

467 Selma Estates Road  
Natchez, Mississippi 39120

February 2, 2006

Mayor Phillip C. West  
Natchez Board of Aldermen  
Natchez, Mississippi

Dear Sirs:

I have been following with interest the activities relating to construction of condominiums along the bluff in Natchez. I say in the beginning that I have no axe to grind on any part of the debate with one exception. My concern is the potential for catastrophic destruction of any building located near the bluff. I know the Board of Aldermen is aware of this problem because the topic has arisen many times in the past. However, I am led to believe, by your action, that you do not appreciate the magnitude of this potential danger.

In light of this possible misunderstanding, I have prepared an abbreviated history of the geology of Adams County to clarify the causes and effects of bluff dynamics. A copy of this summary is attached for your information.

Briefly, the data strongly supports a cautious approach to construction along the bluff. No study has ever found that the slumping that has taken place throughout recorded history is finished. To the contrary, all studies conclude, "A continuation of the slides along the bluffs is inevitable". You should keep this in your mind as you consider options.

Additionally, you might think of the ramifications should some condominiums slide into the river. It is obvious, in this litigious society, someone will be sued for a lot of money. More than likely, every party even remotely responsible will be named. I do not believe you or future aldermen and other city officials would risk facing this liability. This is especially true when the solution is so apparent. Build in a safe location!

Thank you for your attention.

Sincerely,

John P. Bornman, Jr.

For your information, I have a BS and MS in Geology from L.S.U., and an-MBA from Drexel University. I was Senior Geologist for the Louisiana State Mineral Board and Assistant to the Secretary of the Board, Gulf Coast Regional Exploration Manager for Sun Oil Co., and President and Chairman of the Board for Columbia Gas Development. I am now retired and live in Adams County.

## **GEOLOGY OF THE NATCHEZ BLUFFS**

### **History and Sediments**

As one could imagine, the topography and sedimentation in Adams County is directly or indirectly attributable to the Mississippi River. Most of the sediments are either fluvial or eolian, rather than marine. In fact, the only marine formation is the Hattiesburg clay that can be seen outcropping at the base of the bluffs at Natchez. It has, however, played an important role in the history.

The sand and gravels that are so prevalent in the county are either Pliocene (Citronell Formation) or Pleistocene (Natchez Formation and loess). The Citronell represents the remains of old alluvial plains much like the present Mississippi flood plain. There are three and the oldest is the highest. The loess is windblown by prevailing westerlies across the old Mississippi River bottom. This is the most prevalent surface in the county and is responsible for the vertical banks along many of our roads and waterways. It is interesting to note that many snails were trapped in this layer and some mastodons.

Loess deposits are thickest at the river and thin eastward.

The river is also responsible for the bluff that occurs along the western edge of Adams County and indeed is the most famous of the Natchez Landmarks. It is an erosional feature and represents the most eastern meandering of the present Mississippi. While the bluff has been and still is a boon to the city, it has also caused many problems including loss of life and property.

### **The Bluff**

We should examine the unique characteristics that have contributed to these problems. The bluff stands about 200 feet above the mean low water level of the river. It is capped by approximately 60 feet of loess underlain by 140 feet of Natchez Formation. The Hattiesburg clay is immediately under the sand and gravel. This combination of strata promotes sapping which is the flowing of water through the permeable layers to the underlying impermeable clay and out at the base of the bluff. The sapping phenomenon exists along the base of the bluffs from the north end of the county to the south end even where cultural activity is not present.

Sapping destabilizes the bluff through erosion and by “greasing” the contact between the coarser clastics and the clays. Large cracks develop up to several hundred feet back from the bluff and large blocks of unconsolidated material slide along this contact toward the river. According to the Mississippi Geological Survey, this sliding was the cause of the 1939 slump that destroyed the Jones Lumber Company. The mass that fell was 200 feet

wide and 100 feet deep. According to the Survey, “A continuation of the slides along the river bluffs is inevitable.”

