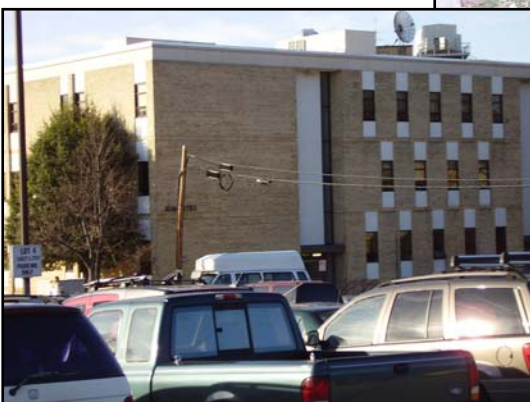


# Montgomery College Rockville Campus

## Facilities Information Technology (IT) Infrastructure Master Plan

### REPORT – VOLUME 1 of 4

September 14, 2007



**Wiley & Wilson**  
*Employee-Owned*

2310 Langhorne Road  
Lynchburg, Virginia 24501  
Phone: 434.947.1901  
[www.wileywilson.com](http://www.wileywilson.com)

Contact:  
Stevens M. Terry, P.E.  
Project Manager  
[sterry@wileywilson.com](mailto:sterry@wileywilson.com)

Comm. No. 207035.00

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## 1 INTRODUCTION

This Facilities Information Technology (IT) Infrastructure Master Plan is being conducted as a means to determine the Montgomery College Rockville Campus (MC RV) Facilities IT Infrastructure system's existing conditions, as well as future Facilities IT Infrastructure systems needs. Emphasis on IT Infrastructure Outside and Inside Designs are key points of this Facilities IT Infrastructure Master Plan.

This Facilities IT Infrastructure Master Plan also provides recommendations for IT Infrastructure communications system improvements and remedial efforts, plus summarizes discussions and interviews with several Montgomery College IT personnel.

### 1.1 Scope

The Montgomery College Rockville Campus Facilities IT infrastructure is composed of Outdoor Design systems and cabling, plus Indoor Design systems and cabling. Current IT systems supported by existing Facilities IT infrastructure include: a) Data Networks for both administrative and academic functions, b) Voice/Telephony communications systems, c) Video/Cable TV systems in support of a College-wide TV Channel, d) Wireless systems for Campus and community Internet access, and e) Physical Security Emergency Phone Systems located throughout the Campus outside areas and parking lots, and within Building elevators and entry ways. This Facilities IT Infrastructure Master Plan includes the Rockville Campus only, and the scope of this Master Plan is to:

- Review each Building's existing IT service entrance point (SEP), take measurements and photographs, and confirm existing conditions in these spaces.
- Review existing IT manholes/handholes and pullboxes to determine condition and extent of cable fill in existing conduits.
- Identify existing IT spaces on Building floor plans.
- Create a summary assessment spreadsheet that details IT SEP space conditions.
- Conduct interviews with Montgomery College IT personnel to obtain operational knowledge of the Rockville Campus IT system.
- Include in the Master Plan:
  - Existing High-level IT Data Network Sketch, as provided by Montgomery College.
  - Point-to-point data cabling information, as provided by Montgomery College.
  - Wireless Access Point information, as provided by Montgomery College.
  - Floor Plans indicating Asbestos containing Building materials, as provided by Montgomery College.

- PBX redundancy network sketch, as provided by Montgomery College.
- Presidio Data Network diagrams, as provided by Montgomery College.

The scope of this document is limited to the Montgomery College Rockville Campus Data (fiber cabling), Voice (copper and fiber cabling), and Video (CATV – coax cabling) service entrance points. Outside Design manholes/handholes and pullboxes have been reviewed for physical conditions, cable fill, and other general conditions. Inside Design SEP, Main Distribution Frame (MDF), and Intermediate Distribution Frame (IDF) space locations have been documented on Montgomery College provided floor plans, and general observations have been provided, where available. Additionally, Data, Voice, and Video Point of Presence locations have been noted. Finally, since the Montgomery College Rockville Campus is currently the site for the College Network Operating Center (NOC), general information (such as pictures) of the NOC is also provided. Although not the focus of this study, Wireless Access Points (WAPs) have been noted as provided by Montgomery College, and respective third-party detailed information is included.

This Facilities IT Infrastructure Master Plan is based on the Campus growth plans shown in the 2002-2012 Facilities Master Plan developed for Montgomery College by EYP (Reference 2), as well as based upon the Utilities Master Plan document provided to Montgomery College by Wiley & Wilson, Inc. (Reference 3). The Montgomery College Rockville Campus Facilities Master Plan and Utilities Master Plan describe several key systems and Building improvements, renovations, and demolition / replacements, spanning Y2004-2030; therefore, the Facilities IT Infrastructure needs to be capable of supporting that growth, both from a capacity, as well as, security standpoint. In preparation for the facilities and utility systems changes noted in those Master Plans plus verbal updates from Montgomery College personnel, the Rockville Campus Facilities IT Infrastructure Master Plan addresses high-level recommendations for short-term and long-term Facilities IT Infrastructure improvements.

The following are assumptions governing this report's content:

- A. Underground manholes/handholes, pullboxes, conduits and duck banks were located, identified, and marked by Montgomery College.
- B. IT cabling was identified by Montgomery College.
- C. Diagrams of existing and planned future network configurations were prepared by Wiley & Wilson and included in this report, but all of the information including point-to-point connection details was provided by Montgomery College in the form of drawings.

- D. Electronic drawings of Rockville Campus Building floor plans were provided by Montgomery College.
- E. If complete information on the existing and planned future systems was not available within 60 days of request for this information, this was noted in this final report and available information was documented.

## 1.2 Reference Documents

1. Original Proposal letter, "RE: Proposal for Professional Engineering Services Rockville Campus Information Technology (IT) Infrastructure Master Plan", dated December 14, 2006.
2. EYP Montgomery College Facilities Master Plan, Rockville Campus section, Rockville Maryland, Project Number 2001051.00, January 2004.
3. Wiley & Wilson Montgomery College Utilities Master Plan Rockville Campus, Volume 6, Electrical Systems, Commission Number 204145.01, September 29, 2005.
4. BICSI Telecommunications Distribution Methods Manual, Eleventh Edition, Volume 1, September 2006.
5. BICSI Outdoor Plant Design Reference Manual, Fourth Edition, February 2007.
6. TIA/EIA Collection – Telecommunications Building Wiring Standards on CD-ROM, April 2007.
7. The National Electric Code, 2005 Edition
8. TIA/EIA Building Telecommunications Wiring Standards, December 2003 or later.
9. ANSI J-STD-607-A Telecommunications Grounding Standards
10. NFPA Standard, Section 75

## 1.3 Acronyms and Definitions

| Acronym | Definition                                    |
|---------|---|
| AC      | <b>Alternating Current</b>                    |
| AP      | <b>Access Point</b>                           |
| CS      | <b>Computer Science Building</b>              |
| CATV    | <b>Cable Television</b>                       |
| COAX    | <b>Coaxial cable – the term ‘coax’ is</b>     |
|         | <b>interchanged throughout this report to</b> |
|         | <b>refer to CATV.</b>                         |
|         |   |
| GPS     | <b>Global Positioning System</b>              |
| HUM     | <b>Humanities Building</b>                    |
| IDF     | <b>Intermediate Distribution Field</b>        |
| IT      | <b>Information Technology</b>                 |
| MC      | <b>Montgomery College</b>                     |
| MDF     | <b>Main Distribution Field</b>                |
| MH      | <b>Manhole</b>                                |
| MT      | <b>Macklin Tower Building</b>                 |
| NOC     | <b>Network Operating Center</b>               |
| PBXs    | <b>Private Branch Exchanges</b>               |
| POP     | <b>Point of Presence</b>                      |
| RV      | <b>Rockville</b>                              |
| SEP     | <b>Service Entry Point</b>                    |
| VoIP    | Voice over Internet Protocol - also called    |
|         | VoIP, IP Telephony, Internet telephony,       |
|         | Broadband telephony, Broadband Phone          |
|         | and Voice over Broadband                      |
|         |   |
| W&W     | <b>Wiley &amp; Wilson, Inc.</b>               |

## **2 ROCKVILLE CAMPUS IT INFRASTRUCTURE MASTER PLAN**

### **2.1 Executive Summary**

Montgomery College would like to improve existing and/or install new IT Communications Systems that positively impact the following College goals:

- Improve Student Experience
- Improve Faculty/Staff Experience
- Improve Community Experience
- Implement Redundant and Diverse Technology Solutions

The Montgomery College Rockville Campus would like Campus IT communications systems to provide leading-edge technology service to the RV Campus' students, faculty, staff and community. Key objectives for enabling IT Communications Systems solutions within MC RV are to provide ways to positively impact the following areas:

1. Improve Student Experience by providing Technology Services with:
  - a. Dedicated data network for students
  - b. Increased network speed
  - c. Increased accessibility
  - d. Best of Class IT security
  - e. Improved service quality
  
2. Improve Faculty/Staff Experience by providing Technology Services with:
  - a. Dedicated data network for Faculty / Staff
  - b. Increased network speed
  - c. Increased accessibility
  - d. Best of Class IT security
  - e. Improved service quality
  - f. Improved maintainability of IT systems
  
3. Improve Community Experience by providing Technology Services with:
  - a. Dedicated data network for Community
  - b. Increased network speed
  - c. Improved security on community webpage accessibility over the Internet
  - d. Improved service quality

4. Implement IT Communications Systems Solutions that provide:
  - a. Foundational platforms for existing and future technology usage and needs
  - b. Utilizes air-blown fiber solutions for Data and Voice outside designs
  - c. Expandable for potential future systems upgrades and integrations
  - d. Redundancy and Diversity Paths for Data, Voice and CATV systems
  - e. Reduces Risks of system downtime

The goal of this Facilities IT Infrastructure Master Plan is to identify existing IT Infrastructure conditions, and recommend future Facilities IT infrastructure conditions that will foster key IT objectives.

