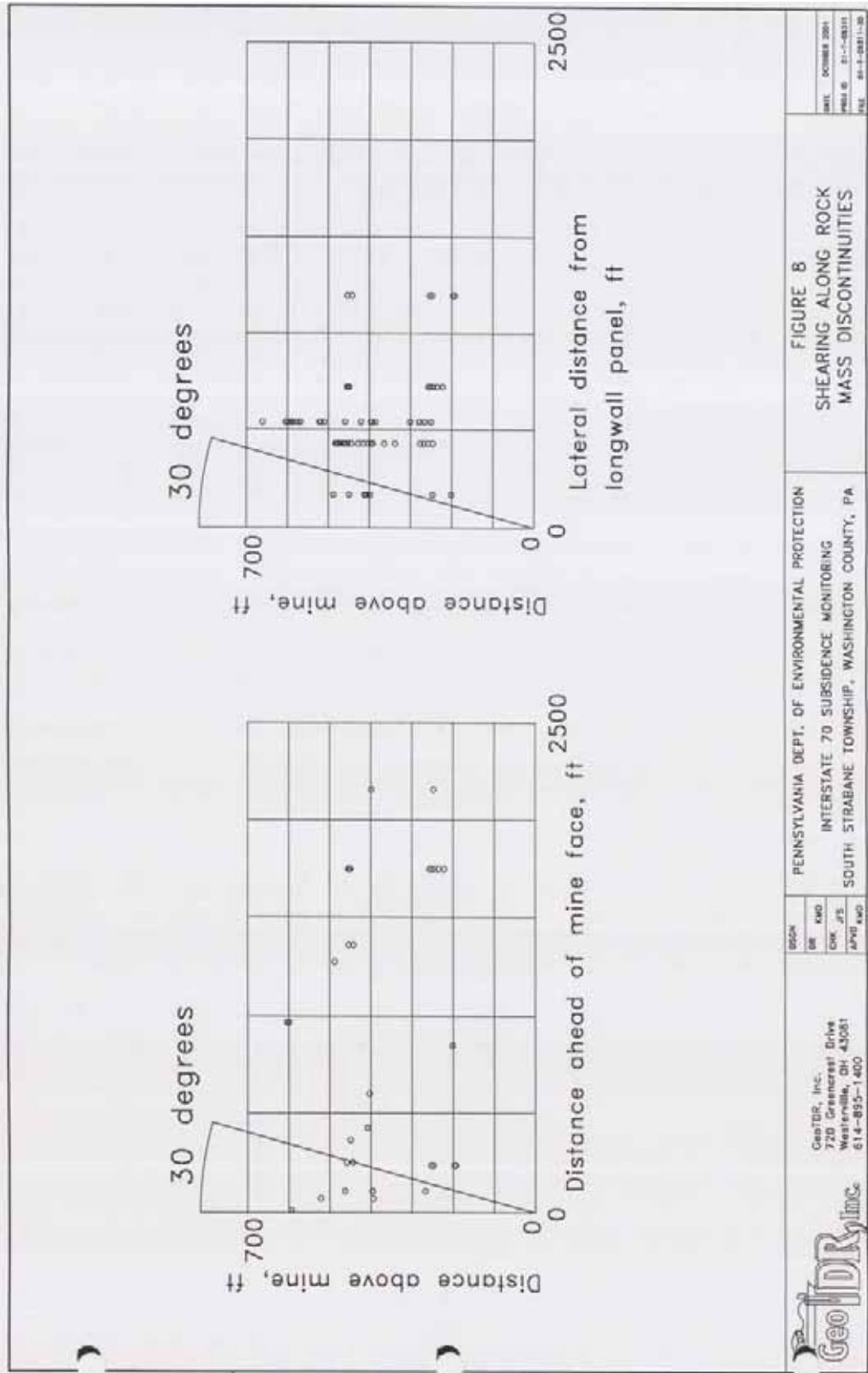


FIGURE 8
SHEARING ALONG ROCK MASS DISCONTINUITIES

PENNsylvania DEPT. OF ENVIRONMENTAL PROTECTION
INTERSTATE 70 SUBSIDENCE MONITORING
SOUTH STRABANE TOWNSHIP, WASHINGTON COUNTY, PA

GeotDR, Inc. 720 Greenway Drive Westonville, OH 43081 614-895-1400	DRG# DR# DRK #/S APVT#	DATE: OCTOBER 2001 PAGES: 211-28211 FILE: 84-1-0011.02
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GeoDR, Inc.

Figure IV-27: Shearing along rock mass discontinuities (Geo TDR, Inc – Effects of Undermining Interstate Route 70).

PART IV

SECTION G - DISCUSSION

The role of the DEP's Investigation Team in this portion of the mine subsidence claim review process is to determine whether damage to the Ryerson Station Dam is attributable to CPCC's mining activities at the Bailey Mine. DCNR and CPCC disagree about this question. Their respective positions are summarized in Part II.F, above, and will not be repeated here.

The DEP Investigation Team considered all evidence available to it in reaching its conclusions regarding this step in the review process. The information considered included consultant reports, monitoring data, dam inspection reports, technical literature reviews, file reviews, and DEP's own experiences with mine subsidence in general and specifically the Ryerson Station area.

The DEP Investigation Team's bases for the Conclusions set forth in Part III, above, will be discussed in this section.

1. The dam was competent and serviceable throughout its 45 year lifetime, requiring only typical repairs and maintenance prior to 2005, and was competent and serviceable in early 2005.

The Ryerson Station Dam was subject to significant forces sufficient to cause major structural damage in late spring to early summer of 2005; however, prior to this time it was serviceable and competent. The Investigation Team reviewed countless records of dam inspections and thoroughly evaluated and considered the conditions of the dam throughout its life. These records show that the dam was competent and serviceable and fulfilled its function (i.e. impounding the stream to create Duke Lake) for 45 years. In this time period it required normal repairs and routine maintenance. As the dam aged, as expected, the repairs and maintenance were required more frequently. Nevertheless, the dam was functional until early summer of 2005. This is demonstrated when the dam withstood record rainfall events as recent as September 2004 and January 2005 without functional impairment. Dam inspections and reports are summarized in Part II-B and Appendix 1 of this report.

2. The Ryerson Station Dam experienced significant movement and damage beginning in the spring and into the summer of 2005.

Beginning in April 2005 and continuing well into the summer, the Ryerson Station Dam experienced significant movements. Visual examinations indicated the right or east side of the dam was moving horizontally towards the west, and there were indications of uplifting of the right side. Physical monitoring beginning in August 2005, confirmed that horizontal and upward vertical movements were occurring and continuing. However, because physical monitoring only began in August 2005, it did not measure observed, but

unquantified, movements that occurred since spring of 2005. Observations and other qualitative indications demonstrated these earlier movements. In July 2005, conditions reached the point where DCNR and DEP Dam Safety officials concluded that the lake should be drained and the dam should be breached to protect downstream persons and property from damage and injury.

The damage and changing conditions are well documented by various parties including staff from DCNR and DEP. CPCC videotaped the conditions of the dam on April 12, 2005 in an effort to satisfy DEP regulations to document pre-mining conditions of structures. The pre-mining inspection was required because underground mining was taking place in CPCC's Bailey Mine in areas north and northwest of the dam. The Bailey Mine was conducting longwall mining operations in a series of panels known as the "I" Panels. These panels were being advanced in an east to west direction, and as each panel was completed, the next panel would begin south of the previous panel. The April 12, 2005 video tape does not document pre-mining conditions because longwall mining had already commenced, but it is the closest visual record to pre-mining condition of the dam that exists.

3. Even after the dam was breached, movements at the dam were detected into 2006

Though the dam was breached in July 2005, monitoring by Gannett Fleming (DCNR's consultant) continued well into 2006. CPCC's longwall mining progressed to other panels in 2006, Panels 5I and 7I. The ongoing monitoring showed that the dam continued to move as longwall mining progressed through these panels.

4. The timing of the movement and damage at the dam coincides with CPCC's mining at the Bailey mine in Panels 3I – 7I.

CPCC conducted longwall mining operations in Panels 3I, 4I, 5I and 7I at the Bailey mine in a roughly two year period between December 2004 and December 2006. The Ryerson Station Dam experienced significant ground movements and serious damage, which lead to its breaching, in this time period. The dam was regularly and extensively inspected through its 45 year life. However, this record shows that the dam did not experience such movements and damage at any other time in its existence.

5. Previous documented incidents show that longwall mining has the potential to cause mining induced movements and damage at distances beyond the areas where customary subsidence theory would predict such impacts.

The DEP Investigation Team explored whether there were other known incidents involving ground movements associated with longwall mining that occurred beyond the area of ground movement predicted by customary mine subsidence theory. Though several technical papers describe movements at remote distances from longwall mining in

the Australian coal fields, the Investigation Team was particularly interested in incidents occurring in settings similar to the Ryerson Station State Park area in Pennsylvania or other portions of northern Appalachia.

The Investigation Team asked CPCC whether it knew of any instances, either in western Pennsylvania or elsewhere, where ground movements or structure damage occurred beyond the area predicted by customary longwall subsidence theory.

CPCC identified five cases. These cases were all examples of unexpected movements at distances beyond the generally recognized area of influence predicted by customary mine subsidence theory. See Part IV-E, above.

Several of the cases identified by CPCC correlate to phenomena observed by the DEP Team in its investigation.

Case 1 is similar in setting and topography to unexpected movements observed by DEP at Ryerson Station along Bristoria Road referred to by DEP as the “Log Cabin Area” (See Sites 1-4, Section IV-D of this report).

Case 2 relates to an area of Panel 2I just northwest of the Ryerson Station Dam and involves the same stream valley as the events of the log cabin area. This stream valley is between Ridge 2 and Ridge 3 as shown on Exhibits 1 and 2.

Case 4 relates to monitoring along State Route 21.

Further details regarding these cases are found at Part IV-E of this report.

The Investigation Team also culled through DEP’s experiences and records of mine subsidence investigations and observations. Five incidents where ground movements were observed beyond the area where customary mine subsidence theory would predict such movements were identified. Each case occurred in southwestern Pennsylvania. In each case, longwall mining was conducted beneath a hilltop and ridge topography and movement or damage was noted near a stream valley. The first four cases involved surface impacts at distances from the nearest longwall mining ranging from 800 to 1,720 feet. The fifth case related to movements within the overburden above the Eighty-Four Mine in Washington County, Pennsylvania. Monitoring showed overburden movements over 1,000 feet in front of the longwall face and one location near a stream valley where overburden movement occurred more than 443 feet from the edge of the prior longwall panel. See Part IV-F for further details of these cases.

These observations show that longwall mining has the potential to cause ground movements at distances significantly beyond the area predicted by customary mine subsidence theory.

6. Many phenomena that are consistent with mining induced ground movement, such as road heaving, pipeline buckling, and structure movements were observed in the vicinity of the dam, but outside of the area predicted by customary subsidence theory.

While DEP staff continued to monitor conditions at the dam during August and September 2005, they also monitored areas adjacent to the advancing 4I West longwall panel for physical damage that might occur. As a result of these efforts, numerous incidents that are consistent with mining induced ground movements were observed, during the time frame of CPCC's longwall mining in the 4I and 5I panels.

The road that leads to the Ryerson Station Dam traveling from State Route 21 is known as Bristoria Road. A compression bump developed in Bristoria road near an abandoned log cabin and was observed on August 15, 2005 (see Site 1, Part IV, Section D and Exhibits 1 and 2). By August 17, 2005, the bump had increased in size to the extent that PennDOT was required to mill and repave the road surface. The 4I panel was being mined approximately 570 feet to the east and was advancing towards this location.

DEP staff discovered that similar bumps developed at this same location on two previous occasions. On January 31, 2005 a bump was reported. It was milled and repaired by PennDOT on February 7, 2005. On April 14, 2005 a bump had again developed and again was repaired by PennDOT.

In this same area on August 17, 2005, a small bridge was inspected and damage was noted to the bridge abutments. There was evidence of horizontal movement of the bridge deck in a northwest direction. This movement was towards the compression bump and away from the 4I panel face (see Site 2, Part IV, Section D and Exhibits 1 and 2).

Two other conditions were noted in this same area near the log cabin on August 17, 2005. A small plastic gas line was observed partially out of the ground in a semi-circular pattern. Between this gas line and Bristoria Road was a compression heave in the ground. The plastic gas line was observed again on August 19, 2005, and had become nearly "V-shaped", with a crimp at the top (see Sites 3 and 4, Part IV, Section D and Exhibits 1 and 2).

All four of these sites were at the base of the hill under which CPCC was then conducting longwall mining in the 4I panel. It was noted that the 3I panel was mining directly beneath the top of this same hill on February 1, 2005, a date that coincides with the first compression bump on Bristoria Road.

There is a series of northeast to southwest trending ridges in the area north of Bristoria Road. Exhibits 1 and 2 depict these ridges, and they are numerically identified for ease of reference. These ridges provide a convenient physical feature to identify the location of mining and observed phenomena. Ridge 2 branches in two segments, shown as 2A and 2B. Segment 2B extends directly to the log cabin area, while the 2A segment wraps around the hill behind the Ryerson Station Dam.

On September 8, 2005, soil separations were noticed at the anchors to both guide rails at the Lazear Lane Bridge. This bridge is downstream of the Ryerson Station Dam. The soil separations were only noted on the west side of each anchor. Because, this entire area was heavily scrutinized for damage or signs of ground movement throughout the month of August and the gaps appeared fresh, it is most likely that the movement occurred near to the time it was observed (see Site 5, Part IV, Section D, and Exhibits 1 and 2).