Of particular significance and concern is the reference to large cracks far removed from the cliff face. This demonstrates a vulnerability to slumping which is unresponsive to control efforts at the bluff face. This phenomenon puts at risk any structure within 200 to 300 feet of the bluff edge.

Cracks of this nature were observed in 1946 on Oak Street. A study was commissioned and concluded that the cause was erosional rather than structural. This conclusion was reached because there was no evidence of “subsidence or tilting.” The conclusion was probably erroneous because movement in such cases is more in the horizontal plane than the vertical. At any rate, the crack was filled with dirt and asphalt and paved over. Was this the end of the problem? In 1951 the Clifton Avenue slump centered just south of the former intersection of Oak Street and Clifton Avenue.

### **Corp of Engineers Study, 1985**

A study of the bluff in September 1985 by the U. S. Corp of Engineers found the danger of large slumps to be reduced because:

The Giles Cutoff of 1933 redirected the river current away from the bluff at Clifton Avenue. It is no longer under direct attack from the River. The current now intersects Natchez under the hill (Silver Street).

A large reduction of leakage from various fluid lines had been accomplished.

Notice the applicable word is **reduced** and not **eliminated**.

The possibility of “medium and small scale slumps, soil falls and slides, mudflows, soil creep and surface erosion still exist. Factors of safety are marginal”.

### **Further Studies**

Christopher Chadbourne and Associates made another bluff study in 1991. This study recommended, with the concurrence of the Corp of Engineers, that a prohibition of construction within 100 feet of the bluff edge be enacted. The Board of Aldermen considered this recommendation but took no action fearing “discouraging business!” Better to build and lose the building and lives than not build within the danger zone?

In October 2000, after the stabilization project was completed, the Natchez Board of Aldermen adopted a city policy to have set backs of 100 feet for buildings and 200 feet for swimming pools. The risk of land loss along the bluff has not diminished since this

position was taken. Within the past 50 or 60 years, a loss of 50 to 100 feet along the bluff edge has occurred. There is little hope that this rate will lessen in the future.

### **The Natchez Uplift**

A little known and less understood structural consideration also exists. Elevation measurements at the contact of the loess/sand along the bluffs at Natchez indicate a structural high, the apex of which is about 75 feet. The highest point is just north of Jefferson Street. The structure was growing during the late Pleistocene (Ice Ages) when the loess was deposited. Uplift of this type tends to generate faulting and other destabilizing movements. The potential for additional movement and attendant risks is unknown. This uplift, by the way, could be responsible for the rather strange pattern of St. Catherine Creek.

### **Major Slumps, Collapses, and Slides of the Natchez Bluff**

- 1939 Jones Sawmill: Loss of bluff 100 feet deep by 200 feet long.
- 1940's ? Cemetery Road: A large part of the road in the Jewish Hill area, but outside of the Natchez Cemetery, slumped off.
- 1951 Clifton Avenue: Large sections of the street collapsed. Additional areas of the street continue to be lost. Crack found in 1946 at the intersection of Oak Street with Clifton was first indication of a problem.
- 1950's ? The Briars: Three railroad employees killed in slump.
- 1970's? Railroad Depot: (Area immediately south of Natchez Pecan Shelling Company) Loss of 2 cattle chutes and 2 cattle pens, as well as 18 railroad switch tracks northwest of the former Railroad Depot building, which no longer exists.
- 1978 Weymouth Hall: Several major slumps over the years.
- 1970's? The Cliffs Plantation: Loss of bluff 150 feet wide by one-half mile long.
- 1980 Silver Street: Two people killed.

- 2005 Learned's Mill Road: Four major mud slides coming out at the bottom of the stabilization project wall. During the summer and fall of 2005, rivers of rip rap have been placed there in an attempt to stop the erosion from these slides.

These major losses of bluff have often occurred in conjunction with periods of very heavy rainfall. The absorption of excessive water into the soil causes it to become so heavy that it cannot withstand gravitational forces. Often a crack has allowed water to penetrate deep into the bluff; and the additional weight overcomes the stability of the bluff, resulting in major losses such as those listed above.