## **2.2 Summary of Findings and Recommendations**

This Master Plan reviewed both IT Infrastructure Outside Plant design and Inside Plant design. The Outside Plant design included manholes, PVC piping and duck banks, and cabling to support Data, Voice, and Video communications systems. Several manholes were found to have water retention issues, a few did not meet the current NEC code clearance requirements, and all had cable management issues. The cable management issues within the manholes were: a) abandoned cabling, b) unidentifiable cabling, c) not in use cabling, and d) lack of cable labeling. It is recommended that the College place all manholes on a maintenance cycle, and that manholes currently containing water are pumped to remove the moisture. Those manholes prone to water retention should be on a more frequent maintenance cycle than other manholes. It is also recommended that the College consider starting a project to document all existing outside plant cabling, to bring the cable labeling up to current standards, as well as to identify and remove (where feasible) abandoned, collapsed, and/or not in use cabling.

The Inside Plant design included surveying all Service Entrance Points and assessing each space against 39 key criteria, based upon BICSI, NEC and National Fire Protection standards.

Key findings included the following:

- 1) Safe and Clean Environment – debris, unacceptable (flammable) materials present, moisture, poor lighting, and lack of safe working clearance in the space were key issues.
- 2) Cable Management – similar to issues found in the manholes and outside plant design, cable management inside the SEP spaces was also an issue. Key areas of concern were: a) cable management systems were not available on racks or were not properly used; b) cable ladder trays were overstuffed with cabling; and c) there was a lack of

cable labeling in some spaces. Telephony cabling into the SEP rooms was documented based upon institutional knowledge, as point-to-point information is not available.

- 3) Facilities - broken door entry locks, a variety of accesses (keyed, swipe card, etc.) to enter a space, poor lighting over or near the equipment, heat dissipation issues, lack of heating and cooling systems, and dangling lighting no longer secured to the support system were a few key themes in the rooms. It was observed that most IT spaces did not have sufficient floor space to serve their purpose with safe working clearance, and several IT spaces were placed in spaces that were not originally designed to be an IT space (such as MER spaces and janitor's closets). There are also issues with IT Spaces being used as storage spaces, for janitorial services and paper/chemical supplies.
- 4) Back-up Power – Another key area in the SEP spaces was observance of towers of Smart UPS stand-alone boxes stacked in IT spaces that contained data racks. There was no clear evidence at the time of the site visits that these UPS supplies were on a maintenance cycle to validate they were still operational. It is suggested that Montgomery College further investigate and consider the use of other alternative methods to secure back-up power during outages, such as placing key spaces or equipment onto back-up generator power.

It is recommended that the College Facilities and IT personnel review the Issues Assessment spreadsheets and supporting materials, and determine the priority of which issues are to be addressed by whom and when.

For the College Facilities Master Plan efforts, a cost estimate is provided for each key plan. There is an estimate for IT outside design facilities infrastructure needs for the Y2007 – Y2012 Plans A & B scenario, an estimate for the Y2012 – Y2030 Plan A option, and another estimate for the Y2012 – Y2030 Plan B option IT outside design changes. The Y2007 – Y2012 plan estimate is the highest, as the majority of changes will occur during this timeframe in support of building additions, remodeling, and demolitions occurring during this timeframe. Costs for Y2012 – Y2030 plans are smaller in scale, as this Master Plan attempted to design a system that will last the College over that timeframe with minimal impacts to existing buildings and systems in place at that time.

### **3 ROCKVILLE CAMPUS EXISTING FACILITIES IT INFRASTRUCTURE OVERVIEW**

The MC RV Campus provides four major Facilities IT Infrastructure systems to its students, faculty, staff and/or community: 1) Data, 2) Voice, 3) CATV, and 4) Wireless. There are two main categories of service provided: Administrative and Academic. Currently, the Rockville Campus does not provide GPS systems.

The below sub-sections discuss the Campus Point of Presence (POP) locations, the Data Network Operations Center (NOC) location, and provide a general overview of the four types of IT Infrastructure cabling available on the RV Campus.

#### **3.1 Point of Presence (POP) Locations**

A Point of Presence is the location by which the IT infrastructure cabling enters the Building from the outside. Often a POP is an IT chase, an IT room that serves as an SEP room, or an IT Closet. Each IT cabling system will have at least one POP per unique service provider. The Rockville Campus has two Data Point of Presence (POP) locations, one Voice POP, and one CATV POP. Comcast and Sprint are the data service providers. Verizon is the Voice service provider, and Comcast is the Video (CATV) service provider. Wireless technology installation is provided by third-party company, named Presidio; they install the Wireless Access Point (AP) units, plus they install the switches and wireless APs to the firewall.

##### **3.1.1 Data POPs**

Comcast and Sprint provide data service to the Campus. The Data Point of Presence for the Rockville Campus is located at the Computer Sciences (CS) Building, Room 108. The CS Building, Room 108, is also the College's current Network Operating Center (NOC) location.

Sprint fiber data cabling enters the Campus from an aerial telephone pole located across the road from Macklin Tower, where it is direct buried under the West Campus Street to Macklin Tower's Outside Pit. The cabling enters the Macklin Tower ground level Outside Pit area overhead and routes around the top walls of the Outside Pit, to enter above the outer double-doors of Macklin Tower, Room B-1. From Macklin Tower, Room B-1, it is assumed the data fiber routes to the Computer Science Building, Room 108, where the cabling terminates on distribution panels.

Comcast data fiber enters the Rockville Campus from aerial telephone poles located along North Campus Drive that route over to an aerial pole located at the North Campus side of the Humanities Building. From the telephone pole outside of the Humanities Building at the North

Campus side, the cabling routes through Humanities, Room 035G area, over to the Computer Science Building, Room 108, where it is terminated.

### **3.1.2 Voice POP**

Voice service enters the Campus from one location and is provided by one service provider, Verizon. The Voice Point of Presence for the Rockville Campus is located at the Humanities (HUM) Building, Room 035G.

Similar to the Comcast data fiber point of presence, the Verizon Voice cabling enters the Rockville Campus from aerial telephone poles located along North Campus Drive that route over to an aerial pole located at the North Campus side of the Humanities Building. From the telephone pole outside of the Humanities Building at the North Campus side, the cabling routes to Humanities, Room 035G, where it is terminated. Currently, Humanities Building, Room 035G, houses three (3) Private Branch Exchanges (PBXs).

Like the Data systems on the Rockville Campus, the Voice Outside Plant systems run through manholes and/or pullboxes to Campus Buildings, and the Voice Indoor Plant systems feed the Buildings via MDFs and IDFs.

In addition to Voice supplied to the Buildings, the Campus also supports an Emergency Phone System. The Emergency Phone System includes both pedestal phones located outdoors throughout the Campus Buildings and parking lots, as well as emergency phones systems present in each Building's indoor elevators and in some walk-in level entry ways.

### **3.1.3 Video (CATV) POPs**

The Video (CATV) service enters the Campus from one location and is provided by one service provider, Comcast. The CATV Point of Presence for the Rockville Campus is located at the Macklin Tower (MT) Building, Room B-1.

Comcast coaxial cabling enters from an aerial telephone pole located across the road from Macklin Tower, where it is direct buried under the West Campus Street to cabling box located at the ground level of the Macklin Tower Outside Pit. The cabling enters the Macklin Tower ground level Outside Pit area at the top wall of the Pit and routes around the top walls of the Outside Pit, to enter above the outer double-doors of Macklin Tower, Room B-1. From Macklin Tower, Room B-1, the CATV coaxial cabling routes to the Macklin Tower, Room 022. All coaxial CATV connections originate from MT, Room 022.

### **3.1.4 Wireless POPs**

The Computer Science (CS) Building, Room 108 serves as the Campus Wireless POP. The wireless server is located in CS, Room 108. Wireless switches are located in various Campus Buildings in the respective MDF rooms.

## **3.2 Data Network Operating Center (NOC) Location**

The Rockville Campus houses the Montgomery College existing Network Operating Center (NOC) for the College. The NOC is currently located at the Rockville Campus, Computer Science Building, Room 108.

## **3.3 Cabling**

### **3.3.1 Data Cabling**

The Outside Design Data system is composed of both Multimode (MM) and Singlemode (SM) fiber optic cabling strands. 62.5 micron single-strand, 12-, 24-, 48-, and 72-strand MM fiber optic cables, and 125 micron single-strand, 12-, 24-, and 48-strand SM fiber optic cables have been deployed to support the data systems on the Campus. Individual fiber optic cables, as well as fiber optic innerducts, run through manholes and/or pullboxes and duck work throughout the Campus, to bring data fiber to the Buildings' service entrance points. Currently, Air-Blown Fiber has not been deployed on the Rockville Campus; however, Montgomery College has set a standard that air-blown-fiber cabling will be used on future data and voice outside design cabling expansion projects.

