## Executive Summary

The following studies pertain to Prince Frederick Hall, a new LEED Gold building for The University of Maryland. A major focus of this project is to promote sustainability for the campus. Programming for the building provisions space for academic rooms on the ground and first floors where the second through seventh floors, along with part of the first floor, are used for student housing. This thesis consists of four main studies: lighting, electrical, architectural, and mechanical. Both lighting and electrical are depth studies. The two breadths are integrated with these lighting and electrical studies for a cohesive report.

The first depth study conducted on this building is a lighting redesign for four spaces. To fully represent the gradient of public and private spaces, the four that were selected are: the entry plaza, the lobby, a seminar room, and a typical dormitory suite. Despite this variation in function, the binding factor between these spaces is the need for each to provide an effective learning environment for its occupants. Therefore, the concept used for the lighting design is discovery, where this is utilized in a unique way for each of the four spaces. To promote the LEED aspect of Prince Frederick Hall, part of the lighting studies involved more strictly adhering to IES recommendations to ensure maximum reduction of the lighting power density within each space. The power used by the existing lighting systems in these four spaces was 22,100 watts. After optimizing the lighting, this was reduced to 10,700 watts in the redesign, for a successful power reduction of 51%.

Three electrical studies comprised the second depth study. In the first of these, the effects of the lighting design changes were determined for the lighting branch circuits. By reducing the power usage by lighting, a few circuits were able to be converted into spares. However, the lighting changes were dispersed over enough circuits that they did not affect any major changes to the electrical system. The main portion of this electrical depth was used to determine that savings could be created by switching to a distributed transformer system, in place of the existing centralized transformers. RSMeans data was used to compare the materials cost difference for equipment and wiring. By using several smaller transformers, instead of two large ones, and reducing the necessary wire sizes, the materials cost savings is approximately $71,000. Finally, a seven-level short circuit calculation was conducted to check the available fault current at critical points along this redesigned dormitory riser.

To reinforce the LEED goal for Prince Frederick Hall, the two breadth studies are focused on increasing sustainability. Architectural features have been applied to provide passive solar shading; this reduces the requirements on the mechanical system by a net 83,500 BTUs per year. To accomplish this, shading was applied to the most typical dormitory room at each orientation of the building. A different shading system was used at each orientation to maximize the unshaded area of each window in the winter and minimize the unshaded area of each window in the summer. This highly visible architectural system was then integrated into the facade. This is a practical addition to the building in that it provides mechanical system savings, but it also very visibly communicates the sustainable goals of Prince Frederick Hall and for The University of Maryland.