The intersection of Bristoria Road and Route 21 lies in a similar topographic setting as the log cabin area discussed above (see Route 21/Bristoria Road Intersection Area, and Ridge 3 on Exhibits 1 and 2). This area was monitored closely as the 4I panel was approaching Ridge 3 and 4. The 4I panel undermined these ridges from late August to mid to late September, 2005. During this period several phenomena consistent with mining induced ground movement were documented. These are identified as Sites 6-11 in Part IV, Section D and Exhibits 1 and 2, and are summarized in the following table.

SITE	DESCRIPTION	DATE FIRST OBSERVED
6	Compression bump, Route 21	September 12, 2005
7	Compression bump, Route 21	September 13, 2005
8	Cracks in road surface, Route 21	September 15, 2005
9	Problems at Bottinelli property	September 15, 2005
10	Soil separation at guide rail anchor	September 16, 2005
11	Stream Heave, North Fork of Dunkard Fork	September 16, 2005

After discovering the stream heave identified as Site 11, DEP examined the entire streambed of the North Fork of Dunkard Fork, beginning at the downstream bridge in Ryerson Station and continuing to the Ryerson Station Dam. This inspection was conducted on September 19, 2005. On this date, a compression zone was discovered in the streambed at a location just downstream of Texas Eastern's Holbrook Compressor Station. A section of the streambed was heaved. In addition, an inactive Texas Eastern pipeline which crossed the stream was heaved out of the stream. The heave occurred shortly before it was observed. It had not been observed during prior inspections, and its physical condition (i.e. the fresh appearance of ground cracks, lack of slumping, moistness of the soil on the pipeline) showed that the heave occurred recently (see Site 12, Part IV, Section D and Exhibits 1 and 2).

On September 20, 2005, ground movements were reported by Texas Eastern officials at their compressor station located immediately downstream of the Lazear Lane Bridge and the Ryerson Station Dam. Site 13, Part IV, Section D contains photographs of the site, and the location is shown on Exhibits 1 and 2. The exact date of occurrence of the movements are not known, however the site was closely inspected just prior to a meeting held at the Ryerson Station State Park Office on September 8, 2005, and no such problems were noted.

CPCC disputes that ground movements, which are not predicted by customary mine subsidence theory occurred in the area of the Ryerson Station Dam. To support this position, CPCC points to four survey points it established at the Texas Eastern facility in 1997. The locations of these points are shown on Figure IV-28. These points were monitored on March 23, August 22, October 4, and December 9 of 2005. CPCC reports that no ground movement occurred at any of these monitoring points.

However, the DEP Investigation Team does not agree that these results rebut or diminish the importance of the actual observations detailed in this report. CPCC's monitoring occurred in a small portion of the Texas Eastern facility. All of these phenomena occurred outside of this small area. Even the ground movements reported by Texas Eastern occurred outside of the monitoring area established by CPCC and closer to the North Fork of Dunkard Fork and the 4I panel than the CPCC survey points.

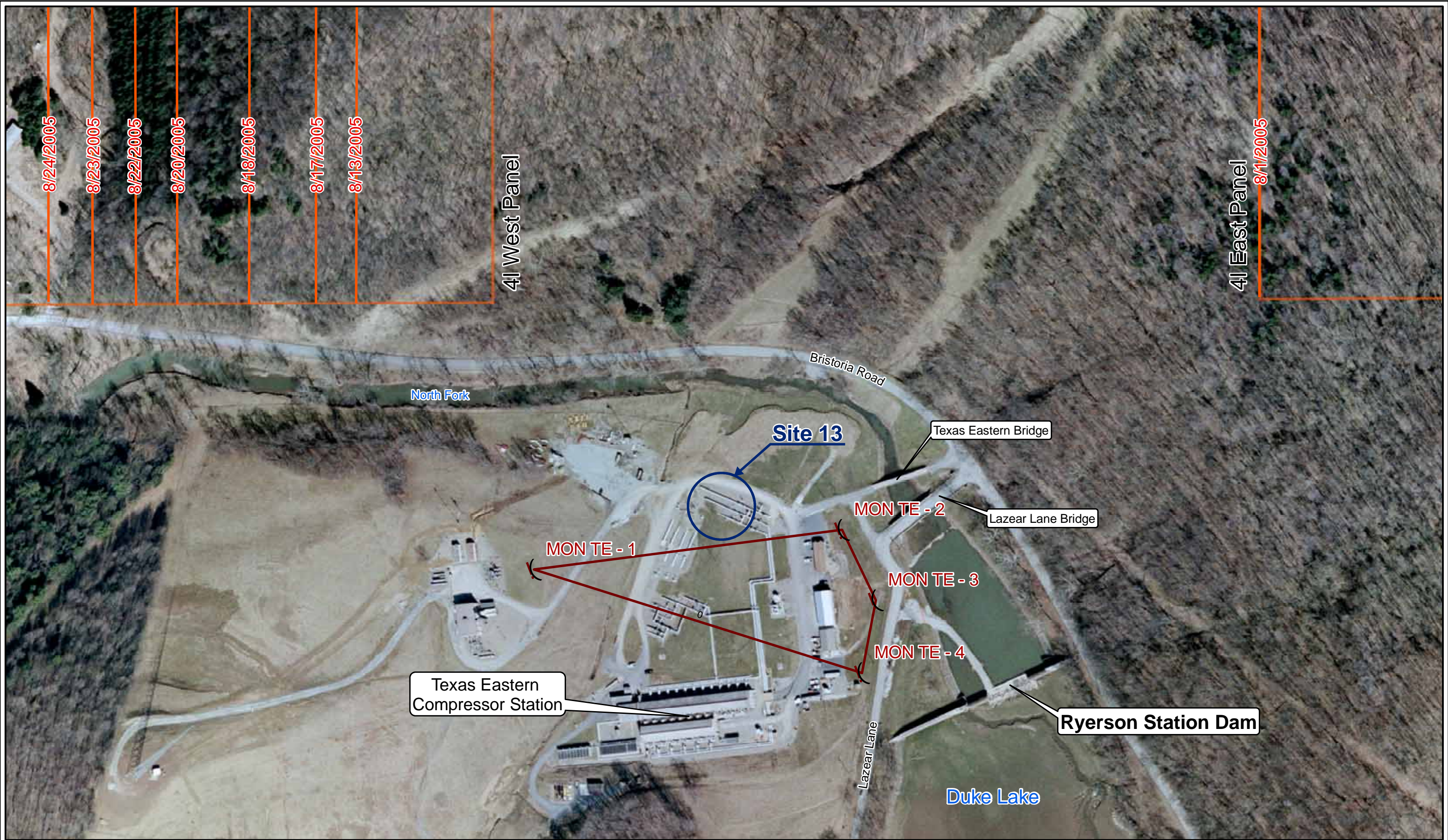
Site 14 in Part IV, Section D involves a pipeline located along the North Fork of Dunkard Fork. It is on the northern side of the stream, south of the Route 21 monitoring area previously discussed, and nearly midway between the 5I and 7I panels. A solid block of coal over 1,600 feet wide was left in place in this area. See Exhibits 1 and 2 for the location of this site with respect to the Bailey Mine longwall panels.

Photo IV-14a is a photograph of this pipeline taken on September 26, 2005. The pipeline was observed to be above ground in places. Upon close examination there was evidence that the pipeline may have recently lifted. At this time, longwall mining was taking place in the 4I panel, having just mined beneath Ridge 4. This pipeline condition was noted 10 to 14 days following sites 6-11 described above.

Photo IV-14b is a photograph of the same pipeline taken on February 2, 2006. The pipeline had lifted considerably more than previously noted. By this time the 4I panel was complete and longwall mining was taking place in the 5I panel. The panel had progressed beneath Ridges 5B, 5C, and 5D, just north of Route 21

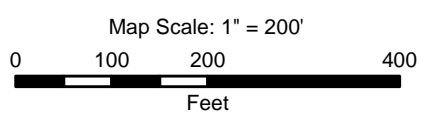
Photo IV-14c is a photograph of the same pipeline taken on October 3, 2006. The pipeline had again lifted more than what was noted on February 2, 2006. The 7I panel started in late April 2006 and mined directly beneath a long ridge trending northwest to southeast. By October 3, 2006, the panel had already mined beneath the highest points of this ridge, which is directly across the stream valley from the noted pipeline.

Gannett Fleming monitored a portion of Route 21 during the period when CPCC was conducting longwall mining within the 5I Panel. Gannett Fleming reports fairly consistent horizontal movements away from the 5I Panel and towards the North Fork of Dunkard Fork.



Data Sources: Base Mapping - PAMAP Project Aerial Photography.
 "Mined Longwall Panel" - Digitized from Bailey Mine 6-month mine maps provided by CPCC.
 "Longwall Face Location" - Digitized from plus readings provided by CPCC.
 "CPCC Monitoring Area" and "CPCC Monitoring Points" - Digitized from "Monuments At Texas Eastern Compressor Station" map provided by CPCC.

- Legend**
- Mined Longwall Panel
 - Longwall Face Location
 - CPCC Monitoring Area
 - ! CPCC Monitoring Points



Prepared By: Department of Environmental Protection
 California District Office
 February 2010

Figure IV-28: Aerial Photograph showing CPCC Monitoring Points and Monitoring Area located near, DEP Site 13, the Texas Eastern Compressor Station.

CPCC disputes these results, and asserts that its own monitoring showed horizontal displacements that were generally small (less than 0.05 feet, or 0.6 inches), and concludes the movements “appeared, overall, to be nonsystematic and within the realm of survey error.” However, it did not offer plausible explanations for the observed phenomena by DEP.

A similar situation existed regarding monitoring near the swimming pool area and Lazear Lane, south of Duke Lake. CPCC monitoring did not pick up movements outside the expected area of influence of the 7I panel, while Gannett Fleming detected consistent horizontal movements away from the panel and towards the center of Duke Lake with nearly 2 inches of horizontal movement over 800 feet from the panel edge (Figure IV-7).

The Gannett Fleming monitoring program indicated a common pattern of small horizontal movements outside the customary area of influence of the 5I and 7I longwall panels, with the general direction of movement toward the stream valley. Similar movements were detected at the Ryerson Station Dam and the vicinity of the Lazear Lane Bridge, as depicted on Figure IV-1. This monitoring is discussed in more detail in Part IV, Section B above. These results are consistent with DEP’s observations of ground movement phenomena in the Ryerson Station area.

7. Empirical evidence suggests where ground movements have been observed beyond the area predicted by customary mine subsidence theory, the mining typically occurred below hilltops or ridges and the ground movements were manifested in stream valleys.

Each of the ten examples of ground movements that occurred beyond the area that would typically be predicted by customary mine subsidence theory discussed earlier in this section share some physical characteristics. Each incident occurred where longwall mining was conducted beneath hilltop and ridge topography, and the ground movements were typically manifested in a valley. The area of the Ryerson Station Dam investigation also shares these physical characteristics. CPCC conducted longwall mining in the 3I – 7I Panels under hills and ridges, and ground movements were observed in valleys. This correlation of the physical characteristics of the Ryerson Station Dam investigation area and other cases of unexpected ground movements provides empirical support for DEP’s conclusion. However, the DEP Investigation Team will not offer a theoretical explanation of the role that hilltop and ridge and valley topography may play in ground movement. Doing so would be beyond the scope of this investigation.

8. The dam is a massive concrete structure, which is anchored into bedrock. Only powerful earth forces could cause the movement and damage observed in 2005 and 2006.

On many mine subsidence investigations the structures investigated, such as slabs and residential foundations, are small and light enough that common natural forces, such as

expansive soils, freezing and thawing, settlement, and surface and subsurface erosion of base material, can move them. The Ryerson Station Dam is not such a structure. It is a massive concrete structure, made of many thousands of yards of concrete. Consequently, only very powerful earth forces, such as those associated with mine subsidence, could move the dam and damage it.

9. The dam is a large rigid structure that acts like a strut across the valley. Unlike homes and structures, typical subjects of mine subsidence investigations, it cannot deflect and deform, and remain functional and structurally sound because of its composition, location, and orientation.

DEP has extensive experience observing structures that experience mine subsidence and investigating claims of mine subsidence damage. Typically, these structures are residences, commercial buildings and outbuildings. These types of structures are fairly flexible, allowing them to absorb limited amounts of ground movement with minimal or no structural damage. The Ryerson Station Dam is fundamentally different. It is a rigid structure that is anchored into bedrock and acts as a “strut” across the valley. When movement occurs perpendicular to the valley, as it did here, the dam can not deform and it can not move without suffering functional or structural consequences. Thus, even relatively small movements would result in great forces on the dam and subsequent damage to the dam.

10. The SDPS mine subsidence model is based upon customary subsidence theory. The model cannot predict remote horizontal movements, and does not take complex topography into account to a significant degree.

CPCC points to the results of the SDPS program, which predicts that mine subsidence effects from longwall mining in the 3I and 4I panels, would not occur at the dam. SDPS employs customary subsidence theory. It is not designed to account for ground movement that may occur beyond the mine panel and the immediate area outside of the panel. In addition, SDPS does not take complex topography into account to a significant degree. As discussed above, empirical observations suggest that the presence of ridges and hilltops above the mined panel and valleys may have some effect on where ground movements occur beyond the area predicted by customary subsidence theory. The DEP Investigation Team offers no opinion on the applicability of SDPS; such an evaluation is beyond the scope of this investigation.

11. No other cause for the movement and damage experienced by the Ryerson Station Dam in the spring and summer of 2005 exists; dam instability and hillside instability have been excluded as potential causes.