The Inside Design data system cabling enters each Building at its respective SEP location, and terminates on fiber optic distribution panels at the MDF location(s). Fiber optic cabling is also used for the backbone runs to IDF locations. From the runs from the IDF locations to the office/floor spaces, Copper cabling has been deployed. Ethernet Category 3, 5, 5e and 6 are deployed.

Volume 2, Appendix B is a spreadsheet that details the existing data fiber optic cabling point-to-point information, provided by the Montgomery College Rockville Campus Information Technology Cabling team. It is assumed this list is current.

### **3.3.2 Voice Cabling**

For the Voice systems on the Campus, copper cabling and fiber optic cabling have been deployed, although the majority of voice cabling is copper. Montgomery College was unable to provide existing documentation on the voice cabling point-to-point details. From general observation, 100 pair, 200 pair and 600 pair copper cabling was present in the existing

infrastructure systems. It is recommended that Montgomery College begin an effort to document the existing Voice cabling types and pair quantities. A proposal to conduct this point-to-point Voice cabling analysis including the services of a third-party consultant can be provided to the College for consideration and planning purposes upon request.

### **3.3.3 Video (CATV) Cabling**

Video cabling used for the on-Campus Cable Television (CATV) system runs throughout the Campus, both within outside manholes and pullboxes, as well as indoor SEPs, MDFs, and IDFs. Coaxial cabling is used to support the CATV systems. No fiber optic cabling has been used as of yet for CATV applications on the Campus; however, it is planned that portions of the CATV systems, such as for the MC I-TV Group/Channel cabling, will be switched over to Fibernet in the future. Other CATV applications will remain on coaxial cabling.

### **3.3.4 Wireless Cabling**

Campus wireless systems support wireless access to the internet (World Wide Web) plus the Montgomery College intranet, for academic and administrative inter- and intra-net usage, as well as community internet use. Wireless Access Points and antennas are located at various Campus Buildings so that inter- and intra-net access is available from common areas and library locations. See Volume 2, Appendix I for more details on the Montgomery College Wireless Access Point locations and wireless systems conditions; this data was provided by the Montgomery College Information Technology Department.

## **3.4 IT Systems Redundancy and Loop Diversity**

The Rockville Campus Data and Voice systems are distributed star configurations. At present, the outside cabling data and voice systems are not setup for cabling redundancy and loop diversity. Today, there is no secondary cabling setup in case the primary cabling is cut or damaged. See Volume 2, Appendix M for more information on redundancy. It is the intent of this Master Plan to offer future outside infrastructure designs that would foster future outside design redundant paths.

## **4 OUTSIDE BUILDING DESIGN**

### **4.1 Manholes and Pullboxes**

#### **4.1.1 Overview**

Manhole and Pullbox locations were identified by the Montgomery College IT Cabling team, and existing conditions were assessed as a part of this Master Plan. The Rockville Campus has fifteen (15) existing IT manholes and four (4) IT pullboxes. Outside Cabling runs through manholes, duct banks, and buried PVC piping to the respective Building service entrance points. See Drawing E-1 of the Existing Site Plan Conditions, located in Volume 2, Appendix J for specific manhole and pullbox locations, and cable routing, throughout the Outside Campus.

#### **4.1.2 Existing Conditions**

When gathering existing conditions of each manhole/pullbox space, specific Facilities-related datum were gathered into a summary assessment spreadsheet, and deficiencies were identified. For each manhole/pullbox space, the following standards were referenced to determine deficiencies: BICSI Telecommunications Distribution Methods, BICSI Outside Plant Design Methods, TIA/EIA Building Telecommunications Wiring Standards, and the National Electrical Code. (See References 4, 5, 6, and 7)

For each manhole/pullbox space, the existing conditions field survey included taking photographs of each space, and compiling a photo gallery of noted issues. Dimensions of the manhole/pullbox were noted, where available, and accessibility issues were noted. For each manhole and pullbox, actual pictures of the existing conditions are provided, as well as conduit cable fill percentage estimates and general condition notes. See Volume 2, Appendix C, for pictures of each manhole/pullbox surveyed, and Volume 2, Appendix E for a summary spreadsheet that details existing conditions of each manhole/pullbox available at the time of the site inspections.

In addition, manhole and pullbox sketches have been created to help visualize the IT infrastructure outside plant cabling systems. Existing conditions have been noted on those sketches based upon limited point-to-point information on the data, voice, and video cabling within the manholes and pullboxes. See Volume 2, Appendix D for copies of each IT manhole/pullbox sketch, and for a copy of legends and general notes to help understand the formatting used for those sketches. When available, the manhole and pullbox sketches note actual cable labeling wording. For a copy of the data fiber point-to-point details provided by the MC IT Cabling team; again, that detail is noted in Volume 2, Appendix B.

Of the 15 existing manholes, four (4) manholes contained splice boxes, and eight (8) manholes contained splitters. Of the four (4) pullboxes, no pullboxes contained splice boxes, and one (1) pullbox contained splitters. Existing conditions surveys showed several manholes that contain abandoned, collapsed, and/or unidentifiable cabling. Manhole photos and sketches show that type of cabling, as well.

#### **4.1.3 Existing System Improvements**

Volume 2, Appendix F notes deficiencies and issues discovered with the existing outside manhole/pullbox infrastructure in a summary spreadsheet—photos with a caption of the identified issue(s) are also noted in that Volume 2, Appendix F in separate word documents. Each issue was categorized and prioritized on a scale of Priority 1-3 issues, with Priority 1 issues noted as issues that should be addressed immediately (next 1-3 months); Priority 2 issues are issues that should be addressed short-term (next 6 months or less); and Priority 3 issues that should be addressed long-term and included in future planning discussions. In addition to the prioritization of issues, recommended corrections have been noted. These recommended corrections help assist in determining quickly which issue is a recommended work-order item, a maintenance cycle item, a future planning item, or training/installation or other category item. Many items categorized as work order items are pick-list/punch list issues that it is suggested could be converted into Montgomery College work orders for repair, replacement, and/or fixing.

One of the most severe conditions discovered was water retention in many manholes. All manholes with moisture inside are recommended Priority 1 items, and it is recommended that water be pumped out of the existing manholes currently containing water. It is also recommended that those manholes be placed on a semi-annual or annual maintenance inspection schedule to determine conditions and need for a sump pump to remove water. The spreadsheet in Volume 2, Appendix E should be consulted for a complete list of manholes containing water.

Another issue observed was that there is a water run-off issue to the Macklin Tower Building, via the existing manholes and outside cabling infrastructure. There is evidence that the Macklin Tower Service Entrance Point location has been flooded previously due to water drainage issues into the manholes outside that Building. Although no moisture was observed at the time of this site survey, it is highly recommended that the Macklin Tower Building Service Entrance Point be placed on a maintenance cycle to ensure that moisture retention is no longer an issue in this area.

A third issue observed was that several existing manholes do not meet the present-day National Electrical Code requirements for manhole cover sizes and clearance dimensions. See Volume 2, Appendix F for more details on the manholes with cover and clearance limitations.

The site survey discovered that Manhole 8 was landscaped over with dirt and grass. Although now un-earthed, it is highly recommended that Montgomery College make the appropriate Departments and personnel aware of this issue and put into place measures to ensure that no manholes on the Campus are landscaped over in the future.

Other items discovered were:

- i. Manholes containing Copper splice boxes are of the older Western Electric type boxes. Many of these boxes are no longer properly secured to the wall of the manhole, as the braces have rusted or broken.
- ii. There is a significant amount of abandoned and collapsed cabling within the existing manhole system.
- iii. Many splice and splitter boxes are not braced; some are submerged completely under water.
- iv. There is a lack of sufficient labeling of the cabling in the manhole system.
- v. There is a lack of Voice and Coax point-to-point diagrams or information for the cabling infrastructure. There is limited Data cabling point-to-point information available.
- vi. There is a lack of knowledge of what cabling is in use, available and useable, and available and not usable.
- vii. There is a lack of migration to Air-blown fiber for Data and Voice applications.

For the existing pullboxes on the Campus, there were two major issues: cabling is exposed to the outside environment, and there is open access to the internal housing due to lack of locks on the pullbox covers. It is recommended that both of these items are addressed immediately for all pullboxes. See Volume 2, Appendices E and F for more details. After addressing the present issues with the pullboxes, it is recommended that Montgomery College place all existing pullboxes on an annual maintenance cycle.

