II. EXECUTIVE SUMMARY

This report encompasses four technical analyses and general project overview of Carderock Springs Elementary School in Bethesda, Maryland. This school has been selected for rebuilding as part of Montgomery County Public School's capital improvement program. The report provides an overview of the construction project including cost details, geographic information, project schedules, and structural estimates. Also included are four in depth analyses in 3D MEP Coordination, schedule acceleration, solar photovoltaic panels, and structural design.

The first analysis focuses on a current critical industry issue; Building Information Modeling (BIM), or, more specifically, 3D Mechanical, Electrical and Plumbing (MEP) Coordination processes. The analysis focuses on assessing the traditional and most widely used 2D coordination process used on majority of projects today. It then considers a generalized 3D process which, with proper planning, can be easily implemented to manage any project. Finally, it assesses the hypothetical application of the 3D process at Carderock Springs Elementary and reviews the potential benefits such as budget control, decreased amount of change orders, decreased amount of RFI's, and greater opportunity for quality control through pre-fabrication.

The second analysis focuses on decreasing the project budget through the relocation of an Underground Storm Water Retention System (UGS). The area where it is located requires deep excavations and setbacks for safety, eliminating access to other trades except the sitework contractor performing the work. Moving the system to a different location is analyzed. Possible benefits are better site utilization, opportunity for schedule acceleration, and more space for material staging and parking. The analysis shows that, by moving the system and adding crews to work in the restricted area, the schedule could be reduced by 20-30 days and saves about $94,000 of general condition costs.

The third analysis demonstrates breadth in structural systems by replacing a load bearing masonry wall system to a steel frame in two sections of the building. This analysis uses the LRFD method to size the new steel columns and beams. The same roof system is used. Also in this analysis it is shown that the steel system is $55,000 less than a masonry system and can save about 12 days on the critical path making this change potentially lucrative if pursued.

The final analysis, an electrical breadth, uses thin film solar photovoltaic panels made by Solyndra to help offset energy costs and add to the sustainability goal of the LEED program in place. By adding the panels, the addition to the budget would be about $800,000 while reducing the electrical utility bill by about $32,000 annually. The payback period will be 25 years making this a feasible option since, on average, a public school building will stand for 42 years in the United States.