Finally, there is no other viable cause for the movement and damage experienced by the Ryerson Station Dam in the spring and summer of 2005. The DEP Investigation Team

considered two possible non-mining causes for the movement and damage experienced by the dam: structural instability and hillside instability.

The stability of Ryerson Station Dam with respect to external loading conditions, such as normal pool with ice loads, record flood pool and record seismic loading, was evaluated by Gannett Fleming. Gannett Fleming performed an extensive investigation of the dam and adjacent areas. The dam was evaluated for potential historical movements that may have led to the movement and distress experienced at the dam in 2005.

The analyses computed resultant locations, maximum base pressures, and sliding safety factors for the three conditions indicated above. The analyses showed that the dam's resisting capability exceeds all three loading conditions by an acceptable factor. Additionally, the direction of the observed movements of the dam is inconsistent with those that would be experienced to result from the potential loadings considered.

The stability of the hillside above and to the right of the Ryerson Station Dam was also evaluated by Gannett Fleming. Gannett Fleming performed an extensive investigation of the area including, field inspections of the hillside to obtain geologic information and to identify discontinuities. Core borings were drilled along the dam and in the slope above the dam, with slope inclinometers installed in the borings to identify potential failure surfaces. Additionally, laboratory testing was performed on rock samples obtained from these borings to develop accurate strength parameters for the rock.

Stability analysis using multiple computer programs and hand calculations were performed using the data obtained to assess the hillside's stability. Analyses performed included deep seated failures through rock, seismic analysis, and shallow failures through the soil mantle only. The results indicated an acceptable factor of safety above 1.5 except for the shallow soil failures. The soil failures were also considered as a possible cause and rejected because the thin soil mantle is thin (typically seven feet or less), and the soil outcrops above the dam.

The Investigation Team found Gannett Fleming's analysis of dam stability and hillside stability to be credible, and agrees that the movements and damage to the dam were not caused by dam instability or hillside instability.

Accordingly, the DEP Investigation Team could find no other viable potential causes of the movement and damage experienced by the Ryerson Station Dam.

12. CPCC's longwall mining in the 3I and 4I panels resulted in ground movements which damaged the Ryerson Station Dam.

Therefore, after an extensive and careful field investigation and evaluation of information and evidence obtained from CPCC, DCNR, DEP files, research and other sources, DEP concludes that CPCC's longwall mining in Panels 3I and 4I caused the movement and damage to the Ryerson Station Dam.

PART V SUMMARY

This interim report contains the partial results of the Department of Environmental Protection's (DEP) investigation of the DCNR's claim of mine subsidence damage to the Ryerson Station Dam. In this step, DEP conducted an extensive investigation into whether the movements and damage experienced at Ryerson Station Dam were attributable to CPCC's longwall mining operations at the Bailey Mine. The Investigation Team assembled and evaluated available information about the dam, CPCC's mining activities and the general area from DEP files, from CPCC and DCNR, and other sources. In addition, this effort included extensive field investigation. Both DCNR and CPCC met with the DEP Investigation Team to present their position about the cause of the movement and damage sustained by the dam.

Following an extensive and detailed review of the information collected and observations of the site and based upon the evidence, DEP has concluded that CPCC's longwall mining in the 3I and 4I panels resulted in ground movements which damaged the Ryerson Station Dam.

This conclusion is an interim step in the claim investigation, and allows the claim investigation to move into its next stage, which will address the remedy. Under the Mine Subsidence Act and regulations, DEP may require CPCC to compensate DCNR for the damage, or require it to repair or replace the structure. The investigation will not be complete until this remedy step has concluded. DEP will contact DCNR and CPCC in the near future and initiate this step. The Department will not take an administrative action until the claim investigation is complete.

GLOSSARY OF TERMS

Angle of draw – This is the angle between a vertical line drawn upward to the surface from the edge of the underground opening and a line drawn from the edge of the opening to the point of zero surface subsidence.

Breach – Remove a section of a dam to prevent the dam from impounding water.

Concrete Gravity Dam – A structure designed to safely impound water entirely by its weight and internal strength.

Extensometer – An extensometer is a device that is used to measure changes in the length of an object. It is useful for stress-strain measurements.

Inclinometer – An inclinometer is an instrument for measuring angles of slope (or tilt), elevation or inclination of an object with respect to gravity. It is also known as a *tilt meter, tilt indicator, slope alert*.

Non-overflow Section – The section of a dam adjacent to the spillway designed to safely impound water in amounts up to the flood for which the dam was designed.

Ogee Weir or Ogee Section – A spillway designed to pass flow through a dam. In cross section the weir is in the shape of an “S”, or ogee.

Spalling – The process by which fragments of a larger mass break away due to stress.

Spillway – The portion of the dam designed to safely pass the flow past the dam. The structure may be a primary spillway designed to pass normal flows, an emergency spillway designed to pass flood flows, or a combination spillway designed to pass both.

Acronyms

DEP	Pennsylvania Department of Environmental Protection
DCNR	Pennsylvania Department of Conservation and Natural Resources
CPCC	Consol Pennsylvania Coal Company
BMSLCA	Bituminous Mine Subsidence and Land Conservation Act
AIR	Annual Inspection Report

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List of Exhibits

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1	Ryerson Station Dam Features with Topographic Maps	1:6,000	CPCC's Bailey Mine six month maps (Sheets 1603, 1604, 1703, 1704 & 1705) and plus readings Gannett Fleming - Volume II USGS Wind Ridge & New Freeport 7.5' Topographic Maps
2	Ryerson Station Dam Features with Aerial Imagery	1:6,000	PAMAP Program CPCC's Bailey Mine six month maps (Sheets 1603, 1604, 1703, 1704 & 1705) and plus readings Gannett Fleming - Volume II USGS Wind Ridge 7.5' Topographic Maps
3	Ryerson Station Dam Bailey Mine Workings	1:6,000	CPCC's Bailey Mine six month maps (Sheets 1603, 1604, 1703, 1704 & 1705) and plus readings

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9. Letter dated December 3, 2008 from CPCC
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11. Letter dated January 20, 2009 from DCNR
12. Letter dated January 21, 2009 from CPCC
13. Letter dated April 9, 2009 from DCNR
14. Letter dated July 2, 2009 from DCNR
15. Letter dated August 3, 2009 from CPCC
16. Electronic submission from DCNR received October 13, 2009
17. Letter dated November 16, 2009 from DCNR
18. Letter dated December 3, 2009 from DCNR
19. Materials presented by CPCC during meeting on September 25, 2009
20. Materials presented by DCNR during meeting on October 29, 2009
21. Letter and accompanying information by DCNR dated November 3, 2008

Appendix I - History – Inspection Reports

This section is a list of excerpts from the annual and semi-annual inspection reports done on Ryerson Stations Dam since its construction on 1960. The inspections were completed by DCNR personnel (engineers and maintenance staff), DEP Division of Dam Safety personnel, and consultants.

1962 Ryerson Dam Inspection Report

Inspection Date: May 1962

Remarks:

- “A slip is putting pressure on wing wall of spillway.”
- “The breast of the dam had several leaks in the joints, some have sealed themselves, but there are still three places where it seeps through.” “These joints should be caulked when the lake is drawn down to construct the beach and boat docks.”
- “The dam being new, there is a lot of drift along the shores and in the lake bottom.” “This could also be cleaned up when the dam is drawn down, for construction of beach and boat docks.”

1962 Ryerson Dam Inspection Report

Inspection Date: November 1962

Remarks:

- “Caulking should be done on the cement seams in the breast of the dam to stop leaks.”
- “The logs, trees, and drift cleaned up along the shore line.”
- “This work project could be set up to coincide with draw down of lake to construct beach and boat docks.

1963 Ryerson Dam Inspection Report

Inspection Date: November 1963

Remarks:

- “Some seepage in breast of dam. One not showing any sealing activity.”
- “Some trash in lake.”
- “Fence posts cemented, to be re-leaded in spring.”
- “Work can be done when lake is drained for Park construction.”

1964 Ryerson Dam Inspection Report

Inspection Date: May 1964

Remarks:

- “Slip in bank between Park road and lake. Slip has dropped three feet at edge of road.”
- “Some seepage in breast of dam.”
- “Fence posts on top of breast of dam need re-leaded.”

1964 Ryerson Dam Inspection Report

Inspection Date: November 1964

Remarks:

- “Slip in bank between Park road and lake. Slip has dropped three feet at edge of road.”
- “Some seepage in breast of dam.”
- “Fence posts on top of breast of dam need re-leaded.”

December 7, 1964 Letter:

- “This is a type slip that does not move as long as it is not disturbed. To improve the appearance of this point, it was filled in with dirt and then it slipped immediately to the original condition. As a safety precaution, posts were placed around the slip. The location of the slip is halfway between the dam and the residence. It has no effect on the lake, only the entrance road.”

1965 Ryerson Dam Inspection Report

Inspection Date: June 1965

Remarks: “One entire section of construction joint near base of dam is leaking.”

1965 Ryerson Dam Annual Inspection Report

Inspection Date: September 24, 1965

Report Date: October 22, 1965

Remarks: None

Recommendations: None

1965 Ryerson Dam Inspection Report

Inspection Date: November 1965

Remarks: “One entire section of construction joint near base of dam is leaking.”

1966 Ryerson Dam Annual Inspection Report

Inspection Date: August 18, 1996

Report Date: August 25, 1966

Remarks:

- Although the seepage condition noted during previous inspections does not present a structural failure Remark it has created a ponding area which hinders maintenance efforts along the downstream face.”

Recommendations:

- “As the reservoir area has been drawn down, it is recommended that sealing of the upstream joints be accomplished at this time.”
- “we believe that a thorough cleaning of the joints, by wire brushing, and the installation of good grade of bituminous roofing cement, might stop the seepage”.
- Referring to the seepage condition mentioned above “If continued ponding should continue along the downstream face, the installation of pervious tile drains is recommended.”

1966 Ryerson Dam Inspection Report

Inspection Date: November 1966

Remarks: No Remarks reported

1967 Ryerson Dam Inspection Report

Inspection Date: May 1967

Remarks:

- “No gauge at dam.”
- “Nearly all the seams caulked in 1966 have stopped leaking”.

1967 Ryerson Dam Annual Inspection Report

Inspection Date: August 2, 1967

Report Date: December 28, 1967

Remarks: None

Recommendations:

- “Repair the deteriorated guard rail on the stream ford and apply a preservative to all of the logs.”
- “It would be desirable to install French drains to the highest weep holes in the retaining walls on each side of the spillway section. This measure will eliminate the two wet spots and facilitate mowing operations.”

1967 Ryerson Dam Inspection Report

Inspection Date: December 1967

Remarks: “No gauge at dam.”

1968 Ryerson Dam Inspection Report

Inspection Date: May 1968

Remarks:

- “No gauge at dam.”
- “Guard logs on Ford-way starting to deteriorate, several have been replaced.”

1968 Ryerson Dam Annual Inspection Report

Inspection Date: August 6, 1968

Report Date: September 3, 1968

Remarks: None

Recommendations:

- “Remove overgrowth and trees along the riprap areas downstream of the dam.”
- “Clean and paint chain link fence, which is starting to rust, along the dam abutments and spillway section.”
- “Remove logs and debris from the stilling basin and the ogee section.”
- “Replace the deteriorated guard posts upstream and downstream of the left abutment of the dam and replace the deteriorated guard rails along the downstream ford.”

1968 Ryerson Dam Inspection Report

Inspection Date: November 1968

Remarks:

- “No gauge present.”
- “Overgrowth has been removed from riprap.”
- “Rust stain has been removed from fence, posts, and braces. New aluminum barbed wire will replace rusting wire present at top of fence.”
- “Ogee is free of debris and no logs exist in stilling basin.”
- “Material is on location for replacing deteriorated guard rails.”

1969 Ryerson Dam Inspection Report

Inspection Date: May 1969

Remarks: “No gauge exists.”

1969 Ryerson Dam Inspection Report

Inspection Date: December 1969

Remarks: “No gauge exists.”

1970 Ryerson Dam Annual Inspection Report

Inspection Date: May 14, 1970

Report Date: June 5, 1970

Remarks: * *First report of structural crack*

- “Seepage has occurred through the horizontal joints and there was evidence of seepage through a vertical crack on the downstream face of the right abutment. This crack also extends along the top and upstream face of the dam.”

Recommendations:

- “Clean and paint the chain link fence with an inorganic zinc-based paint.”
- “Repair or replace dilapidated access steps along left abutment.”
- “Repair crack in right abutment with either a top and bond cement or an epoxy cement.”
- “Remove and debris in stilling basin during low water.”
- “Trail operate sluice gate periodically.”

1970 Ryerson Dam Inspection Report

Inspection Date: June 1970

Remarks: “No gauge exists.”

1970 Ryerson Dam Inspection Report

Inspection Date: December 1970

Remarks:

- “No gauge exists.”
- “Chain link fence cleaned and painted.”
- “New access steps installed.”
- “Hair-line cracks in right abutment repaired with Top and Bond”
- “Sluice gate raised and gear box greased”

1971 Ryerson Dam Inspection Report

Inspection Date: June 1971

Remarks: None

1971 Ryerson Dam Annual Inspection Report

Inspection Date: July 13, 1971

Report Date: August 2, 1971

Remarks:

- “Some seepage still present along the downstream face on both the left and right abutments.”
- “...riprap along the outlet channel slopes is heavily overgrown.”

