Executive summary

This report analyzes the existing mechanical systems of Ft. Detrick Defense Medical Logistics Center (DMLC) and proposes a redesign to improve the existing system. The existing systems were designed to meet typical ASHRAE guidelines as well as Anti-Terrorism/Force Protection guidelines mandatory for military structures. The building met most of the requirements for ASHRAE 62.1 and ASHRAE 90.1, as was studied in Technical Assignments 1 and 2. Because VAV systems are not the most energy efficient, a dedicated outdoor air system partnered with chilled beams and high induction diffusers was selected for the redesign. The building's electrical system was then resized to accommodate these changes. A constructed wetland was also added to the project as an architectural/site breadth topic to maintain sustainability. The goals of the redesign are:

- Decrease Lost Rentable Space
- Increase Energy Efficiency
- Maintain Affordability
- Maintain Occupant Safety and Indoor Air Quality
- Improve Sustainability

Since a DOAS system requires a smaller volume of air than a VAV system, only two DOAS units were needed to replace the six existing AHUs. Therefore, the lost rentable space decreased almost 2%. Because of the enthalpy wheel in the DOAS unit, the redesigned system saved 17.2% more energy than the existing system. Although the redesign is more expensive initially because of the higher cost of DOAS equipment and the added $38,700 for the constructed wetland, with the increased energy savings and savings to the electrical system, the design can payback in 5.2 years.

The contaminant removal analysis also showed that the DOAS was better for occupant safety. Although the DOAS takes two hours longer to flush out contaminants completely, it distributes the chemicals more evenly throughout the building at a concentration not harmful to the occupants. The design also made the building more sustainable, which was proven by the increase from SPiRiT (Sustainable Project Rating Tool) Silver to SPiRiT Gold. Six credits were obtained from the increase in energy efficiency, and one credit was obtained from the constructed wetland. In conclusion, all five of the project's objectives were met by the new system. Upon completion of the analysis, it was determined that if the owner was willing to pay the higher first cost, the redesigned system would be recommended.