Section 2: Executive Summary

This report discusses the Phipps Conservatory's *Center for Sustainable Landscapes*, being constructed by Turner Construction. The *Center for Sustainable Landscapes* is a three story, 24,350 GSF, new construction located in Pittsburgh, PA. Upon completion, this project will require net-zero energy and water, and attain sustainable certifications including: LEED Platinum, Living Building, and Sustainable SITES. The analyses discussed will provide insight into improving efficiency both directly and indirectly in the construction industry through investigation of a critical industry issue, constructability, value engineering, and schedule acceleration.

The critical industry issue discussed in the first analysis analyzed legislation in the state of Pennsylvania that requires the use of traditional delivery methods and contract types. Specifically, this research attempted to expose legal opportunities to Penn State's Office of Physical Plant to employ the use of more progressive delivery systems. It was determined through the analysis of other projects that specific exemptions are made to these regulations by the legislature, and that exemptions can be obtained provided the project being considered would significantly benefit. Other public funding sources that do not require the adherence to procurement law were also discussed, these consisted primarily of grants. A decision tree was successfully developed to illustrate these opportunities.

In an attempt to improve constructability, an alternative design was developed for the building's atrium in the second analysis. The atrium was the source of a significant amount of conflicts for the construction team. This was largely due to the two-story radiused cast-in-place concrete stair located at its center. The construction of the stair was highly laborious and produced a large amount of on-site congestion and waste. An alternative atrium design was developed utilizing a free-standing steel stair. Since the atrium is intended to be passively heated and cooled, the thermal mass (concrete) removed from the stair was added to concrete walls in an attempt to maintain the amount of thermal mass in the room. The alternative design did successfully improve constructability, but did so at an increased cost of $70,000. This alternative was rejected due to its increase in cost.

Presented as a value engineering alternative, the third analysis considered removing the raised access flooring HVAC distribution system and replacing it with a traditional above ceiling system. It was determined that the alternative design added a total of 100 man hours but reduced the system cost by $59,162. Despite not having any significant benefits to sustainability, the alternative design is recommended due to the significant decrease in cost, and comparable value provided.

Finally, the fourth analysis analyzed the applicability of prefabricated structural insulated panels as an alternative to the conventional exterior metal stud wall specified to accelerate the project schedule. It was determined that the structural insulated panel system offered improved thermal performance as well as a 50% reduction in time to the construction of the exterior wall assembly. This alternative design was accepted and incurred an net additional cost of $3,704.

When considered as a whole, the findings in this report suggest that under certain circumstances, the benefits of incorporating a contractor earlier in design phases of construction can be significant. This report performed three analyses that exposed two significant changes in design that could have saved the project owner a significant sum of money. Furthermore, this report also provided valuable insight into the overall direction of the public works sector in Pennsylvania. In conclusion, a large amount of experience was gained through researching the diverse areas of each analysis, information that will prove to be beneficial as a professional in the AEC industry.