Recommendations:

- “Repair remainder of the crack on the upstream and downstream face of the right abutment.”
- “Remove overgrowth from riprap sections of outlet channel.”
- “Remove weeds from joints.”
- “Clean stilling basin.”
- “Recommending that a minimum swath of fifty (50) foot width be kept clean of trees downstream of the toe drains of dams. Where no toe drain exists in dam, the trees should be kept at such a distance that the branches do not overhand the downstream slope of the dam. This fifty (50) foot swath serves another purpose in that area can then be mowed and wet areas, which could be due to uncontrolled seepages, will be readily noticed, investigated, and remedied before damages to the dam occur.”

1971 Ryerson Dam Inspection Report

Inspection Date: December 1971

Remarks: “Gage installed December 15, 1971”

1972 Ryerson Dam Annual Inspection Report

Inspection Date: April 24, 1972

Report Date: May 1972

Remarks:

- “...leaking along the downstream face which has been present over the past years was minimal at the time of this inspection.”
- “A small area of leakage existed on the right downstream face near the bottom of the wall. The report revealed that minor spalling is occurring where leakage has occurred in the past.”

Recommendations:

- Referring to the spalling areas “These areas should be periodically observed and any unusual conditions reported to this office.”

1972 Ryerson Dam Inspection Report

Inspection Date: June 1972

Remarks: “Sluice gate raised and checked 3/15/72”

1972 Ryerson Dam Inspection Report

Inspection Date: November 1972

Remarks: “Sluice gate raised and checked 11/30/72”

1973 Ryerson Dam Inspection Report

Inspection Date: June 1973

Remarks: None

1973 Ryerson Dam Annual Inspection Report

Inspection Date: October 17, 1973

Report Date: November 19, 1973

Remarks:

- “Slight erosion was noted in places along the downstream face of the ogee section.”

Recommendations:

- “Clean, paint, and lubricate stem, stem guide, and gate control.”
- “Remove logs and debris along the upstream face of the dam.”
- “Anchor the loose chain link fence along the downstream right abutment of the dam.”
- “Remove overgrowth along the riprapped areas downstream of the dam.”
- “Caulk the vertical crack along the downstream right abutment face.”

1973 Ryerson Dam Inspection Report

Inspection Date: November 1973

Remarks: None

1974 Ryerson Dam Inspection Report

Inspection Date: May 1974

Remarks: “Bi-annual gate inspection and operation conducted 5/29/74”

1974 Ryerson Dam Annual Inspection Report

Inspection Date: June 6, 1974

Report Date: June 26, 1974

Remarks: None

Recommendations:

- “Lubricate stem, stem guides, and gate control.”
- “Remove logs and debris from the upstream face of the dam.”
- “Remove the overgrowth along the riprapped areas downstream of the dam.”

1974 Ryerson Dam Inspection Report

Inspection Date: November 1974

Remarks: “Bi-annual gate inspection and operation conducted 11/26/74”

1975 Ryerson Dam Inspection Report

Inspection Date: May 1975

Remarks: None

1975 Ryerson Dam Annual Inspection Report

Inspection Date: September 23, 1975

Report Date: December 4, 1975

Remarks: None

Recommendations: Unable to read

1975 Ryerson Dam Inspection Report

Inspection Date: November 1975

Remarks: "Gate tested 9/2/75"

1976 Ryerson Dam Inspection Report

Inspection Date: June 1976

Remarks: "Gate tested 6/4/76"

1976 Ryerson Dam Inspection Report

Inspection Date: August 24, 1976

Report Date: September 15, 1976

Remarks:

- "...leakage was in evidence flowing through the bottom right horizontal joints of the ogee section."
- "The lake flow was just trickling over the center portion of the ogee section."

Recommendations:

- "Remove tree and brush along downstream riprap areas."
- "Remove debris and deposits from stilling basin."
- "Crack open and close the gate valve twice annually. Lubricate gate stem at stem guides."

1976 Ryerson Dam Inspection Report

Inspection Date: November 1976

Remarks: None

1977 Ryerson Dam Inspection Report

Inspection Date: May 1977

Remarks: None

1977 Ryerson Dam Inspection Report

Inspection Date: September 21, 1977

Report Date: September/October 1977

Remarks:

- "A little seepage was noted flowing through the horizontal joint along the downstream right side of the dam."

Recommendations:

- "Remove tree and brush from the downstream riprap areas."

1977 Ryerson Dam Inspection Report

Inspection Date: November 1977

Remarks: None

1978 Ryerson Dam Inspection Report

Inspection Date: May 1978

Remarks: None

1978 Ryerson Dam Inspection Report

Inspection Date: November 1978

Remarks: None

1979 Phase I Inspection Report – National Dam Inspection Program By D’Appolonia Consulting Engineers

Inspection Date: December 6 and 21, 1978

Report Date: April 22, 1979

Remarks:

- “A structural crack was observed on the downstream face of the dam near the right abutment and extending across the crest. Only minor seepage was associated with this crack, indicating that the crack does not extend through the whole section. This condition is not considered to be serious relative to the overall stability of the dam at this time.”

Recommendations:

- “The structural crack observed near the right abutment should be regularly inspected and monitored for signs of further structural distress, such as displacement in increased quantity of seepage through the crack. Necessary remedial measures should be performed if such conditions are observed.
- “An around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system developed to alert the downstream residents in the event of emergencies.”
- “The dam and appurtenant structures should continue to be inspected regularly and necessary maintenance should be performed.”

1979 Ryerson Dam Inspection Report

Inspection Date: June 1979

Remarks: None

1979 Ryerson Dam Inspection Report

Inspection Date: November 1979

Remarks: None

1980 Ryerson Dam Annual Inspection Report

Inspection Date: June 25, 1980

Report Date: July 29, 1980

Remarks:

- “Right abutment – slight seepage from vertical crack.”
- “Evidence of slight seepage along downstream face on left and right sides.”

Recommendations:

- “Referring to vertical crack in right abutment – “This crack should be repaired with “Secrete” Top and Bond or equal.”
- “Remove brush from the ripped areas of the channel slopes.”
- “Repair steps” referring to top step of wooden steps at left side of dam.
- “Remove underbrush and trees in this area” referring to area along the left side of the stream channel.”

1981 Ryerson Dam Annual Inspection Report

Inspection Date: March 13, 1981

Report Date: March 30, 1981

Remarks:

- None

Recommendations:

- “Remove the small trees and brush from the riprapped side slopes of the spillway channel.”
- “Periodically monitor the seepage at the vertical structural crack and at the horizontal construction joint of the right abutment.”

1982 Ryerson Dam Annual Inspection Report

Inspection Date: March 18, 1982

Report Date: March 31, 1982

Remarks:

- None

Recommendations:

- “Periodically monitor the minor seepage at the vertical structural crack and at the horizontal construction joint of the right abutment.”
- “Again this year lubricate the mechanical gate...” (unable to read)

1982 Ryerson Dam Annual Inspection Report

Inspection Date: June 7, 1982

Report Date: July 29, 1982

Remarks:

- “The stem guide (for the gate valve), which is located 12 inches below water level has completely rusted out and broken off. It needs to be replaced.”
- Quote from Ronald J. Duke, Superintendent of Ryerson Station State Park regarding an inspection of the gate valve. “I opened the gate valve on the dam, as I normally do this time of year as part of the dam maintenance and inspection. Upon attempting to close the valve I found I was unable to close the last two inches. I contacted a friend of mine who is a scuba diver with the West Virginia State Police. On June 19th they checked out the valve. As a result of their dive, the following was determined:
 - The stem guide (for the gate valve), which is located 12 inches below water level has completely rusted out and broken off. It needs to be replaced.
 - There is no visible foreign object such as a small log or stick in the valve.
 - The “as built” drawings show the dam trash rack rising six feet high off its footer. According to the divers, the bottom has silted to within 8 to 10 inches off the top of the trash rack. They were unable to see the valve because of the silt and the trash rack design.
 - In an attempt to rule out silt and/or a stick jamming the valve, I opened the gate for three hours trying to wash away as much silt as possible from the trash rack area. I was again unable to close the valve completely. I was losing water through the valve but not a point where I would have a drain down of the lake. After a call to the company, which built the gate valve, I received drawings of the valve. With the information received, I managed to close the gate valve. I have since opened and closed the valve 4 or 5 times to insure proper functioning.”

Recommendations:

- None

1986 Ryerson Dam Annual Inspection Report

Inspection Date: August 20, 1986

Report Date: January 9, 1987

Remarks:

- “The ogee weir has seepage through some of its joints and a minor amount of concrete spalling.”
- “The spillway walls have a minor amount of concrete erosion and a very minor amount of surface cracking.”
- “Seepage through a concrete joint in the right abutment nearby” referring to nearby the long vertical crack on the right abutment.
- “The left abutment had seepage through joints near the left spillway wall and had some minor amount of concrete surface cracking.”

Recommendations:

- “Continue monitoring the vertical crack in the right concrete abutment visually on a monthly basis and during periods of flood emergencies.”
- “Seal concrete joints in the ogee weir.”
- “Monitor visually seepages from the right abutment wall coming through the joint near the vertical crack; from the left abutment near the left spillway wall that is coming through joints; and from concrete joints of the ogee weir (until sealing is performed).”
- “Monitor the minor amount of surface cracking near the left spillway wall, and the minor amount of concrete erosion and cracking on the spillway sidewalls.”
- “Monitor the minor amount of concrete erosion on the ogee weir.”

1987 Ryerson Dam Annual Inspection Report

Inspection Date: August 26, 1987

Report Date: August 26, 1987

Remarks:

- “There was evidence of seepage near the vertical crack, but no flow was observed during the inspection.” Referring to the long vertical crack on right abutment.
- “There was evidence of seepage near the left spillway wall, and there is some concrete deterioration in three locations near the joints. There was no flow observed however.”
- “There is some minor sedimentation in the upper reservoir area.”
- There are hairline cracks on the downstream side of the spillway, but it is still in good condition.”
- The ogee weir has some concrete deterioration and there is an indication of seepage through the weir near the right spillway wall. There was no flow through it but there appears to be no open joints on the downstream side.”

Recommendations:

- “Continue to monitor the vertical crack near the right abutment on a monthly basis and during periods of heavy rainfall and flooding.”
- “Continue to monitor the indications of seepage near the vertical crack by the right abutment and the indications of seepage starting near the left spillway wall.”
- “Repair the concrete deterioration of the ogee weir.”

- “Continue to monitor the minor concrete deterioration on the left side near 3 joints that show indications of seepage.”

1988 Ryerson Dam Annual Inspection Report

Inspection Date: August 2, 1988

Report Date: October 3, 1988

Remarks:

- “Possible displacement of the vertical crack is being measured at four locations.” Referring to the long vertical crack near the right abutment.
- “Indications of seeps near the left spillway wall were present.”
- “There is concrete deterioration at three locations near the construction joints of the left side wall.”
- “There is sediment in the upper portion of the reservoirs.”
- “The ogee weir of the spillway has some concrete deterioration and a minor amount of seeps.”
- There are some hairline cracks on the downstream side of the spillway.”

Recommendations:

- “Continue to monitor the vertical crack near the right abutment on a monthly basis and during periods of heavy rainfall.”
- “Continue to monitor the indications of seeps near the vertical crack by the right abutment and the indications of seeps starting near the left spillway wall.”
- “Repair the deteriorated concrete of the ogee weir.”
- “Continue to monitor the minor concrete deterioration on the left side near the three joints that are showing indications of seeps.”

1989 Ryerson Dam Annual Inspection Report

Inspection Date: October 18, 1989

Report Date: October 20, 1989

Remarks:

- “The long vertical crack near the right abutment had a small amount of flow through it.”
- “There were indications of seeps near the left spillway wall.”
- There is a concrete deterioration at some of the construction joints along the left sidewall.”

Recommendations:

- “Continue to monitor the vertical crack near the right abutment on a monthly basis and during periods of heavy rainfall.”
- “Continue to monitor the indications of seeps near the vertical crack by the right abutment and indications of seeps near the left spillway wall.”
- Monitor concrete deterioration of the ogee weir.”
- “Continue to monitor the concrete deterioration of the left side near the construction joints that are showing indications of seeps.”

1990 Ryerson Dam Annual Inspection Report

Inspection Date: March 7, 1990

Report Date: March 13, 1990

Remarks:

- “On November 29, 1989 Park Superintendent, reported a substantial increase in the flow through the long vertical crack near the right abutment. The flow has remained fairly constant on visual monitoring. The vertical crack measurements are the same as the October 1989 inspection.”
- “Precipitation from past seepage is evident near the vertical crack and along the left side horizontal construction joints.”
- “There is also concrete spalling, near those construction joints. These conditions are unchanged in recent years.”
- “The ogee weir has a minor amount of spalling and downstream spillway walls have some hairline cracks.”
- “There is some sediment in the upper portion of the reservoir.”

Recommendations:

- “Continue to frequently monitor the vertical crack near the right abutment.”
- “Continue to monitor the indications of seeps near the left sidewall and the small indications of seeps near the vertical crack by the right abutment.”
- “Monitor the concrete spalling of the ogee weir.”
- “Continue to monitor the concrete spalling on the left side near the construction joints.”

1991 Ryerson Dam annual Inspection Report

Inspection Date: June 20, 1991

Report Date: June 25, 1991

Remarks:

- “Indications of seep along the horizontal construction joints on the left side and along the right side near the vertical crack still exist.”
- “There is some minor spalling near the construction joints.”
- “There was a rodent hole on the downstream side of the left abutment.”
- “The ogee spillway has some minor concrete spalling.”
- “The downstream sidewalls of the spillway have some hairline cracks.”