#### **4.1.4 Proposed Short-term Manhole System - Y2007 – Y2012**

As detailed in the Montgomery College Facilities Master Plan document, there are four new Buildings proposed that will drive the need for Information Technology Infrastructure additions and changes. Drawing E-2 in Volume 2, Appendix J shows the proposed IT Infrastructure needs in support of the Facilities Y2007-2012 Plan. Outside IT Infrastructure changes will need to be in place prior to the construction of each new Building, as well as there will be IT changes implemented post construction, or in parallel with new Building construction. Therefore, planning for new Building construction, existing Building renovations and demolitions should include planning for all impacted IT infrastructure needs. New manholes and conduits/ductwork will be required to support the proposed Facilities Master Plan changes. For all outside plant infrastructure changes, it is recommended that Air-Blown Fiber (ABF) is utilized for all future expansions and new IT infrastructure cabling. This Master Plan assumes the use of 19-tube ABF assemblies and the use of 4-foot x 4-foot x 5-foot manholes with double-leaf hatch design covers that are traffic rated. This Master Plan also assumes the use of 5-inch D conduits, instead of 4-inch D conduits, so as to gain the capacity of having three 19-tube assemblies per 5-inch D conduit, as opposed to only two 19-tube assemblies per 4-inch D conduit. Finally, this Master Plan assumes that 8-way PVC duck banks are utilized to route between new manholes.

##### **4.1.4.1 Construction of the Science Center – Y2007 – Y2012**

It is projected that the new Science Center will be the only implemented new Building addition to the Rockville Campus during the Y2007 – Y 2012 timeframe. The new Science Center will be located to the South of the existing Science East Building, and will have an overhead breezeway walkway that connects the new Building to the Southside of the existing Science East Building. To service this Building with Voice, Data, and Video systems, a new manhole located between the most eastern corner of the Science East Building and the Science Center will need to be installed. It is suggested that a small PBX may need to be installed in the New Science Center, as well.

During this timeframe, IT infrastructure needs should be planned for the additions of the New Student Services Center Building, New Library Resources Center Building, and the Physical Plant Building.

##### **4.1.4.2 Construction of new Student Services Center (new DATA POP) – Y2007 – Y2012**

This Master Plan proposes that the Student Services Center Building become the New Data Point of Presence location for the Campus. Planning should include the necessary estimates to ensure that the outside infrastructure is in place to support this plan for the new Data POP.

#### **4.1.4.3 Construction of new ARTS Addition Building (Square Footage) – Y2007 – Y2012**

This Master Plan proposes the building footprint is 81,675 gross square feet, still assuming three floors.

#### **4.1.5 Proposed Longer-term Manhole System - Y2012 – Y2030**

During this timeframe, and based upon the EYP “Facilities Master Plan”, there are two alternatives for new Buildings, parking, and landscaping located on the Campus. The new IT Infrastructure outside design proposed in support of Campus changes planned in Y2007-2012 are designed to minimize the changes needed to the outside design to accommodate longer-term Campus Facilities changes. Drawing E-3 in Volume 2, Appendix J shows the proposed IT Infrastructure for the Facilities Plan A changes. And, Drawing E-4 in Volume 2, Appendix J shows the proposed IT Infrastructure for the Facilities Plan B changes.

#### **4.1.6 Summary and Recommendations**

The IT Outside design strategy presented in this Master Plan suggests that the majority of IT Infrastructure is updated and implemented during the Y2007 – Y2012 plus sets the stage for an easy transition to migrate to the Y2012 – Y2030 Plan A or Plan B option, with minimal effort and time expended to do so during that timeframe. Special consideration to the New Science Center planning and design was provided, and this Master Plan suggests a communications path to the building that should support both short-term connection (from the CS and HUM Buildings) and long-term connection needs (from the new Data POP and HUM Building). Finally, the IT Outside Design presented in this Plan supports outside redundancy and future growth expansion.

## **4.2 Physical Emergency Phone System**

The Rockville Campus has a physical Emergency Phone System which services specific areas throughout the Campus, both outside and inside. Physical emergency phones are located on outside pedestal-style phones, plus phones located on parking lot light poles. Inside emergency phones are emergency phones located in Buildings at the entrance and/or in the elevators; pedestal-style and wall-mount phones were observed.

A thorough analysis of the Emergency Phone System was not within the scope of this Plan. Based upon interviews with key IT Staff, as well as general discussions with the Rockville Campus Security personnel, it was noted that current outside emergency phone pedestals are not functioning reliably. From information provided by the Rockville Campus Security

personnel, Volume 2, Appendix G documents known locations of the existing outside Campus emergency phones, both pedestal type and pole-mounted type. See Drawing E-7 in Volume 2, Appendix J for a view of exact locations of the existing outside physical emergency phones on the Campus.

Volume 2, Appendix F notes issues found with existing outside Emergency Phone Systems via general observations; this may not be an all-inclusive list of issues with the existing Emergency Phone Systems. Volume 2, Appendix C offers a complete photo gallery of pictures taken with respect to the outside emergency system phones. Consistent categories of issues were observed: a) parking lot pole-mounted phone installations were missing the 'Emergency Phone' labeling and the lights above the phones were not functioning or lit; therefore, making it difficult to locate the phones; b) institutional knowledge of issues with phone connectivity and operability; and c) elevator wall-mount style phones were not properly installed within the elevator, for example, phones that were wire-tie secured to the elevator wall instead of secured per manufacturer's instructions.

It is recommended that a future, near-term project be conducted to gather all conditions and assessments of the existing physical Emergency Phone Systems, and to make recommendations on near-term and longer-term system updates and upgrade improvement needs, with consideration given to proposed Campus changes, Homeland Security guidelines, and policies on Emergency Phone System requirements.

## **5 INSIDE BUILDING DESIGN**

### **5.1 General**

#### **5.1.1 Overview**

The Rockville Campus is composed of 21 Buildings, which vary in size, age and function. Data, Voice, Video and Wireless technology services are provided throughout the Campus. All Buildings utilize Data and Voice systems; some also utilize CATV and wireless systems. See Drawing E-5 in Volume 2, Appendix J for a view of which Buildings on the Campus contain Voice, Data, Wireless, and/or CATV type of service. See Volume 2, Appendix I for more details on the wireless access points.

For each IT system provided to a Building, there is a respective system Service Entrance Point (SEP). See Drawing E-6 in Volume 2, Appendix J for the location of each SEP on the Campus, and see Volume 2, Appendix E for a summary assessment of each Building's SEP(s) and the respective IT system each SEP supports. From the Building SEP location, conduits and cable route to a MDF space, and then, where applicable, to the respective IDFs within the Building. In several spaces, the SEP serves as the MDF, as well. Volume Three shows floor plans for each Building, with IT space locations noted on those plans.

#### **5.1.2 Existing Conditions**

The first portion of gathering existing conditions information on the IT SEP Spaces at the Rockville Campus was to hold a kick-off meeting with key Montgomery College Facilities and Information Technology senior management and personnel to determine their needs and expected outcomes of this Master Plan. Meeting minutes were captured from that meeting and are noted in Volume 2, Appendix K. Based upon the thorough discussions in the Kick-off Meeting, several one-on-one interviews were conducted with the Information Technology team members and management, both formally and informally, to gather further information and clarification on what those individuals felt were issues that needed to be addressed from an IT space facilities infrastructure perspective. Some key themes were reoccurring in those discussions, such as:

- There is a lack of 'as-built' information on the Facilities IT Infrastructure cabling and spaces.

- The current Montgomery College Cabling Standard needs to be revised to include more detailed requirements for the IT spaces and cabling, in accordance with BICSI Methods, and TIA/EIA and NFPA Standards.
- IT spaces need to be placed upon a maintenance cycle.
- There is a lack of a standardized approach to designing an IT Room Space, and a lack of standardization in implementing physical access to those spaces.

Once the Voice of the College was gathered, the next step was to go on-site to the Rockville Campus and gather actual existing conditions from each Inside IT SEP space. Inside IT Spaces conditions assessments included locating and identifying each IT space on the Rockville Campus and noting the space on existing floor plans, as either a SEP, MDF, or IDF space, plus conducting conditions surveys on the IT SEP spaces. Categories of information gathered for each SEP space were based upon the requirements and methods noted in the BICSI methods manuals and TIA/EIA and NFPA Standards for Telecommunications spaces.

When gathering existing conditions of each IT SEP space, specific Facilities-related datum were gathered into a summary assessment spreadsheet, and deficiencies with EIA/TIA Building Telecommunications Wiring Standards, BICSI Telecommunications Distribution Methods, and the National Electrical Code were identified. (See References 4, 5, 6, and 7)

For each IT SEP space, the on-site field survey also included taking photographs of each space (see Volume 2, Appendix C) and compiling a photo gallery of noted issues. See Volume 2, Appendix F for noted Facilities Inside Plant IT issues and Inside Plant IT Cabling issues. Each issue was categorized and prioritized on a scale of Priority 1-3 issues, with Priority 1 issues noted as issues that should be addressed immediately (next 3 months or less); Priority 2 issues noted as issues that should be addressed short-term (next 6 months or less); and Priority 3 issues noted as issues that should be addressed long-term and included in future planning discussions. In addition to Priority 1-3 issues, recommended corrections were provided, with the intent that Montgomery College could leverage this list of issues to create a pick-list / punch-list of items that should be converted into Montgomery College work orders for repair, replacement, and/or fixing. See Volume 2, Appendix F to view a list of Issues Conditions Assessments summarized by category and resolution codes, and by priorities.

Of the 34 existing IT SEP Spaces, existing conditions surveys showed several SEP spaces that contain abandoned, collapsed, and/or unidentifiable cabling. SEP space photos and sketches show that type of cabling, as well.

In general, the findings of the on-site surveys supported the information gathered from discussions with key Montgomery College personnel prior to conducting the IT space surveys. The below sections discuss the findings of the on-site survey and data analysis. Summarized information from the data gathered during the on-site assessments for each category below is located in Volume 2, Appendix E.

