
PROJECT MEMORANDUM

TO: ERIC EPSTEIN – REPRESENTING CENTENNIAL ACRES RESIDENTS
FROM: STEVE FULTON, P.E., P.G. – ARM GROUP INC.
SUBJECT: ISSUES OF POTENTIAL CONCERN ASSOCIATED WITH THE
STORMWATER MANAGEMENT PLANS FOR “THE ESTATES AT
AUTUMN OAKS”
DATE: OCTOBER 14, 2008

Introduction

At your request, this memo has been prepared by ARM Group Inc. (ARM) to further address the issues of potential concern associated with the stormwater management plans for the proposed Estates at Autumn Oaks in Lower Paxton Township, Dauphin County, Pennsylvania. These issues of potential concern were presented in ARM’s letter to the Centennial Acres residents, care of Eric Epstein, dated September 8, 2008, and generally included concerns associated with potential flooding or damage of downslope properties (as could be caused by leakage of the proposed stormwater management basins, failure of the downslope berms, and other factors). This memo presents a summary of the supplemental actions that have been undertaken by the Developer of Autumn Oaks (i.e., the McNaughton Company) to address these concerns, and the associated implications on the proposed project. It should be noted that this memo is generally limited to the issues previously presented in our letter dated September 8, 2008, and it generally does not address any other site development issues.

On Tuesday October 14, 2008, ARM met with Eric Epstein, representatives of the McNaughtons, a representative of CMX (geologic consultant to the McNaughtons), and a Township representative to review the issues of concern from ARM’s September 8, 2008 letter. The McNaughtons indicated that they had hired CMX of Mechanicsburg, Pennsylvania to conduct a geologic investigation and geotechnical evaluation of the proposed stormwater management basins in general conformance with the investigation program recommended by ARM. The results and conclusions of the investigation were provided to ARM in a report entitled, “Summary Report of Steep Slope Analysis & On-Site Soil Evaluation, Proposed Autumn Oaks Estates”, completed by CMX and dated October 8th, 2008.

Report Summary

CMX completed a focused geological and geotechnical evaluation of the proposed stormwater management basins (basins). Two test pits were excavated at each of the three proposed stormwater management basins to the immediate north of Centennial Acres (basins E1, D1, and D2). Soil conditions were classified in the field by an attending geologist, and laboratory testing was performed on four of the samples to establish engineering parameters for the design analysis.

The test pits indicated that the subsurface consists of topsoil underlain by 2 to 11 feet of clays and clayey sands that become coarser with depth. These materials are underlain by coarser sands and gravels down to the top of the underlying bedrock, at depths of 5 to greater than 10 feet below grade. It is reported that no groundwater or subsurface seeps were encountered during the excavation activities.

Because of the gravels and coarse materials in the subsurface at and below the proposed depths of the stormwater basin bottoms, the CMX report recommends that the basins include a low-permeability clay liner and embankment clay core. Without these measures, stormwater that collects within the basins could infiltrate (leak) into the subsurface and potentially flood downslope properties. The shallow, finer-grained on-site clays and clayey sands were tested for hydraulic conductivity (permeability), and determined to have a permeability of less than 1×10^{-6} cm/sec, which is generally considered to be suitable for the lining of stormwater management basins. Recommendations for placement and testing of the compacted clay liners and embankment cores are also presented in the CMX report.

In addition to the leakage evaluation, CMX completed a slope stability analysis for the proposed basin embankments. The slope stability analysis was completed using the soil properties and subsurface conditions determined from the geologic investigation. Based on the analysis conducted, CMX concluded that the embankment designs have an adequate factor of safety against global and veneer slope failures.

Conclusions/Recommendations

ARM believes that the additional activities completed by the Developer have substantially addressed the data gaps and primary concerns identified by ARM in our September 8, 2008 letter.

ARM believes that incorporation of the low-permeability clay liner over the entire wetted perimeter of the basins is essential to prevent concentrated infiltration and subsurface flow below the basins, which could otherwise lead to increased flooding problems downslope from the basins. This is particularly important given the high-permeability, coarse-grained gravels that were encountered in the subsurface. ARM agrees that the clays and clayey sands from Statum I are suitable for use in the construction of the clay core and low-permeability liner, provided they meet the design criteria specified in the report. In addition to the liner placement and compaction criteria presented in the CMX report, ARM recommends that the soils be compacted in 8-inch maximum loose-lift thickness (or 4-inches where hand-operated equipment is used), and that the soils be compacted to a moisture content that is within -1 to +3 of the optimum moisture content as determined by ASTM D1557.

ARM recommends that an independent, third-party inspection and testing firm be retained to conduct quality assurance testing and documentation that the clay liners were placed and compacted in accordance with the applicable specifications.

Closing

If you have any questions or comments regarding this memo, or if you require any additional information, please do not hesitate to contact us at your convenience.