Recommendations:

- “Continue to frequently monitor the vertical crack near the right abutment.”
- “Continue to monitor indications of seeps near the left sidewall and near the vertical crack by the right abutment.”
- “Monitor the concrete spalling of the ogee weir.”
- “Monitor the concrete spalling near the construction joints on the left side.”
- “Backfill the rodent hole near the downstream side of the left abutment and try to eliminate the rodents.”

1992 Ryerson Dam Annual Inspection Report

Inspection Date: April 28, 1992

Report Date: June 4, 1992

Remarks:

- “There were indications of seepage along the downstream left side as well as along the downstream right side near the vertical crack.”
- “A minor amount of spalling still exists near the construction joint on the downstream left side.”
- “The rodent hole was reestablished near the downstream side of the left abutment.”
- There was more spalling on the ogee weir than the previous inspection.”
- The staff gage on the left spillway has been slightly dislocated.”
- “There are some hairline cracks on the downstream left and right spillway sidewalls.”
- “There was some debris on the ogee weir, which is scheduled to be removed.”

Recommendations:

- “Continue to frequently monitor the vertical crack near the right abutment.”
- “Continue to monitor indications of seepage near the left sidewall and near the vertical crack by the right abutment.”
- “Repair the concrete spalling on the ogee weir.”
- “Repair the concrete spalling near the construction joint on the left side.”
- “Backfill the rodent hole near the downstream side of the left abutment and try to eliminate the rodents.”
- “Reposition the staff gage on the spillway.”
- “Remove the debris from the ogee weir as scheduled.”

1993 Ryerson Dam Annual Inspection Report

Inspection Date: April 5, 1993

Report Date: April 28, 1993

Remarks:

- “Approximately 100 gallons/day as observed flowing from the vertical crack on the downstream side of the right dam crest. This crack extends across the top and down the upstream side of the dam crest as well.”
- “Four other similar cracks of lesser degree exist along the left dam crest. One of the cracks extends across and completely down both sides. The other three cracks extend across but only five feet down on both sides. No flow was observed from these cracks.”
- “A small spalled area exists at one of the cracks on the downstream side of the left dam crest.”
- “A rodent hole was observed on the left bank just below the abutment.”
- “The intake structure and the discharge of the outlet conduit are submerged and could not be inspected. “Very dirty water was observed discharging from the end of the submerged outlet conduit when the slice gate was raised; probably due to sediment build-up in the dam.”
- “There is a spalled area existing near the top center section on the ogee weir.”
- “Several large tree sections/branches are stuck floating at the top of the weir.”
- “Some vegetative growth was observed along the left side of the discharge channel. It is collecting trash from the fisherman and the dam itself.”
- “Park personnel have recently reseeded worn grass areas located just below the left and right spillway walls due to fisherman.”

- “The chain link fencing along the spillway walls and the dam crest is weathered and rusting. It has not been painted for a long time.”

Recommendations:

- “Repair the crack on the right dam crest as a surface repair to prevent spalling.”
- “Monitor the four cracks on the left dam crest.”
- “Repair the spalled area on the ogee weir.”
- “Remove floatable debris from the ogee weir.”
- “Remove the trash that has collected along the left side of the discharge channel.”
- “Backfill the rodent hole located along the left bank just below the abutment and eliminate the rodent.”
- “Paint the chain link fencing along the spillway walls and the dam crest.”

1994 Ryerson Dam Annual Inspection Report

Inspection Date: July 12, 1994

Report Date: July 17, 1994

Remarks:

- “Minor cracking and efflorescence exist on the downstream left side. These cracks appear to be the same observed during the last year inspection.”
- “The intake and outlet conduit were not inspected due to submerged conditions.”
- “A few of the joist appear wider than normal due to minor spalling.” Referring to the concrete weir.
- “A horizontal joint, approximately 20 feet long located at the lower right side shows evidence of seepage.” Referring to concrete weir.
- “Several large rocks were observed in the impact basin next to the sill.”

Recommendations:

- “Remove large rocks from the impact basin to prevent damage to the concrete.”
- “Monitor the surface of the concrete weir for possible spalling.”
- “Monitor minor seepage through the concrete weir along the lower right side.”

1995 Ryerson Dam Annual Inspection Report

Inspection Date: June 6, 1995

Report Date: July 3, 1995

Remarks:

- “Only minor seepage near the bottom was observed from the crack.” Referring to the structural crack on the right abutment.
- “The crack, though, is evident from top to bottom on both sides of the wall including the top.”
- “The area along the downstream side of the left abutment wall was spongy.”
- “A small area located on the overbank, approximately 100 feet downstream of the left abutment, was wet. This is nothing new for both these areas.”
- “The intake structure and outlet conduit were not inspected due to submerged conditions.”
- “A few of the joints appear wider than normal due to minor spalling.” Referring to the concrete weir.
- “A horizontal joint, approximately 20 feet long located at the lower right side shows evidence of seepage.” Referring to concrete weir.
- “Several large rocks were observed in the impact basin next to the sill.”

- “Some vegetation growth was observed on the riprapped banks on both sides of the discharge channel.”

Recommendations:

- “Inspect the intake structure using divers.”
- “Inspect the 36-inch sluice gate and trash rack for any blockage and rusting of the metallic parts including the condition of the gate and stem.”
- “Remove rocks from the stilling basin.”
- “Remove vegetation growth from the riprapped banks along the discharge channel just below the stilling basin.”
- “Continue to monitor the area downstream of the dam for any substantial increases in seepage or new seepage areas.”
- “Repair spalled joints on the spillway.”
- “Consider repairing the structural crack on the right concrete abutment wall by pressure grouting with epoxy.”

1997 Ryerson Dam Annual Inspection Report

Inspection Date: June 27, 1997

Report Date: September 25, 1997

Remarks:

- “The crack is evident from top to bottom on both sides of the abutment wall including the top. Referring to the structural crack on the right abutment.
- “The area long the downstream side of the left abutment wall was spongy. This is nothing new for this area.”
- “An active ground hog hole was observed on the left bank just below the concrete abutment wall.”
- “The intake structure and outlet conduit were not inspected due to submerged conditions.”
- “Some floatable debris was observed at the top of the spillway weir.”
- “Erosion is occurring at the end of the concrete slope protection on the left bank just below the spillway. This erosion is due to a 15-inch cmp storm sewer pipe that discharges at the top end of the concrete slope. Erosion is also occurring over top of the 15-inch cmp.”

Recommendations:

- “Continue to monitor the area along the left abutment wall for substantial increases in seepage or new seepage areas.”
- “Repair the eroded area at the end of the sloped concrete protection just below the left side of the dam. Repair the deteriorated 15-inch cmp storm sewer causing this erosion.”
- “Consider repairing the structural crack on the right concrete abutment wall.”
- “Repair minor joint spalling on the left downstream concrete wall face.”
- “Fill the ground hog hole located just below the left side of the dam. Remove the ground hog from the area.”
- “Inspect the intake structure using divers. Inspect the 36-inch sluice gate and trash rack for any blockage and rusting of metallic parts including the condition of the gate and stem.”

1998 Ryerson Dam Annual Inspection Report

Inspection Date: July 17, 1998

Report Date: October 26, 1998

Remarks:

- “Some very minor wet areas, though, through the left concrete abutment were observed for the first time. One was located at the inside corner where the spillway wall meets the abutment; the other a damp area near the center of the abutment at the first horizontal joint above the ground.”
- “The area along the downstream side of the left abutment wall was spongy again this year but drier than usual (probably due to the hot dry weather).”
- “A minor spall exists at a cross joint on the left downstream abutment face.”
- “An active ground hog hole was observed on both the left and right banks just below the concrete abutment wall. Due to the close proximity to the dam, these holes should be backfilled and the ground hogs removed from the area.”
- “The intake structure and outlet conduit were not inspected due to the submerged conditions.”

Recommendations:

- “Continue to monitor the area along the left abutment wall for substantial increases in seepage or new seepage areas. Also monitor the minor seepage points observed through the left concrete abutment.”
- “Consider repairing the structural crack on the right concrete abutment wall to prevent further deterioration.”
- “Repair minor joint spalling on the left downstream abutment wall face (at the lower cross joint).”
- “Fill the ground hog holes located just below the left and right sides of the dam. Remove the ground hogs from the area.”
- “Inspect the intake structure using divers. Inspect the 36-inch sluice gate and trash rack for any blockage and rusting of metallic parts including the condition of the gate and stem.”
- “Revise the current Emergency Action Plan as needed to meet the situation of this dam. Perform a dam breach analysis to determine the probable extent and downstream limits of the potential flood wave.”

1999 Ryerson Dam Annual Inspection Report

Inspection Date: July 9, 1999

Report Date: September 24, 1999

Remarks:

- “For the first time, though, the ground just to the right of the crack and several feet up along the abutment/slope interface was observed to be soft and spongy.” Referring to the structural crack on the right abutment.”
- “Some very minor seepage was also observed through the wall drain on the right wing wall of the stilling basin. This is not unusual.”
- “An eroded area exists on the right upstream bank next to the concrete abutment.”
- “The area along the toe of the left abutment wall continues to be soft and spongy. There appears to be no change in conditions from last year.”
- “A minor spall and a thin structural crack exists on the downstream face of the left abutment (nothing new).”

- “The outside spillway wall is damp where it meets the left abutment. Last year there was some seepage observed from this area.”
- “The intake structure and 36-inch concrete outlet conduit were not inspected due to submerged conditions.”
- “Only a minor spall was observed on the ogee section.”
- “Some dampness/minor seepage was observed at several locations at joints through the spillway – nothing new.”

Recommendations:

- “Continue to monitor areas of minor seepage along the right abutment/slope interface and on the outside face of the left spillway wall/abutment.”
- “Inspect the intake structure and 36-inch sluice gate using divers. Inspect the sluice gate and trash rack for any blockage and rusting of metallic parts including the condition of the gate and stem. Inspect the 36-inch outlet conduit using a closer circuit TV camera.”
- “Stabilize the eroded area behind the right upstream abutment at the embankment slope using 18-inch riprap.”
- “Repair the minor spall on the downstream face of the left abutment and on the ogee spillway.”
- “Continue to monitor the structural crack on the right abutment wall for any deterioration/widening of the crack (existing crack is approx. 0.27 inches wide at the surface on the downstream face).”
- “Revise the current Emergency Action Plan as needed to meet the situation of this dam. Perform a dam breach analysis to determine the probable extent and downstream limits of the potential flood wave.”

1999 Letter from Monitoring and Compliance Section of Division of Dam Safety

Letter Date: March 2, 1999

Filed Under: 1999 Ryerson Dam Annual Inspection Report

Recommendations:

- “In addition to the maintenance needs recommended by the BSP’s engineer, the vegetative growth in the joints or cracks of the spillway channel sidewalls and discharge channel side slopes should be removed. The joints should be thoroughly cleaned. If needed, a sponge filter backing material installed. A high quality flexible joint sealer compound needs to be installed in accordance with the manufacturer’s directions. It is very important to keep the spillway flow from entering the joints or cracks in order to prevent erosion of the soils beneath the slab or behind the walls. This type of erosion can result in severe structural damage to the spillway, or a piping failure of the dam. Preventative maintenance will save the dam owner very costly replacement construction and eliminate a possible failure of the dam.”
- “Our March 25, 1998 letter requested that a close inspection of the outlet or drawdown conduit, appurtenant gates, or valves be conducted. In consideration of the age of the structure and the occurrence of Remarks encountered with outlet systems for other older dams in Pennsylvania, we again request that the BSP conducts a detailed inspection of the dam’s outlet/drawdown system.”

2000 Ryerson Dam Annual Inspection Report

Inspection Date: July 14, 2000

Report Date: October 23, 2000

Remarks:

- “A few minor spalls on the spillway and abutment wall, though, should be repaired.”
- “Also, the old structural crack on the right abutment wall is beginning to open up a little. It should be repaired.”
- “The ground just to the right of the crack and several feet up along the abutment/slope interface was observed to be soft and spongy.”
- “Some minor seepage was also observed though an old 12-inch cmp at this same location. This seepage has only been observed for the past 2 years.”
- “An eroded area exists on the right upstream bank next to the concrete abutment.”
- “The area along the toe of the left abutment wall continues to be soft and spongy. There appears to be no change in conditions from last year.”
- “Two minor spalls and a thin structural crack exist on the downstream face of the left abutment (nothing new).”
- “The outside spillway wall is damp where it meets the left abutment. This has been observed for the past 3 years.”
- “The intake structure and 36-inch concrete conduit were not inspected due to submerged conditions.”
- “Two spalls were observed on the ogee section.”
- “Some dampness/minor seepage was observed at several locations at joints through the spillway – nothing new.”

Recommendations:

- “Continue to monitor areas of minor seepage along the right abutment/slope interface and on the outside face of the left spillway wall/abutment.”
- “Also, monitor the soft/spongy grass area along the center portion of the left downstream abutment face.”
- “Inspect the intake structure and 36-inch sluice gate using divers. Inspect the sluice gate and trash rack for any blockage and rusting of metallic parts including the condition of the gate and stem. Inspect the 36-inch outlet conduit using a close circuit TV camera.”
- “Stabilize the eroded area behind the right upstream abutment at the embankment slope using 18” riprap.”
- “Repair the eroded area behind the right upstream abutment at the embankment slope using 18” riprap.
- “Repair the two minor spalls on the downstream face of the left abutment and on the ogee spillway.”
- “Continue to monitor the structural crack on the right abutment wall for any deterioration/widening of the crack (existing crack is approx. 0.30 inches wide at the surface on the downstream face).”