#### **5.1.2.1 Physical Dimensions / Size Guidelines Conditions**

SEP rooms vary in size, shape and location. Most Buildings have at least one SEP; some Buildings have multiple SEP rooms. Square footage of these SEP spaces varied, dependent upon the technology serving the Building, the gross square-footage of the Building, and space available at the time the service was provided to the Building. See the square-footage analysis tab within the Volume 2, Appendix E “Existing Service Entrance Point IT Spaces - Summary Conditions Assessment Spreadsheets” for more information on the SEP square-footage to gross Building square-footage analysis. There are many cases where IT equipment was placed into a Mechanical Equipment Room, or a Closet, that were not originally designed to serve as IT Communications spaces. As a result, there are many IT spaces on the Campus that lack the appropriate amount of safe working clearance space or lack expansion space for future growth.

#### **5.1.2.2 Environmental conditions – Temperature and Humidity**

Several existing IT spaces that contain active equipment do not have HVAC returns and supplies, or a continuous and dedicated environmental control system to keep the temperature and humidity ranges within acceptable ranges. Some rooms contain stand-alone pedestal fans to help dissipate heat and generate circulation. Of rooms that do contain HVAC systems, it was uncertain if these HVAC systems are connected to emergency power. If the existing HVAC systems within those telecommunications spaces are not connected to emergency power, it is recommended that Montgomery College begin a process to connect those systems to emergency power.

For all accessible IT spaces, a one temperature and humidity data point was gathered. Temperature and humidity readings inside the IT space, as well as an outside room temperature and humidity readings, were gathered. That time- and date-stamped data is located in Volume 2, Appendix E. The purpose for those data readings was to determine if there are IT spaces of concern.

BICSI TDMM standards suggest that spaces with active equipment should be within the 64-75 degrees Celsius range, with 30-55 percent humidity, and spaces without active equipment

should fall within the 50-95 degrees Celsius range, with less than 85 percent humidity. Based on that one-point data collection, it is recommended that for IT spaces showing signs of extreme temperature and humidity conditions that Montgomery College monitor those IT spaces to best determine the severity of the environmental issues before finalizing action plans. Additionally, it is recommended that Montgomery College consider conducting a temperature/humidity study to best determine full scope of the issues, to create a priority list of spaces that need new HVAC systems or improvements on existing HVAC systems, and to ensure that there is proper heat dissipation of active devices in those spaces.

### **5.1.2.3 Asbestos Conditions**

Montgomery College provided a copy of recent Asbestos study data for reference with this Master Plan. See Volume 2, Appendix A for a copy of the data provided. This data was used to verify if regulated IT spaces containing asbestos were labeled. Warning signs and / or labels that were not provided, or were not displayed at each area were noted.

One common issue within IT spaces that contained warning labels and/or signs is that an outdated warning label/sign was displayed. Contact information on these labels is outdated. The Code of Federal Regulations Title 29, Labor—Part 1910.1001, Asbestos Section 1910.1001 (j)(3)(i) states that warning signs shall be provided, displayed at each regulated area, and at all approaches to regulated areas so that an employee may read the signs and take necessary protective steps before entering the area. At the Rockville Campus, asbestos warning labels / signs are located inside the room. There were no instances of warning labels / signs located at the entrance of the room.

It is recommended that Montgomery College immediately kick-off a project to update the present-day signage used in asbestos containing IT spaces, as well as to review that all asbestos-containing IT Spaces are marked with the appropriate and required signage.

### **5.1.2.4 Electrical Power / Receptacle Outlet Conditions**

In general, the existing IT Service Entrance Point locations at the Rockville Campus provided two duplex receptacles per room location. In most cases, a turnkey twist lock receptacle was not present. The table in Volume 2, Appendix E lists SEP room locations that did not contain a minimum of 2-duplex receptacles, as well as notes which rooms did contain a twist lock receptacle. For purposes of this Master Plan, it was not determined if IT spaces containing existing receptacles were dedicated or convenience receptacles.

IT Telecommunications rooms must be able to provide adequate electrical power. At least two dedicated, non-switched AC duplex receptacles (each on individual circuits) should be provided for telecommunications equipment power. Separate duplex (convenience) receptacles that would be used for tools, test instruments, and other similar types of equipment should be provided and placed at six (6) feet intervals around the room walls. Depending on the type of equipment to be installed or planned for the IT space, additional receptacles or power strips should be provided. All receptacles should be properly identified and labeled as dedicated or convenience receptacles. Volume 2, Appendix E summarizes the existing receptacle conditions for the SEP spaces.

Where SEP rooms also contain electrical distribution panels, the relative locations of the panels in the room are noted on the SEP room sketches, found in Volume 2, Appendix D. This Master Plan did not access or document the conditions of each electrical distribution panel. However, it is recommended that Montgomery College begin an effort to document the existing panels and circuits at the Rockville Campus, if this data is not already available to them. Such a study could also determine if there are telecommunications spaces where a dedicated power panel would be best to serve that space. This Master Plan assumes that distribution panels that serve lighting fixtures are separate from the distribution panels that serve the telecommunications equipment.

#### **5.1.2.5 Data Rack Conditions**

Several SEP locations contained data wall-mount and / or floor-mount racks. In several cases, it was observed that floor-mounted racks were not properly secured at the top of the rack, making the rack easy to shake or vibrate. It is recommended that all floor-mount racks be properly installed per the manufacturer's instructions. Floor-mount racks should be properly secured at the floor and top of the rack.

In existing SEP locations, there are incidences of floor-mounted racks being completely filled with rack-mounted equipment. In some racks, there is abandoned and unusable equipment that remains in the rack. This abandoned and unusable equipment takes up unnecessary space in the racks, and it is recommended that all equipment which is not in use be removed. Additionally, it is recommended that Montgomery College create a best practice for the way they desire racks to be loaded. For example, they may decide to designate one rack for data patch panels and terminations, another rack for voice terminations, a third for switches, etc. If such a best practice is created, it is recommended that special consideration be placed upon how the rack is loaded and the weighting of the rack load, so that physical loads on the rack are distributed to prevent the racks from swaying or becoming top-heavy.

Due to the floor square footage in some SEP rooms, there is a lack of data rack expandability in these rooms under the current configuration. In many cases, the lack of expandability is due to the fact that there is not enough space remaining in the room to add new racks and still allow the proper, safe amount of working clearance to the front and rear of the racks.

In most rooms with existing data racks, there are smart UPS stand-alone units sitting near the racks, on the floor. In several rooms, there are multiple columns of stacked smart-UPS units lined up in the room. This Master Plan did not assess the usability or the integrity of these existing smart-UPS units. However, it is recommended that Montgomery College keep track of the useful life of these smart-UPS units to ensure they are protecting the equipment, as desired and needed, to protect against power outages and brownouts.

#### **5.1.2.6 Data Rack Grounding Protection Conditions**

A system of grounding is an essential safety feature that should be put in place to protect from potential differences in electrical equipment such as cable management racks. Upon examination of the SEPs at the Rockville Campus, a lack of standardization and presence of grounding equipment was very noticeable. The following lists have been arranged by priority starting with the most important (the highest need).

The following SEP rooms showed no grounding equipment:

- ART 11A (MU 125, ART 113)
- CC MER
- CCC "Storage Area A"
- SE MER 13
- SS 131B: there is a copper colored wire visible, but its purpose is unknown and it might be an old WANG cable
- SW 11A
- TA 153

- TEC 175

The following rooms show green or copper grounding cable, but the rooms do not show a Telecommunications Grounding Busbar (TGB) to which these cables attach, nor a connection to the structural steel.

- CC 110 Closet: Grounding cable attaches to a small Equipment Grounding Busbar (EGB), which is not made of copper, but this EGB has no other connections besides the painted wood to which it has been screwed.
- GITE 250: A green insulated grounding cable bundled with other black cables goes through a hole in the ceiling.
- HUM 029: A full sized splice bar is located on the wall and joins two large grounding wires that come from the ceiling, but no grounding wires are attached to any of the telecommunications equipment in the room.
- PAC 111: Telephone lightning protection boxes are visible, but no grounding cables are seen.
- RA 100C: Green insulated cable attaches to phone lightning boxes and exits through conduit.
- RVMS First Floor: Green cable attaches to phone lightning boxes (cannot see to where they go)
- SCIB 003: Telephone lightning protection boxes are mounted to wall, but no grounding cables are seen.
- SS 001MeR: Grounding wires are visible on the wall. One wire comes out of a conduit (and final destination cannot be seen). Another grounding wire is attached between a green box on the wall (telephone lightning protection) and a copper conduit coming from the ceiling.

The following rooms show a connection to either the steel structure or a TGB, but should be inspected to be sure that they follow code:

- TA 104: A green wire attaches one of the telecommunications racks to a horizontal steel beam, but no connections have been documented between the other racks. The horizontal beam, however, has been painted and there is definitely not an exothermic bond present.

General Notes: The lack of TGBs in the rooms may suggest that one Telecommunications Main Grounding Busbar is in connection with most of the rooms. It could also be possible that some rooms that are not SEPs do include TGBs in connection with some of the grounding wire seen exiting through holes and conduit from the rooms. It could also be that the steel structure only is being used as a ground.

