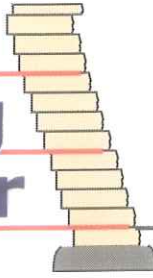


# Scott Miller Consulting Engineer



P.O. Box 94529 North Little Rock, AR 72190

Tel: 501.374.3546 Fax: 501.374.3547 E-mail: segwalls@gmail.com

June 12, 2019

Mr. Timothy Robins, PE  
Construction Department Manager  
City of Broken Arrow  
485 North Poplar Ave  
Broken Arrow, OK 74012

RE: Omega Retaining Walls  
Hillside Drive  
Broken Arrow, OK

Dear Mr. Robins:

As requested, I have visited the Omega block retaining wall on the north side at Hillside Drive in late May during a period of severe flooding and historic rainfall in the City of Broken Arrow and the Arkansas River basin. Reports by local media indicated the 30-day rainfall for May had exceeded all prior months, historically. This retaining wall had experienced some minor movements in December 2015 or January 2016 during a period of heavy rainfall and was remediated by the City the Broken Arrow. Reportedly this wall had experienced no more observed movements until to May 2019.

As a direct result of the heavy rain this May, a portion of the wall from approximately Station 1+60 to Station 3+30, slid outwards several feet towards the street causing the curb and adjacent pavement to buckle upwards. The retaining wall appeared to be sliding only. There did not appear to be global stability rotation or bearing capacity failure as would be expected since this portion of the retaining wall is likely founded on bedrock. It is apparent from reports by city employees that a significant surface area above this retaining wall is draining subsurface water toward the back of the retaining wall as there was no evidence of surface erosion behind the wall. At the time of my visit, 10.0-foot void had opened up approximately 15.0 feet behind the retaining wall at the tail end of the geogrids. This would be consistent with the retaining wall sliding outwards. Overall, the block and geogrid, reinforced soil appears to be moving as a block forced outward by the excessive hydrostatic pressure from the subsurface water above and behind the retaining wall.

Overall, the north retaining wall from Station 0+00 to approximately Station 1+60 as well as from approximately Station 3+30 to the east end of the retaining wall does not appear to be moving with no exhibited soil tension cracks, wall face movements or other movements that would indicate wall stability issues. There were survey measurements taken of the wall face on the same monuments that were used in 2016. These confirm the outward movements from Station 1+60 to approximately Station 3+30.

Mr. Timothy Robins, PE

June 12, 2019

Page Two

In my opinion, the central portion of the retaining wall from Station 1+60 to 3+30 is not repairable given the amount of deflection and disturbance. In addition, any repair would have to address the significant groundwater flows behind the retaining wall, which would likely require demolition of the retaining wall face in this area. It appears the ends of the retaining wall are satisfactory, and in my opinion, will likely not need to be rebuilt. However, a field determination during demolition may determine otherwise depending upon the field and groundwater conditions observed. Reconstruction of the retaining wall can reuse the same block; however, the geogrid, drain rock and reinforced zone fill will all have to be hauled off-site. Any remediation plan must be designed by a retaining wall engineer, experienced with walls of this type and include a chimney drain behind the geogrid zone capable of intercepting the significant groundwater flows which are occurring.

Based upon approximately 170 to 200 linear feet of retaining wall requiring remediation, I estimate the remediation costs will be on the order of \$200,000 to \$300,000 depending upon how much work the City self-performance.

I appreciate this opportunity to be of continuing service to you and City of Broken Arrow. Should you have any questions regarding this letter, please do not hesitate to contact me at your convenience.

Sincerely,



Scott A. "Sam" Miller, PE  
Principal

SAM/sym

13248, remediation status2