2000 Letter from Monitoring and Compliance Section of Division of Dam Safety

Letter Date: August 31, 2001

Filed Under: 2000 Ryerson Dam Annual Inspection Report

Remarks:

- “The wet area along the center portion of the left downstream abutment face could be a concern. An underdrain might need to be provided.”
- “A review of DEP’s historic file for Ryerson Station Dam found that it was constructed circa 1960. A close inspection of the outlet or drawdown conduit, appurtenant gates, or valves might not have been conducted since the dam was built. In consideration of the age of this structure and the occurrence of Remarks encountered with outlet systems for other older dams in Pennsylvania, we request that the Bureau conduct a detailed inspection of the dam’s outlet/drawdown system. The inspection should include the conduit, appurtenant gates or valves, and structures.”

2001 Ryerson Dam Annual Inspection Report

Inspection Date: June 27, 2001

Report Date: January 19, 2002

Remarks:

- “A few minor spalls on the spillway and the abutment wall should be repaired.”
- “Also, the old structure crack on the right abutment wall is beginning to open up a little.”
- “The bottom of the fence posts on top of the dam need cleaned and painted (very rusty).”
- “An eroded area exists on the right upstream bank next to the concrete abutment.”
- “The area along the toe of the center portion of the left abutment wall continues to be soft and spongy. There appears to be no change in conditions from last year.”
- “Also, the grassy area about 75 feet downstream of this area was also soft/spongy (not unusual).”
- “Two minor spalls and a thin structure crack exist on the downstream face of the left abutment wall (nothing new).”
- “A section of concrete was observed cracked/broken at the top of the left upstream side of the dam (first time observed).”
- “The outside spillway wall is damp where it meets the left abutment. This has been observed for the past 4years.”
- “The intake structure and 36-inch concrete outlet conduit were not inspected due to submerged conditions.”
- “The water from the outlet pipe during operation of the slice gate was very dirty indicating silt build-up in the approach channel to the intake (nothing unusual).”
- “Two spalls were observed on the ogee section.”
- “Some dampness/minor seepage was observed at several locations at joints through the spillway – nothing new.”
- “A few logs were observed stuck on the top of the low flow notch of the ogee spillway.”

Recommendations:

- “Continue to monitor areas of wetness through the horizontal joint on the right abutment wall and on the outside face of the left spillway wall/abutment.”
- “Also, monitor the soft/spongy grass area along the toe of the left concrete abutment wall and the grassy area just downstream of this area.”

- “Inspect the intake structure and 36-inch sluice gate using divers. Inspect the sluice gate and trash rack for any blockage and rusting of metallic parts including the condition of the gate and stem. Inspect the 36-inch outlet conduit using a closed circuit TV camera.”
- “Clean and paint the bottom of the fence posts on the top of the abutment wall (very rusty).”
- “Stabilize the eroded area behind the right upstream abutment wall at the embankment slope using 18” riprap.”
- “Repair the two minor spalls on the downstream face of the left abutment and on the ogee spillway. Also repair the broken concrete at the top of the left upstream abutment wall.”
- “Consider repairing the structural crack on the right abutment wall using an epoxy resin (existing crack is approx. 0.30 inches wide at the surface on the downstream face).”
- “Consider dredging key portions of the impoundment area.”

2002 Ryerson Dam Annual Inspection Report

Inspection Date: July 24, 2002

Report Date: December 16, 2002

Remarks:

- “A few minor spalls on the spillway and the abutment wall should be repaired.”
- “The old structure crack on the right abutment wall on the upstream face is beginning to open up a little.”
- “The structure crack located on the right abutment needs to be repaired on the upstream face (Park plans to contract this work).”
- “The ground along the toe of the right abutment wall was slightly soft and spongy (nothing new).”
- “The first horizontal joint on the concrete abutment wall above this area was also wet.”
- “An eroded area exists on both the right/left upstream bank next to the concrete abutments.”
- “The area along the toe of the center portion of the left abutment wall continues to be soft and spongy.”
- “The grassy area about 75 feet downstream of this area was also soft/spongy (not unusual – not as large an area this year).”
- “Two minor spalls and a thin structure crack exist on the downstream face of the left abutment wall (nothing new).”
- “The wood steps on the far left abutment are wear/rotted.”
- “The intake structure and 36-inch concrete outlet conduit were not inspected due to submerged conditions. Both should be inspected using divers since this has not been done for a long time, if ever.”
- “Several logs and other debris were flushed out of the conduit during the raising of the sluice gate.”
- “Three spalls exist on the ogee section.”
- “Some dampness/minor seepage was observed at several locations at joints through the spillway - nothing new.”

Recommendations:

- “Continue to monitor areas of wetness through the horizontal joint on the right abutment wall and on the outside face of the left spillway wall/abutment.”
- “Monitor the soft/spongy grass area along the toe of the left concrete abutment wall and the grassy area just downstream of this area.”
- “Repair the structural crack on the right upstream abutment wall.”
- “Repair the minor spalls on the downstream face of the left abutment and on the ogee spillway.”
- “Repair/replace the weak/rotted wood steps leading down to the top of the left abutment.”
- “Inspect the intake structure and 36-inch sluice gate using divers. Inspect the sluice gate and trash rack for any blockage and rusting of metallic parts including the condition of the gate and stem. Inspect the 36-inch outlet conduit using a closed circuit TV camera.”
- “Stabilize the eroded embankment slopes behind both the left and right upstream abutment walls using 18-inch riprap.”
- “Consider dredging key portions of the impoundment area.”

2003 Ryerson Dam Annual Inspection Report

Inspection Date: August 15, 2003

Report Date: January 8, 2004

Remarks:

- “The structural crack on the right abutment mentioned above was seeping slightly from the small diameter plastic tub (>1.2”) near the bottom on the downstream face. Park maintenance indicated that this plastic tube was flowing partially full this spring during a period of above normal pool levels.”
- “The horizontal joint adjacent to the structural crack was wet (not unusual).”
- “The area along the toe of the center portion of the left abutment wall was very soft/wet during this inspection. The grass had to be cut with weed wackers instead of using the tractor, which would have left ruts. It is suspected that the excessive wetness this year is due to the above normal/recent heavy rainfall experienced in the area this year.”
- “It is difficult to read the staff gage on the left spillway wall without zoom style field glasses.”
- “It is suspected that the approach channel to the intake is full of silt and some wood debris as indicated by the discharge from the outlet conduit.”
- “The only other item needing attention is the ongoing erosion along the banks adjacent to the upstream concrete abutments faces.”

Recommendations:

- “Proceed with the concrete repair work to the spillway and abutment walls as designed and contracted (construction to begin spring 2004).”
- “Consider stabilizing the eroded banks behind both the left and right upstream abutment walls using 18-inch riprap.”
- “Continue to monitor the wet/soft area along the toe of the center portion of the left abutment wall.”
- “Inspect the staff gage on the left spillway (area numbers clear and readable-secure to the wall?) – repair/replace as required.”
- “Inspect the intake and draw down outlet conduit using divers/closed circuit TV cameras.”

- “Consider using a chemical herbicide (Rodeo) to control vegetation grown on the riprap banks just below the spillway discharge area.”
- “Consider dredging key portions of the impoundment area.”

2004 Ryerson Dam Annual Inspection Report

Inspection Date: August 4, 2004

Report Date: December 29, 2004

Remarks:

- “The trash rack in front of the intake structure was found to be almost completely covered with silt and sunken tree/log debris.”
- “During this inspection, several spall and crack repairs were observed on the downstream face of the left abutment wall.”
- “The crack, which extends to the top of the upstream face, across the top of the wall and down the upstream face still needs repaired.” Referring to the structural crack on the right abutment. “This crack was later repaired during late summer 2004 along with several spalls on the spillway weir.”
- “The old wooden staff gage on the left abutment wall next to the spillway weir washed away during a high water event.”
- “The only other item needing addressed is the ongoing erosion along both banks (especially the right side), adjacent to the upstream concrete abutment faces.”
- “The normally wet/spongy area on the grass along the bottom of the left abutment wall was essentially unchanged from recent previous inspections.”
- “An active ground hog hole was observed on the left bank just below the abutment wall.”
- “On September 17, 2004, the Park Manager reported approximately 2 feet of water going over the spillway weir from heavy rainfall. During this time, some seepage was observed through the left abutment at joint at elevation 967. This seepage had never been observed before.”

Recommendations:

- “Continue to monitor the wet/soft area on the grass along the bottom of the left abutment wall. Also, monitor the joint that was seeping during the high water event this past September.”
- “Paint line markers on the left abutment wall next to the spillway weir to replace the old wooden staff gage.”
- “Partially open/close the draw down sluice gate at least twice/year to keep operator working properly and the intake free of silt.”
- “Backfill the ground hog hole on the left side of the dam and remove the ground hog from the area.”
- “Consider stabilizing the eroded stream banks behind both the left and right upstream abutments wall using fabric-form stream bank protection.”

2005 Ryerson Dam Annual Inspection Report

Inspection Dates: July 25-26, 2005 (original report not consistent)

Report Date: August 29, 2005

Remarks:

- “This 42’ high Category 1 (Class B-high hazard) concrete gravity dam built in 1960 appears to be in serious condition at this time. This dam historically, though, has been generally in good condition since it was built. Remarks began around the 2nd week of April 2005, when park maintenance personnel first observed a new active seepage area on the left downstream side of the dam.

April 2005 – Interim Inspection:

- “The main source of new seepage appeared to be an artesian effect coming up along the edge of the downstream concrete dam wall, located about 115 feet from the left spillway wall. The seepage was estimated to be between 3 and 5 gallons/minute. No seepage was observed from any of the vertical joints along this side of the dam although some had been observed about a week ago (the most noticeable located 148 feet from the left spillway wall). A review of the annual inspection reports for this dam between 1983 and 1994 shows essentially no wet ground conditions or seeping joints in this area. The first indication of wet/spongy ground conditions was first reported in 1995 report with conditions becoming much worse in 2003/2004. These last two years experienced almost record amounts of rainfall (58.58 inches and 52.27 inches respectively – normal rainfall is about 40 inches). The elevation of the lake level during the April 2005 inspection was about 965.0 and the ground elevation of the seepage area approx. 960.8 (difference of only 4.2 feet). Construction drawings of this concrete gravity dam show a top elevation of 976.8 with a bottom imbedded in 5 feet of rock at elevation 934.8. The Dept. of Environmental Protection – Division of Dam Safety in Harrisburg, reviewed their file on the dam and indicated that groundwater conditions in this area are normally high (reported to be within 1 foot from the surface). The grass covered surface in this area had become extremely soft/spongy due to the seepage problem and poor drainage (100’ x 50’). The right side of the dam was also inspected today since minor seepage problems have existed in this area for many years. Some seepage was observed on the downstream concrete wall face across the entire bottom horizontal joint (about 1’ above the ground) and also across the next horizontal joint (about 6’ above the ground on the far right side). Also, a 1” diameter tube inserted in the bottom horizontal joint many years ago was flowing almost full. None of these items are too unusual for this time of year. What was unusual, though, was the rate of seepage flowing from the 3” diameter wall drain through the vertical concrete wall next to the spillway on this side. It was estimated to be flowing about 10 gallons/minute, which is more than anyone at the Park has ever seen.”

Monitoring:

- “After the April 2005 interim inspection, Park maintenance personnel continued to monitor these seepage areas on a weekly basis. The situation remained relatively unchanged until about the middle of June when it appeared the seepage on the left side began to decrease slightly and the seepage on the right side began to increase. By the first week of July, seepage on the right side of the dam was definitely increasing. During the second week of July, the seepage from the 3” wall drain next to the spillway was measured at approximately 35 gpm; an increase of 25 gpm since

April. More seepage was also observed from the horizontal construction joints on the right downstream face. Seepage on the right side of the dam had decreased to about 1 or 2 gallons/minute. A thin shear crack on the left downstream face of the dam observed during last year's inspection appears to have become much wider just recently (located just below a horizontal construction joint next to the spillway). The adjacent horizontal joint appeared also to have opened up slightly across a good portion of the downstream face. No seepage, though, was observed from this crack or open joint."

Present Conditions:

Inspection Date: July 25, 2005

- "During this inspection, seepage on the left side of the dam along the downstream toe appeared to remain unchanged from recent weeks (about 1 to 2 gallons/minute). Seepage on the right side, though, has increased dramatically during the past 2 weeks. The rate of seepage from the 3" wall drain next to the spillway was measured at 60 gpm today, an increase of 25 gpm just 2 weeks ago. Increase seepage was observed from across the bottom two construction joints, along the groin and from the 15" cm pipe next to the groin. The ground surface in this area was completely saturated and flooded. In addition, a new shear crack was observed on this side of the dam on the downstream face; very similar and in the same location as observed on the left side of the dam. The horizontal joint adjacent to this shear crack also appears to have separated. The lake level during this inspection was just slightly below normal pool with essentially no water over the spillway."

Appendix 2

Pennsylvania Department Of Environmental Protection, Bureau of Waterways Engineering, Division of Dam Safety Timeline (Gannett Fleming – Volume I)

This appendix contains a timeline of events concerning the Ryerson Station Dam as observed by the Pennsylvania Department of Environmental Protection, Bureau of Waterways Engineering, Division of Dam Safety from 1957 through September 2005

RYERSON STATION DAM DATA REPORT

1. Chronology

- 1.1 The following section contains notes outlining the timeline of events starting with the design of the dam in 1957 and ending in September 2005. The information was extracted from a document prepared by the Pennsylvania Department of Environmental Protection (PADEP), Bureau of Waterways Engineering, Division of Dam Safety.