Data racks, whether wall-mount or floor-mount, should be properly grounded per the manufacturer's instructions. In several SEP spaces containing existing data racks, it was difficult to find evidence of data rack grounding. In cases where grounding was discovered, there are some incidences of improper grounding. In one space, GITE Room 250, the rack grounding was attached to a removable rack-mount piece of equipment, instead of being attached to the rack structure. In numerous cases, it was difficult to determine if the rack grounding traces back to the telecommunications ground bus bar or the Building ground bus.

It is recommended that Montgomery College ensure that all racks are properly grounded to the room's telecommunications ground bus bar, and that the telecommunications ground bus bar/room are properly tied back to the Building's ground bus, in accordance with the TIA/EIA Telecommunications Equipment Grounding Standard.

#### **5.1.2.7 Phone Equipment Protection Conditions**

The NFPA 76: Standard for the Fire Protection of Telecommunications Facilities, 2005 edition calls out specific requirements for fire protection in a telecommunications space. In addition, the National Electric Code, Article 800, requires the use of surge protection for telephone lines. The findings from the on-site survey of the IT SEP spaces on Rockville Campus showed a lack of consistency in providing surge protection on the telecommunications equipment located within those spaces. It is recommended that Montgomery College include in their future planning the need for phone equipment protection.

#### **5.1.2.8 Fire Protection Conditions**

IT communications spaces should contain a fire alarm system, according to NFPA 75: Standard for the Protection of Electronic Computer/Data Processing Equipment, 2003 Edition, Section 8.1 and 8.2 and local codes. Portable fire extinguishers should be mounted within the IT space as close to the entrance of the space as possible, per NFPA Section 8.3, 8.3.1, and those extinguishers should be maintained according to NFPA 10, Standard for Portable Fire Extinguishers.

The on-site assessment of IT SEP Spaces on the Rockville Campus showed many cases of the use of sprinkler head systems and smoke detectors systems, and many cases where no evidence of a fire alarm or smoke detection systems existed within the space. It was rare to find a portable fire extinguisher in the SEP space.

It is recommended that Montgomery College plan to include portable fire extinguishers in or near the IT spaces in the future. It is also recommended that all issues related to fire protection, as noted in the Volume 2, Appendix F SEP summary assessment spreadsheet, get addressed immediately. Particularly, it is highly recommended that the CCC Building IT space room smoke detector is checked for operational integrity and immediately replaced or repaired if found to be deficient.

#### **5.1.2.9 Lighting Conditions**

Lighting for the Rockville Campus SEP locations is a concern. In most cases, lighting illumination in existing SEP locations was insufficient. Often, the lighting illumination was poor, and occasionally, room lighting switches were difficult to find as they were not located near the entrance(s) to the telecommunications space, as one would anticipate. In several cases, lighting from existing lighting fixtures was obstructed by overhead IT equipment, such as overhead cable trays, cabling, and cable baskets. In some spaces, existing lighting fixtures were dangling loosely from the ceiling and were no longer attached to the Building steel.

In many cases, due to the fact that IT equipment was added to a room after the room's original construction, there was evidence of a lack of coordinating the lighting layout configuration with the IT equipment layout. In some locations containing racks, cabinets or enclosure placements, lighting fixtures were not located at locations that closely coordinated with these equipment locations. In most mechanical and electrical equipment rooms that housed telecommunications/IT equipment, there was a lack of 50 foot-candles minimum measured at the points of cable terminations.

A variety of lighting fixtures has been used in existing SEP locations. Some existing lighting fixtures contain lenses and some do not. It is recommended that all lighting fixtures within telecommunications spaces have some type of lense or guard over them, so as to prevent glass shards from falling on personnel, if the lamp is damaged.

For this Master Plan, it was not determined if the electrical power provided to existing lighting in the SEP locations was on separate circuits from the telecommunications equipment. In addition, it was not determined if at least one light or set of lights in each space was on emergency power, while another set of lights, or one light, was on normal power. It is assumed that emergency lighting has been setup according to applicable Building codes and to ensure that the loss of power to normal lights will not hamper or prevent an emergency exit from the existing SEP locations.

It is recommended that Montgomery College assess the existing lighting in the telecommunications spaces and determine which spaces need additional lighting fixtures to ensure a minimal 50-foot candles illumination at the cabling terminations within the space. For areas where it is not feasible to add additional overhead lighting, it is recommended that personnel be advised to take additional portable lighting with them before entering the space, so as to safely enter, work within, and exit the space. Additionally, it is recommended that moving forward, there should be a planning step or phase that ensures proper coordination of lighting layout to equipment layout design before implementations of new IT spaces occurs.

For the short-term, it is recommended that Montgomery College create work-orders to have lamps changed in those lighting fixtures noted from this Master Plan survey as being out.

#### **5.1.2.10 Debris Conditions**

Debris in rooms should be removed from IT spaces to reduce fire concerns. In particular, combustible materials such as paint cans, flammable cleaning fluids, and other similar matters are unacceptable materials to have in an IT space. Upon examination of the Rockville IT SEP spaces, both combustible and non-combustible materials were observed in some spaces. A trend was that several rooms had empty boxes and equipment packaging materials remaining, either stacked in a corner of the room, or stacked near the data equipment racks and other IT equipment. In some IT SEP spaces, janitorial supplies, such as brooms, mop baskets, and combustible chemicals or cleaning fluids were discovered. In one IT space, landscaping materials were stored in the telecommunications space. Miscellaneous non-IT supplies and equipment were stored in some IT spaces, or stored directly up against the telecommunications equipment that was wall-mounted in that space.

All combustible and unacceptable materials in the IT SEP spaces must be removed. A summary of locations that should be visited to remove any existing debris are listed in Volume 2, Appendix E. Photos of these spaces, showing types of materials and severity of debris in these spaces, can be found in Volume 2, Appendix C.

#### **5.1.2.11 Moisture Conditions**

In order to provide a safe environment in an IT Space, the space should be free from moisture. Upon survey of the Rockville Campus IT SEP spaces, several locations were found to contain moisture in the space. See Volume 2, Appendix E and Appendix F for a list of the IT SEP spaces that have moisture issues. All moisture issues should be addressed immediately. It is recommended that caution tape is placed in these areas around the water / moisture while waiting to have the space serviced.

In addition to the abnormal moisture found on the floors in the IT SEP Spaces, it is important to note that some IT SEP Spaces were found to have sinks in the space. It is recommended that each sink in these areas is checked for any leaks and that the sinks be placed on a maintenance cycle. For areas with sinks, it is important to have a drain hole, or some method to effectively drain water out of the space, should the sink leak or have an overflow issue.

#### **5.1.2.12 Accessibility Conditions**

Survey of the telecommunications/IT SEP spaces proved that all SEP locations were locked spaces. At the Rockville Campus, there are varying systems used to lock the spaces. Most common was the use of a mechanical key that unlocks door knobs and door handles. In some cases, a key had to be provided by the Montgomery College Security team to gain access to the space. There were also Buildings that used a card swipe reader to grant access to the space.

Several SEP locations were found to have broken door knobs or key locks. See Volume 2, Appendix E and Appendix F, for more details on which location has a door knob/lock issue that should get addressed and resolved immediately. It is recommended that Montgomery College further investigate these issues and resolve items as soon as possible.

There were some incidences of blocked access to a SEP location due to other non-IT materials stacked up against the door entry. The CCC 110 Closet area and the TA 152 area are locations where blocked access is an issue. It is recommended that these entry ways be cleared immediately of all debris and materials blocking access to the space entry. It is also

recommended that Montgomery College ensure that appropriate measures are taken to ensure these doorways are not blocked in the future.

### **5.1.2.13 Clearances Conditions**

Maintaining an adequate and unobstructed space for the installation and maintenance of cabling and IT equipment mounted on the walls, racks, enclosures, or cabinets is highly important for safety considerations. Specifically, adequate clearance should be available in all areas of cabling terminations and equipment connections. In most cases, equipment and connecting hardware extends beyond the racks, cabinets, enclosures and backboards they are installed upon. When planning for appropriate safe clearance, the outermost surface of the devices mounted on the racks, cabinets, enclosures or backboards must be where the starting point of the clearance begins.

Although the manufacturer's documentation and local codes should be consulted, as a general rule of thumb, an unobstructed clearance of 1 m (or roughly 40 inches) should be provided for the installation and maintenance of all cabling and equipment mounted on walls, cabinets, enclosures, and racks. For an aisle or row of racks, enclosures or cabinets, 1 meter to the front and rear of the respective equipment should be provided with a minimum side clearance of 12 inches in the corners provided. For raised access flooring and areas above the ceiling, 40-inch clearance is preferred where spacing is available to do so. If spacing is not available, then as much clearance as can be provided should be provided in access floors and above the ceiling areas.

Upon survey of the existing IT SEPs at Rockville Campus, clearance conditions were determined to be poor in most spaces. In general, clearance to the front, rear and side corner(s) of floor-mounted and wall-mounted equipment was below the preferred clearances noted in BICSI and other standards for a telecommunications space. In many cases, the clearance to the rear of racks was so poor that safety became a main concern and problem. It is highly recommended that Montgomery College review the spaces in Volume 2, Appendix E listed with clearance limitations, and determine how best to address the lack of sufficient clearance to maintain the equipment and space long-term. In some cases, Montgomery College may determine they need to relocate existing equipment to a larger space to achieve providing safe clearance.