<u>Time Period</u>	<u>Observation</u>
1957	Design by Swindell-Dressler Corporation of Pittsburgh
1960	Construction completed by Seabright Construction Company
1960-2005	Dam performs well with minor seepage and cracks present
1997	Mining of less than 50% extraction is proposed in the area of the dam, but not directly below the dam
April 13, 2005	Park Manager reports to DCNR Bureau of Facility Design and Construction that normally wet areas at the downstream of the left side of dam are showing signs of increased amounts of seepage and water movement on the ground surface. Some seepage noted through construction joint located just above the ground surface. Reported to DEP Dam Safety on April 14.
April 18, 2005	DCNR engineer inspects dam. Seepage through wall drain on left side of dam is more than observed in previous inspections. Ground downstream of right side of dam reported as "a little wet". Seal of historical vertical crack in right side of dam, which was performed in 2003, is in good shape. Mine maps were reviewed with DEP California District Mining representative at this inspection.
April 21, 2005	DCNR submits report of April 18 inspection and proposes to DEP Dam Safety a conceptual plan to collect seepage from left side of dam. Conclusion is that seepage is a combination of flows from the dam and from the high water table currently present in the abutments due to wet spring. Drawdown of lake and construction of drain is to take place after Labor Day. All seepage will continue to be monitored.

- April 27, 2005 Concept approved by DEP Dam Safety and request made for detailed plans and specifications to include provisions to monitor seepage amounts.
- June 15, 2005 Park measures seepage at drain on right side of dam at 20 gallons per minute (gpm) at a location where seepage was reported as 15 gpm in April. New crack noted on left side of dam near spillway training wall.
- July 13, 2005 Park measures seepage at drain on right side of dam at 35 gpm with no apparent reason for this increase. New crack first noted on left side of dam on June 15 appears to have increased. Historical vertical repair on right side of dam has opened up near base of dam.
- July 19, 2005 DCNR reports findings of July 13 inspection to DEP Dam Safety and requests a July 26th joint inspection.
- July 26, 2005 Joint inspection of dam by DCNR Parks and Central Office engineers as well as DEP Dam Safety, Regional Office Soils and Waterways, District Office Monitoring and Compliance and District Office Surface Subsidence personnel. Seepage at right side of dam is estimated at 60 gpm. Transition zone between mining site and dam will continue to be monitored by DEP California Office. Park will install crack gauges on the dam.
- July 27, 2005 Findings of July 26 inspection relayed to DEP Dam Safety Chief. Dam Safety staff is directed to immediately set up a meeting with County and local emergency management officials to distribute and review inundation maps and responsibilities should a precautionary or required evacuation of downstream areas be necessary due to deteriorating conditions at the dam. Meetings were scheduled and staff person on the road to Greene County by late morning and met with County EMA personnel that evening.
- July 28, 2005 Meeting is held at the dam site in regards to Inundation Mapping and evacuation responsibilities of EMA and other local officials. Attendees include DEP Dam Safety, DCNR Parks, Greene County Commissioner's Office, Greene County EMA, Greene County Sheriff, Richhill Township, Richhill Township VFD, West Finley VFD, Graysville VFD, Center Township VFD, Pennsylvania State Police, West Greene School District, Marshall County (WV) EMA, Marshall County Sheriff and Texas Eastern.
- Team from Gannett Fleming performs inspection of dam for an initial assessment of the dam's structural stability and to determine an appropriate scope of work for further monitoring and analysis of the

condition of the dam and its foundation. Crack gauges installed by Park personnel were observed.

At 10:30 a.m., DEP Dam Safety Chief is informed that the Gannett Fleming team has observed the location and amounts of seepage at the dam. Seepage amounts are estimated to have increased to 80 gpm at right side of dam, up from 60 gpm two days earlier. Chief directs on-site Dam Safety personnel to request DCNR to immediately open the spillway gate and lower the reservoir at least 10 feet. Gate was fully open by 1 p.m. This will lower the pool below the primary horizontal construction joint showing seepage. Evacuation immediately below dam is not necessary, as discharges will be contained within the banks of the stream. DCNR contacted Regional Fish and Boat Commission to inform them of need to immediately lower the lake.

DEP Dam Safety Chief discusses downstream conditions at WV3, a flood control dam in West Virginia, with West Virginia Dam Safety and NRCS personnel from West Virginia. Joint decision made to evacuate recreational users from the pool due to uncertainty of how much the reservoir would rise.

Late afternoon phone call between DEP Dam Safety Chief and Gannett Fleming Team resolved that due to the uncertain condition of the dam and the continuing deterioration of the structure, steps should be taken to permanently eliminate impounding capacity of the dam.

July 29, 2005 DEP Dam Safety staff computes that reservoir will refill from runoff from a relative small runoff event and, thus, determines that reservoir should be fully drained. Dam Safety contacts park and learns that the reservoir was lowered by approximately 11 feet by that morning. DCNR shut gate due to stranded fish and concerns for these fish. Dam Safety directs DCNR to reopen gates to attempt to flush fish downstream and keep gate open due to growing concern for stability of structure. Dam Safety also informs DCNR that a large portion of the dam's spillway must be removed and requests that they initiate steps to contract for this removal. DCNR starts these arrangements.

August 1, 2005 DEP Dam Safety staff completes reservoir routings that determine that 100 feet of the 200-foot spillway must be removed down to at least 14 feet below normal pool elevation to manage downstream risks for events up to and including the 100-year-storm.

A conference call takes place between DEP Dam Safety, DCNR Facility Design and Construction and Gannett Fleming. DCNR is requested to remove at least 14 feet, and more if possible, but to stay one foot above accumulated sediment levels at the upstream face of

the dam to retain as much of the accumulated sediment in the reservoir area. DCNR indicates contractor will be at site by August 15.

August 3, 2005 DEP Dam Safety Chief and other staff inspect dam. Park Manager informs Dam Safety that cracks formed in dam overnight from August 1 to August 2 and pointed these cracks out. Park Manager also shows Dam Safety a heave that formed the same night in the road surface of Bristoria Road (SR 3022) at the right abutment of the dam. This heave is located in line with the dam's alignment, approximately where the dam structure ends in the abutment area. This heave is approximately nine inches to one foot in vertical relief. Park Manager requests that PennDOT not repair this heave to allow for further monitoring for movement. DEP Mining Office is monitoring this area. As a result of the heave and additional cracks observed, Dam Safety Chief calls central office requesting communication be made with DCNR to step up schedule for commencement of spillway removal. Deputy Secretary for Water Management makes this communication to DCNR Facility Design and Construction Bureau Director. Dam Safety Chief also communicates facts about the heave and additional cracking by telephone with Dam Safety staff geotechnical engineer and with Gannett Fleming team member.

Dam Safety Chief and other staff evaluate the stream and its floodplain downstream of the dam for the purpose of identifying critical homes that should be evacuated as a precautionary measure should a runoff event cause the reservoir to refill at or near the normal pool level before the spillway can be demolished. Eleven homes and one restaurant were identified as being critical between the dam and the downstream end of the village of Ryerson Station. One additional home should be evacuated as the access bridge to it may be washed away.

Gannett Fleming and DCNR survey personnel worked together to perform a survey of existing monitoring points for movement of the dam and installation of additional crack monitoring gauges.

August 4, 2005 Governor's Office is briefed by DEP and DCNR of the deteriorating conditions at the dam site and the plan for demolition of the dam's spillway. The need for further study necessary to ascertain what is happening and to determine if and when the dam can be rehabilitated or replaced were also discussed. Governor's Office requests door-to-door contact of the critical structures that may be evacuated as a precautionary measure. DCNR informs all that a contractor will be at the site on August 9.

DEP Dam Safety forwarded a map depicting the critical homes to be evacuated as part of a precautionary evacuation to DEP's Environmental Emergency Response Office. This map was then forwarded to Pennsylvania's Emergency Operation's Center for distribution to the Greene County EMA for door-to-door contact at these critical structures.

August 5, 2005 DEP Dam Safety and Environmental Emergency Response Office conference call with PEMA, Greene County EMA and DCNR Regional and Park personnel to discuss Governor's request to conduct door-to-door contact to inform owners of critical homes of the potential for a precautionary evacuation in the event of storm event refilling the reservoir. This will only be necessary until the spillway can be demolished. This took place on afternoon of August 5. Greene County indicated they would make these contacts.

August 8, 2005 Two conference calls took place the morning of August 8, 2005. The first involved Dam Safety, DCNR Facility Design and Construction, Gannett Fleming and Ryerson Station Park. In this call, it was ascertained that some minor movement of the dam occurred between Thursday and Friday. Gannett's survey crew will arrive at the site on the 8th and will continue their work tying in to DCNR's former survey. During this call, the Park was directed to call 911 to activate a precautionary evacuation if the pool level reaches El. 959, six feet below spillway crest. Gannett's survey crew will set a convenient monitoring point at this elevation for the Park's use. Park will contact Greene County EMA to update them on setting of trigger point.

Second conference call included Dam Safety, DCNR Facility Design and Construction, Gannett Fleming and DEP Mining Program. Mining maps showing permitted mining and actual mining have been assembled. This will be forwarded to Dam Safety for distribution to Gannett. Mining downstream and west of dam (Block 2207-160) to start today. A meeting will be held at Park Office on Wednesday, September 7 at 1 p.m. Invited attendees will be DCNR, DEP Mining, DEP Dam Safety, Gannett Fleming, Consol, Texas Eastern.

August 9, 2005 Received confirmation from Ryerson Station Park that equipment is beginning to show up at the dam site.

Updated Mining Map received from DEP Mining Program. Nearest point to mine entryway is 565 feet at an angle of draw of 57.1 degrees. Nearest point to longwall mining is 890 feet at an angle of draw of 57.6 degrees.

- August 10, 2005 A Gannett Fleming crew installed 16 movement gauges at different locations on the dam. They indicated the only crack to show movement in the last couple of days is the vertical crack (above mean pool towards right end of dam) that opened after the dam was drained. Gannett Fleming also installed markers at El. 959 ft. for indicators for the Park to trigger a precautionary evacuation.
- August 11, 2005 Hydroseeding of the reservoir and construction of an access road to the downstream face of the dam commenced early in the morning.
- August 16, 2005 Call from Jim Blair, DCNR Bureau of Facility Design and Construction inspector, and he said that the breach is 12 to 13 feet deep by 60 feet wide.
- August 22, 2005 Photos received from Jim Blair, DCNR, indicate the breach is nearing completion at a depth of approximately 18.2 feet.
- August 24, 2005 The breach section through the spillway structure is essentially completed. The low-level outlet pipe is open, but quickly silting shut. Silt check dams were installed downstream of dam.
- August 25, 2005 A meeting organized by Greene County Conservation District is held at the State Park Office. Purpose of meeting was to begin a dialogue of state, county and local officials on causes of the event, reaction to the event and future of the dam and state park.
- Sept. 8, 2005 DEP conducts Ryerson Station Dam Monitoring Status Meeting.
- Sept. 29. 2005 Movement near downstream pump station causes concern by PEMA. On Monday, Sept. 26, Texas Eastern (Duke Energy) lines buckled out of ground near the pump station and elsewhere in the area.

1.2 The following section contains notes outlining the timeline of events starting with the quarterly inspection of the dam on 4/4/2005 through 12/16/2005 as recorded by Ryerson Dam State Park personnel.

Appendix 3

Pennsylvania Department of Conservation and Natural Resources, Ryerson Station State Park Personnel Timeline (Gannett Flemming – Volume I)

The following section contains notes outlining the timeline of events starting with the quarterly inspection of the dam on 4/4/2005 through 12/16/2005 as recorded by Ryerson Dam State Park personnel.

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

- Mon – 04/04/2005: Quarterly Dam Inspection
- Tue – 04/12/2005: Dam Leak first reported to Jeff Anna and Dennis Miller who were away at 2-day regional meeting – 4/12-13/05 @ State College, PA.
- PMS Jacobs left message for John Shearer about Dam Leak
- Wed – 04/13/2005: Pictures taken of dam/leak and emailed to Dennis Miller, Jeff Anna, John Jaskolka, Al Thomas, Jim Eppley, Ed Raptosh, and John Shearer.
- Thu – 04/14/2005: John Jaskolka and Jim Blair, FD&C – Region 2, here to check out dam leak.
- Sat – 04/16/2005: Opening Day of Trout Season.
- Mon – 04/18/2005: John Shearer, DCNR and Joel Folman, DEP here to check out dam leak.
- Thu – 04/21/2005: Report sent from John Shearer noting leaking approximately 3 – 5 gallons per minute believing this was due to heavy rains / winter snow melt, with recommendations to continue to monitor, call if any change, and apply for drawdown permit of approximately 7 feet of lake pool to take place after Labor Day 2005.
- DEP District Mining Office, California, PA sent 2 people out to take pictures – William E. Keefer, Environmental Trainee, California District Office, 25 Technology Drive, California Technology Park, Coal Center, PA, 15423 – Office # 724-769-1024, Cell # 412-916-7328, Fax # 724-769-1120, email wikeefer@state.pa.us – other individual info not available.
- Fri – 04/22/2005: Weekly dam reports are now being emailed from either Dennis Miller, Francis Jacobs, or Ryerson Station State Park email accounts to Jeff Anna, John Jaskolka, & John Shearer. This week's sent from Dennis noting no change in flow.
- Fri – 04/29/2005: Weekly dam report sent from Francis Jacobs notes no change in flow.
- Sat – 04/30/2005: PA Fish & Boat Commission stock 1400 trout in lake.
- Fri – 05/06/2005: Weekly dam report sent from Dennis Miller notes no change in flow.

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

- Sat – 05/07/2005: PA Fish & Boat Commission stock 1400 trout in lake.
- Tue – 05/17/2005: Ditch dug along wall of dam to help flow and dry some of the swampy area.
- Fri – 05/20/2005: Weekly dam report sent from Dennis Miller noting increase in flow and notes the ditch that was dug.
- Fri – 05/27/2005: Weekly dam report sent from Dennis Miller noting no change in flow.
- Fri – 06/03/2005: Weekly report sent from Dennis Miller noting no change in flow.
- Fri – 06/10/2005: Weekly report sent from Francis Jacobs noting increase in seepage.
- Wed – 06/15/2005: Pictures taken by Steve Smith note seepage discharging at about 20 gallons per minute.
- Fri – 06/17/2005: Dam Inspection conducted by Francis Jacobs - Weekly report with pictures sent from Dennis Miller noting increase in flow and widening crack.
- Mon – 06/20/2005: Email from John Shearer noting Ed Raptosh to make trip to Ryerson first week of July.
- Fri – 06/24/2005: Dam Inspection and Weekly report from Francis Jacobs noting no change in flow.
- Fri – 07/01/2005: Weekly report from Francis Jacobs noting increase in flow.
- Wed – Fri – 07/06 – 08/2005: Ron Carney surveying and taking digital photos of dam.
- Fri – 07/08/2005: Dam Inspection and Weekly report from Dennis Miller noting increase in flow and crack widening.
- Wed – 07/13/2005: Steve Smith from Region 2 office FD & C and Ed Raptosh from CO here to inspect dam. Pictures taken by Steve Smith note seepage discharge increasing to about 35 gallons per minute.

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

- Fri – 07/15/2005: Email from Stephen Smith with pictures attached showing increased flow – first picture dated June 15th and flow was approximately 20 gallons per minute – second picture dated July 13th shows flow has increased to approximately 35 gallons per minute. Also shows crack width has increased.
- Dam Inspection and Weekly report from Francis Jacobs confirms increase in flow.
- Mon – 07/18/2005: Email from Dennis guessing flow has increased to 45 gallons per minute.
- Sat – 07/23/2005: Dam Inspection – ground hogs – hoses placed over dam.
- Mon – 07/25/2005: Power failure at 5:30 p.m. due to storms. Power not restored until Wednesday, July 27, 2005 at 5:30 p.m (power out for 48 hours).
- Tue – 07/26/2005: John Shearer, DCNR FDC CO, Ed Raptosh from DCNR FDC CO, Dennis Miller, DCNR PM Ryerson, Francis Jacobs, DCNR PMS Ryerson, Jeff Anna, DCNR ARM Region 2, Steve Smith, DCNR FDC Region 2, Karl Hartner, DEP Dam Safety Pittsburgh, Mark Frederick, DEP Mining California, Ron Deslauriers, DEP Mining California, Bill Franz, DEP Dam Safety Harrisburg, and Joel Folman, DEP Mining California here to do inspection of dam.
- Tue – 07/26/2005: Dam Straps installed on crack by PMS Jacobs, MR2 Syfrett, and SSL Bland.
- Wed – 07/27/2005: Dam Emergency Action Plan Activated – phone call from Jo Lewis at Greene County Control and Richhill Township Fire Dept. showed up – was told that it was activated in Harrisburg by Tom Bold, DEP Dam Safety – it was supposed to be a “drill” to see if every one had the same plan and knew what to do.
- Dam Straps continue to be installed on crack of dam by Syfrett, Bland, SSL Brosovich, and SSL Harris.
- Thu – 07/28/2005: Dam Emergency Action Plan Meeting held with the following attendees: Jo Lewis, Richhill Vol. Fire Dept & Greene County EMA 911 – Greg Leathers, Greene County EMA – Dave Coder, Greene County Commissioner – John Riley, Greene County Sheriff’s Office – Pam Snyder, Greene County Commissioner – Martin Niverth, Greene County

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

Thu – 07/28/2005 continued:

Conservation District – Thomas E. Mannion, Fire Chief, Richhill Twp. Vol. Fire Dept. – Dave Hieronimus, Texas Eastern – Bill Armstrong – Texas Eastern – Victor Antill – West Greene School District – John Garrett, West Finley Fire Department – Frank Shook, West Finley Fire Department – Francis Jacobs, Park Maintenance Supervisor - Jim Inman, Graysville Fire Department – Jack B. Cooper, Center Twp. Fire Department – Tom Chess, Richhill Twp. Supervisors – Doug Grim, Richhill Twp. Supervisors – Sgt. Kit Kolson, PSP, Waynesburg Barracks – John Gardner, Greene County Commissioner – Rex Rohm, Greene County EMA – Dennis Miller, Park Manager – Larry Newell, Marshall County, WV 911 – Tom Hart, Marshall County, WV Emergency Management – Kevin Cecil, Marshall County, WV Sheriff's Office – Tom Bold, DEP Dam Safety, Harrisburg, PA. – 9am

Approximately 10 volunteers from Greene County Department of Emergency Services went door-to-door downstream of the dam to alert everyone of the situation. The number of address on list was 43.

Six (6) people who moored boats at lake were called and notified of situation. Messages were left on all answering machines but one who answered and said his boat was already out (John Corwin). 12:20 pm

Barrels that stretched across lake above dam to keep boats from going over dam were removed by PMS Jacobs, SSL Brosovich and SSL Harris.

Lake drawdown begins at 1:00 pm – to drawdown 10 feet of lake pool level.

Email from Rachel Wagoner – verbal approval from DEP and PA Fish & Boat Commission to do drawdown of lake. 2:15 pm.

Press Release from Harrisburg regarding lake drawdown hits AP wire...numerous calls from various news media.

Fri – 07/29/2005: Tom Bold from DEP called Dennis Miller to tell him to keep gate wide open to completely drain lake.

Lake drained completely.

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

Fri – 07/29/2005 - continued:

Gannett Fleming, Inc. contacted to survey situation with dam.

Big mess with fish kill due to lake drawdown.

Sat – 07/30/2005: Many people trying to get fish in buckets to take to other water areas.

Sun – 07/31/2005: Fish dying by the thousands according to email from Dennis. Channel 11 (WPXI) news and Channel 4 (WTAE) news in area filming fish kill.

Many locals upset.

Unable to contact local WCO of PA Fish and Boat Commission. Also unable to contact PA Fish and Boat Commission SW Region Office.

Unable to contact DEP SW Region Office.

Unable to contact local WCO of Game Commission.

Mon – 08/01/2005: PA Fish and Boat Commission stated it is park's responsibility to deal with fish, dead or alive.

Two (2) lined dumpsters brought in from Waste Management for loading dead fish into.

Alfred Burns, Burns Excavating and Drilling, brought in machines to help with dead fish cleanup.

Warden Harry Dale Gillispie, Greene County Prison, sent 6 prisoners to help with clean up of dead fish.

Three (3) staff from Raccoon Creek here to help with dead fish cleanup.

Email from Lesley Miller asking if Duke Lake will become another Dutch Fork.

Email from Betty Supler questioning concerns of lake.

Email from Melody Longstredth (Waynesburg Chamber of Commerce) questioning concerns of lake.

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

Tue – 08/02/2005: Mary Lorah and Jeff Anna from Region 2 office, 3 staff from Raccoon Creek State Park, 3 staff from Moraine State Park and 6 prisoners from Greene County Prison here to help with dead fish cleanup.

Wed – 08/03/2005: Continuing with dead fish cleanup.

Thu – 08/04/2005: Continuing with dead fish cleanup.

Annual Inspection performed by John Shearer.

Fri – 08/05/2005: Jim Blair here to inspect dam.

Greene County EMA to go door-to-door to alert all downstream for precautionary evacuation if heavy rains fill reservoir.

Plans to breach dam 200 ft x 17 ft. to avoid catastrophe downstream.

Tue – 08/09/2005: Heavy equipment brought in for dam breaching. To be done by Alex E. Paris Contracting Company, Inc. 1595 Smith Township State Road, Atlasburg, PA 15004. They will also reseed the lakebed, bury the water/sewage lines to the park office and install desilting ponds. Jim Blair here.

Wed – 08/10/2005: Dam Breaching begins. Hydroseed of lakebed begins. Jim Blair here.

Thu – 08/11/2005: Jim Blair here. Friends Group hold meeting in evening regarding dam and lake.

Fri – 08/12/2005: Luncheon held for all participants who helped with dead fish cleanup. Catered lunch provided by Rep. H. William DeWeese.

State Rep. H. William DeWeese and State Senator J. Barry Stout here to inspect dam and meet with Dennis Miller, Jeff Anna, and John Jaskokla

Mon – 08/22/2005: Mark Hartle, PA F&BC and Mike ? DEP here to check dam. Jim Blair here.

Thu – 08/25/2005: Meeting regarding Dam failure – email sent from Martin Niverth, Greene County Conservation District to possible participants including stthomas@dem.pasen.gov,

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

Thu – 08/25/2005 - continued:

Sue Germanio – DeWeese's office, glee@co.greene.pa.us, Robbie Matesic, Jeff Marshall, Greg Leathers, Lisa Bennett, Dennis Miller, Harry Dale Gillispie, kendral@alltel.net; Gary Slagel of Consol Energy, Mike Dufalla, consultant, Tom Crist, PA F&BC, pblaker@co.greene.pa.us; and Pam Snyder – Dave Coder – John Gardner, Greene County Commissioners.

Thu – 09/01/2005: Hydroseeding lakebed finished.

Thu – 09/08/2005: 9:00 am meeting – participants include: Dennis Dickey, DEP Dam Safety, Bill Franz, DEP Dam Safety, Sue Germanio, Rep. H. William DeWeese's office, Debbie Konosky, Rep. H. William DeWeese's office, David Wilson, Gannett Fleming, Ed Motycki, DEP District Mining, Jeff Anna, DCNR Region 2 Office, John Jaskolka, DCNR FD&C Region 2 Office, Barry Miller, Consol Energy, Jonathan Pachter, Consol Energy, Al Thomas, DCNR FD&C – CO, Richard Gray, DiGioia Gray and Assoc., John A Harper, DCNR PA Geological Survey, Dennis Miller, DCNR Ryerson Station, Gary Slagel, Consol Energy, Greg Hasenfus, Consol Energy, Joe Cerenzia, Consol Energy, Martin Niverth, Greene County Conservation District, Lisa Bennett, Greene County Conservation District, Will Webster, Duke Energy (Texas Eastern), Stanley Layman, Duke Energy (Texas Eastern), Randall Putt, Duke Energy (Texas Eastern), Mark Frederick, DEP California District Mining.

Fri – 09/23/2005: Jeff Anna here meeting with Consol – Task Force Group planned to

Wed – 09/28/2005: Meeting with Army Corps of Engineers, PA Fish and Boat Commission, and FD & C regarding extended fishing area – attendees include Jeff Anna, DCNR Region 2 Office – John Jaskolka, DCNR – FDC Region 2 Office, Al Thomas, DCNR – FDC Central Office, Matt Azeles, DCNR – Central Office, Francis Jacobs, DCNR – Ryerson Station, Sean Benson, DCNR – Ryerson Station, Lisa Bennett, Greene County Conservation District, Jack Kraeutner, DEP, Scott Hans, COE.

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

- Thu – 09/29/2005: 2 men here from DEP investigating rumor that Texas Eastern might explode due to ground shifting.
- Sat – 10/01/2005: Hillside and pipe movement at Texas Eastern across from entrance bridge.
- Thu – 10/20/2005: Jeff here to meet with Consol regarding powerline.
- Wed – 10/26/2005: DEP Mine Subsidence rep Scott Hamilton here.
- Tue – 11/08/2005: Pre-Task Force Meeting of a few members.
- Wed – 11/09/2005: Task Force Meeting held from 11am – 1pm. Attendees include Jeff Anna, DCNR – Region 2 Office, Greg Schrum, DCNR – Central Office, Mike Manzo, DeWeese's Office, Jack Kraeutner, DEP – Harrisburg, Bill Franz, DEP – Harrisburg, Sean Benson, DCNR – Ryerson Station, Harry Dale Gillispie, Friend's of Ryerson Group, John Gardner, Greene Co. Commissioner, Jim Lovette, DeWeese's Office, Sharon Thomas, Stout's Office, Martin Niverth, Greene Co. Conservation District, Rick Lorson, PA F&BC, Sue Germanio, DeWeese's Office, Debbie Konosky, DeWeese's Office, Ron Clark, PennDOT, Dave Whitlatch, PennDOT, Doug Grim, Richhill Twp. Supervisor, Robbie Matesic, Greene County Development, Tom Chess, Richhill Twp. Supervisor, Mike Dufalla, Greene County Consultant.
- Wed – 11/16/2005: Sean Benson attended meeting at Wisecarver Dam in Waynesburg.
- Tue – 11/29/2005: Jim Blair here with man from PSI to gather soil samples from lakebed.
- Fri – 12/02/2005: Stu Cohen, Chief Counsel's Office, Dick Gray, Consultant, and Ed Matesic here to meet with Gannett Fleming and gather information from investigation of dam.
- Mon – 12/05/2005: Gannett Fleming here to approach neighboring property owners to ask for permission to enter property for surveying.
- Tue – 12/06/2005: Jeff Anna here to meet with Gannett Fleming regarding core drilling.
- Wed – 12/07/2005: John Baker of Consol here to meet with Sean Benson to walk powerline ROW.

TIMELINE FOR RYERSON STATION STATE PARK DAM EMERGENCY

Tue – 12/13/2005: Jeff, John Jaskolka, Jim Garoncy of Consol, Sean and Francis to meet regarding Shop, Bridge, and Trail.

Fri – 12/16/2005: Town meeting held at Center Twp. Firehall in Rogersville.