#### 5.1.2.14 Door Swing Conditions

Per BICSI Methods, a few issues with IT Space Door installation that could create issues with the IT Space are:

- Doors can hinder usable access to the space and reduce room layout options, if the doors do not open outwardly.
- Doors that are not lockable compromise physical security and allow for access to the space by unauthorized personnel.
- Doors that are less than 3 feet wide create clearance constraints.
- Single-leaf doors to an IT Space that contain large equipment, such as racks, Optical Network Node racks, or data servers, create issues moving equipment in and out of the space.
- Multiple door entrances to an IT Space creates potential physical security and unauthorized entry issues.

At the Rockville Campus, there were examples found of each of the issues noted above. Volume 2, Appendix E highlights rooms that have issues. For a complete list of rooms with doorway issues, please see the summary conditions assessment sheet and the issues assessment check, for more details.

Several doors at Rockville Campus were broken, and/or had broken locks. Volume 2, Appendix E and Appendix F summarize the rooms with compromised doors and locks. It is recommended that these issues get addressed immediately.

The BICSI TDMM Manual recommends that doorsills should not be installed at the entry to an IT Space. There were causes found at Rockville Campus where adherence to this recommendation and based upon the adjacent areas to the IT Space, that the lack of doorsills is creating moisture leakage into the space. Basically, it was consistently found that locations open outwardly to a hallway and do not have a doorsill installed are having issues with water from the hallway floor mopping and waxing leaking into the IT Space entry from under the door. This could create a safety hazard should someone enter the IT Space after a mopping or waxing is complete and mop water or wax has entered the room under the door, as the IT space flooring inside the entryway is wet, and no warnings exist to let the person know the floor is wet. It is recommended that, in spaces such as this that personnel are trained to look before entering, and that maintenance cleaning personnel are trained that IT spaces do not have doorsills. The College may want to consider placing warning signs outside the doors as a caution, or determine if they prefer to add doorsills to locations at risk of mop or wax water leaking under the IT SEP space doorway.

### 5.1.2.15 Firestop Conditions

Firestop conditions in the IT SEP Spaces were noted. Observations noted during the on-site survey of the IT SEP Spaces are documented in the SEP Summary Conditions Spreadsheet (Volume 2, Appendix E). The following table summarizes the criteria used to rank the firestop available in the respective IT SEP Space.

| Firestop Ranking Number | Firestop Ranking Description  |
|-------------------------|---|
| 1                       | No fire-stop.   |
| 2                       | Very little or barely recognizable fire-stop.   |
| 3                       | Less than half of conduits/holes have fire-stop.  |
| 4                       | About half conduits/holes have fire-stop (possibly overfilled*).  |
| 5                       | More than half conduits have fire-stop (possibly overfilled*). Any room with conduit that is highly overfilled (70 percent of conduit area) must not be rated over "5".   |
| 6                       | Almost all conduits have practical fire-stop, slight overfilling* (not more than 60 percent of the conduit area) might be present.  |
| 7                       | All locations have firestop. Some intumescent putty-filled conduits may be slightly overfilled (not more than 60 percent of the conduit area). Conduit <b>not</b> marked as "full" if they have reached the recommended limit*. |
| 8                       | All locations have modern firestop, Conduits with intumescent putty (or other modern retrofittable firestop) not overfilled*. Conduits <b>not</b> marked as "full"*.  |
| 9                       | All required locations have modern firestop. Conduits not overfilled*. Conduit marked as "full" if they are filled to recommended limit*.   |

\*It is recommended that conduits using intumescent putty or another modern, retrofittable fire-stop are not filled more than 50 percent of the conduit area, so that the firestop may be effective. Having too much cable volume or re-packing intumescent putty too often can have negative consequences on the effectiveness of the fire-stop.

### Priority

Ratings 7-8, are low priority, fire-stop is present in all locations.

Ratings 4-6, are medium priority, and do **not** have the recommended fire-stop or are overfilled.

Ratings 1-3, are high priority, and do **not** have *practical* amounts of fire-stop.

Priority groupings for ratings 1-8 are suggestions only. Any room without a rating of “9” has not been provided the most effective means of fire-stop or prevention of future fire-stop problems.

Based upon the data gathered, it is recommended that the Montgomery College Cabling Standards contain detailed requirements about the need for, and the type of, firestop required. It is also recommended that firestop should be confirmed during the final walk-through of future implementations before Montgomery College approves the work. See Volume 2, Appendix F for more detailed firestop issues and recommended corrections.

#### 5.1.2.16 Ceiling Conditions

Ceiling conditions were noted in Volume 2, Appendix E for each IT SEP space. In many areas where ceiling structures and tiled ceilings were provided, there were maintenance issues observed. In some cases, the ceiling structure and support have been compromised and/or damaged beyond repair, creating a safety hazard issue, as there are lights and HVAC supplies dangling loosely from the ceiling. It is recommended that Montgomery College address all ceiling issues creating safety hazards immediately. It is also recommended that Montgomery College ensure that personnel are using the appropriate safety measures when removing any tiles or ceiling support in areas that may contain asbestos materials. Finally, it is recommended that future implementations of IT Spaces contain specific requirements about the ceiling structure and needs.

#### 5.1.2.17 Flooring Conditions

The on-site survey found that flooring used with IT SEP Spaces is inconsistent. This is probably largely due to the fact that most IT Spaces were implemented into rooms that were not originally designated to be IT Spaces, such as classroom areas, office areas, and Mechanical Equipment Rooms.

Concrete, tile, and carpeted flooring have been deployed in the IT SEP Spaces on the Campus. It is recommended that future IT Space implementations do not contain carpeted flooring;

instead, it is recommended that these future spaces utilize tile or some other smooth surface that does not produce dust or static electricity once installed.

It is also recommended that Montgomery College create and document a standard flooring requirement for future IT Space needs. The standard should consider the requirements for flooring materials, as well as, the floor rating to ensure that the room flooring can withstand the type of loading that will be placed upon it. This is particularly important for IT Spaces that will house floor-mounted rack systems.

#### **5.1.2.18 Walls Conditions**

Another important Facilities room structural design consideration is the type of wall conditions desired for an IT Space. It is recommended that IT Spaces be painted to help minimize or reduce dust particles and static, as well as to increase light illumination. The on-site survey of the Rockville Campus IT Spaces discovered that, similar to the IT Space flooring, the wall conditions are a mixed assortment.

It is desired in Information Technology SEP spaces that the walls be finished from ceiling to floor, and that all walls covered by plywood for wall-mounting telecommunications/IT equipment be properly fire-rated and treated for the conditions it will support.

If the College does not currently have a standard requirement noted for future IT Space implementations, it is recommended that a standard requirement be defined and documented.

#### **5.1.2.19 Plywood Conditions**

From review of the IT SEP Spaces, there is a lack of consistency in implementing and installing plywood within the IT Spaces. Several rooms were discovered to have unpainted, and questionable fire-rating plywood, installed on the walls of the room. Additionally, the plywood thickness and board dimensions used in the IT Spaces were inconsistent.

If the College does not currently have a standard requirement noted for future IT Space implementations, it is recommended that a standard requirement be defined and documented. For fire protection purposes, plywood must be properly fire-rated, whether painted or stained.

#### **5.1.2.20 Conduits, Trays, Slots, Sleeves, and Ducts Conditions**

Within the IT SEP Spaces, conduits, trays, slots, sleeves, and ducts were all found. There were some instances of through-holes and holes in the flooring that were found. One of the most major issues discovered was the lack of proper fire-stopping. Another major issue was

excessive cable fill within the conduits, trays, slots, sleeves, and ducts. A third major issue was the lack of expansion available within the conduits, trays, and sleeves.

#### **5.1.2.21 Dust Conditions**

Dust was found in all IT SEP spaces during the on-site surveys. One of the goals in designing an IT Space should be to design the space to minimize dust. It is recommended that the annual maintenance cycle of IT spaces include clean-up of the rooms to minimize dust. It is also recommended that Montgomery College ensure that future room designs account for wall painting, flooring, ceiling, and HVAC structures/systems that would foster minimizing dust in the area.

#### **5.1.2.22 Acoustic Noise Levels**

One IT SEP location that stood out from the others as an area that may require use of earplug protectors before entering was the Rockville Maintenance Shed Building, the First Floor Painter's closet room containing Voice equipment. There is an air compressor that is quite loud in this area. Montgomery College should further investigate this item and address.

#### **5.1.2.23 Transformers**

Volume 2, Appendix E list the SEP rooms that contain existing transformers, and Volume 2, Appendix F provides suggested corrections to the issues found in those spaces. For rooms with debris placed on or near the transformer, it is recommended that the debris is removed from the space immediately. It is also recommended that Montgomery College ensure that personnel are trained about transformers existing in the IT spaces and are aware that papers and boxes should not be stored on or near transformers, to prevent potential fire and safety hazards. For rooms that had poor heat dissipation, it is highly recommended that measures be taken to ensure that the excess heat emitted into the room by the transformers is properly dissipated.

#### **5.1.2.24 Location Conditions**

In survey of the IT SEP spaces at the Rockville Campus, one could make the general observation that IT spaces were in many cases an after-thought. As the Campus need for technology has grown, IT equipment was installed in areas where extra spacing was available instead of installing the equipment in areas dedicated solely for IT equipment. In most Buildings on the Campus, the IT rooms are not aligned vertically, making it difficult and time-consuming to locate a room. In addition, there are cases of facilities or custodial services equipment stored in

the telecommunications space. See Volume 2, Appendix E and Appendix F for more details on the issues found related to location conditions.

### **5.1.2.25 Physical Security Conditions**

See Volume 2, Appendix E and Appendix F for more details on the issues found related to physical security conditions.

### **5.1.2.26 Safe and Clean Environment Conditions**

See Volume 2, Appendix E and Appendix F for more details on the issues found related to safe and clean environment conditions.

### **5.1.2.27 Security Conditions**

See Volume 2, Appendix E and Appendix F for more details on the issues found related to security conditions, specifically the door lock issues.

### **5.1.2.28 Unacceptable Materials Present**

See Volume 2, Appendix E and Appendix F for a list of all SEP spaces containing unacceptable materials that should be removed immediately from the space. For example, rooms containing paint cans and other flammable items should be removed from the room. The only exception is the Rockville Maintenance Shed, First Floor level SEP area. Montgomery College may want to consider adding a wall to separate the IT equipment from the Painter's supplies.

### **5.1.2.29 Documentation and Equipment Manuals**

It is highly recommended that Montgomery College create 'as-built' documentation of all IT spaces, not just the SEP IT spaces. Sketches similar to those provided in Volume 2, Appendix D are recommended for IT MDF and IDF locations, as well. IT MDF and IDF locations conditions assessments are also recommended.

Moving forward, it is recommended that Montgomery College require laminated drawings of the IT spaces are mounted to the IT space wall, as you enter the space. This could be required of the third-party installer and validated at the implementation final walk-thru.

Copies of equipment manuals should be removed from the IT space and stored, as noted in NFPA standards for a telecommunications space.

### **5.1.3 Voice over Internet Protocol (VoIP) Migration Considerations**

As part of this Master Plan, the College wanted to better understand what facilities infrastructure changes may be needed to support a migration to VoIP technology in the future. Based upon discussions with key Facilities personnel, research was conducted to provide a package of information to the College on VoIP and items to consider before implementing a VoIP system. Appendix M offers many applicable articles on VoIP and the industry questions of back-up/emergency power.

One key area to consider while planning for the VoIP migration is back-up power. This Master Plan advises that MC needs to hold internal discussions about their projected implementation of VoIP, and also with their provider, should they seriously consider going to VoIP to determine specifically how their service would be affected. At a minimum, MC would need to provide emergency power for their campus phone system and explore ways of providing adequate reliability for emergency communications during periods when internet connections may not be reliable. MC will need to make the determination of what is needed as part of the selection of a service provider, since apparently the features can vary with the provider. Also, the Federal Communications Commission (FCC) is continuing to address issues, and this technology area is likely to continue to evolve, so how systems work may well change somewhat before the College moves to implement a VoIP system sometime down the road.

VoIP is a part of the convergence taking place as a result of the explosion of IP based applications. Applications for mobile VoIP and conventional VoIP are all a matter of accessing the backhaul systems of their provider. Again, the College's vision on how IP software solutions can change how they do business is key to planning for the VoIP migration. With the addition of functionality to VoIP, the value of VoIP goes up, creating an escalating argument for increased reliability and levels of back-up power.

### **5.1.4 Summary and Recommendations**

This Master Plan reviewed all Service Entrance Points on the Rockville Campus to determine existing conditions in compliance to BICSI TDMM standards, and other telecommunications standards. Conditions were noted and deficiencies were summarized. Issues were assessed, categorized, and proposed resolutions were offered for the College's review and consideration. It is recommended that the appropriate College Facilities and Information Technology personnel

review this Master Plan's findings and create an actionable plan to address remedial, short-term and longer-term priority items. It is also recommended that the College consider placing these SEP rooms on a maintenance schedule to ensure that all Facilities-related items are operational. Further, it is recommended that a similar conditions assessment project is started to survey the IT MDF and IDF spaces to determine if similar issues exist so that an actionable plan can be created to identify and address any issues.

Moving forward, it is recommended that the College assign personnel to maintain the documentation set forth in this Master Plan, such as the SEP room sketches, Summary Assessment Spreadsheet, and Manhole / Pullbox sketches. It is also recommended that a College personnel or team is assigned to maintain the IT Space locations Floor Plans provided in this Master Plan.

From a planning perspective, it is recommended that the Facilities and IT teams work jointly to approve IT space designs and modifications before designs are finalized and implementation begins. Consideration needs to be given to the amount and type of equipment to be contained in the room, the type and quantity of communications to be supported by the room/floor/building, and safe working clearance requirements, at a minimum. Appendix M, Item 4 is an IT Space Data Sheet and Estimation Tool that could be used to help facilitate discussions in the planning phases.

## 6 APPENDICES AND SUPPORTING MATERIALS

### Volume 2 - Appendix

#### A Asbestos Report

#### B Existing Cabling Point-to-Point Spreadsheets

- Existing Data Fiber - Cabling Spreadsheet
- Existing Voice Copper & Voice Fiber - Cabling Spreadsheet

#### C Existing IT Spaces Pictures - on DVD

- Existing Manholes & Pullboxes - Pictures
- Existing Physical Security Emergency Phones - Pictures
- Existing Service Entrance Point (SEP) IT Spaces - Pictures

#### D Existing IT Spaces Sketches

- Existing Manholes & Pullboxes - Sketches
- Existing Service Entrance Point IT Spaces - Sketches

#### E Summary Conditions Assessment Spreadsheets

- Existing Manholes & Pullboxes - Summary Conditions Assessment Spreadsheet
- Existing Service Entrance Point IT Spaces - Summary Conditions Assessment Spreadsheets

#### F Issues Assessment Spreadsheets and Pictures

- Existing Manholes & Pullboxes - Issues Assessment Spreadsheet
- Existing Physical Security Emergency Phones - Issues Assessment Spreadsheet
- Existing Service Entrance Point IT Spaces - Issues Assessment Spreadsheets
- Existing Outside Design - Manholes & Pullboxes - Facilities Issues Assessment Document
- Existing Physical Emergency Phones - Facilities Issues Assessment Document
- Existing Inside Design - Service Entrance Point IT Spaces - Facilities Issues Assessment Document
- Existing Inside Design - Service Entrance Point IT Spaces - IT Issues Assessment Document

#### G Physical Security Emergency Phones Documentation

- Existing Physical Security Emergency Phones - Mapping Data

#### H PBX Redundancy Documentation

- Existing PBX Redundancy Diagram

## **I Montgomery College WiFi Installation Documentation**

Existing Montgomery College WiFi Installation - Presidio Report  
Existing Montgomery College WiFi Installation - Presidio Wireless Hotspot Connections & Diagrams

## **J Site Plan Drawings**

Drawing CS-1 - Cover Sheet

Drawing E-1 - Information Technology System - Site Plan - Existing Conditions

Drawing E-2 - Information Technology System - Proposed Site Plan - Plans A & B - 2007-2012

Drawing E-3 - Information Technology System - Proposed Site Plan - Plan A - 2013-2030

Drawing E-4 - Information Technology System - Proposed Site Plan - Plan B - 2013-2030

Drawing E-5 - Information Technology System - Site Plan - Building IT System Functions - Existing Conditions

Drawing E-6 - Information Technology System - Site Plan - Service Entrance Points - Existing Conditions

Drawing E-7 - Information Technology System - Site Plan - Physical Security Emergency Phones - Existing Conditions

## **K "Voice of the College" - Survey Data**

Interview Memos

Kick-off Meeting Minutes

## **L Preliminary Cost Estimation Spreadsheets & Proposals**

## **M Best Practices Information**

Berkeley Article

BICSI Article

Redundancy Article

IT Space Data Sheet Tool

## **N Block Diagrams**

Existing IT Campus Communications Block Diagrams

Future IT Campus Communications Block Diagrams

## **Volume 3 - Montgomery College Rockville Campus Facilities Information Technology (IT) Infrastructure Master Plan - FLOOR PLANS**

A Site Map

B Art (ART)

C Counseling and Advising Building (CAB)

D Campus Center (Continuing Education) (CC)

E Child Care Center (CCC)

- F Computer Science (CS)
- G Campus Tower (CT)
- H Homer S. Gudelsky Institute for Technical Education (GITE)
- I Humanities (HUM)
- J Interim Technical Training Center (ITTC)
- K Mannakee Building (Central Administration) (MKE)
- L Macklin Tower (MT)
- M Music (MU)
- N Performing Arts Center (PAC)
- O Physical Education Center (PEC)
- P Rockville Annex (RA)
- Q Rockville Maintenance Shed (RMS)
- R South Campus Institutional Building (SCIB)
- S Science East (SE)
- T Science West (SW)
- U Theatre Arts (formerly Fine Arts) (TA)
- V Technical Center (TEC)

**Volume 4 - Rockville Campus - Data Network Diagrams**

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**Corporate Office:**

**Lynchburg**

127 Nationwide Drive  
Lynchburg, Virginia 24502-4272  
Phone: 434.947.1901  
Fax 1<sup>st</sup> Floor – 434.947.1647  
Fax 2<sup>nd</sup> Floor – 434.947.1613  
Fax 3<sup>rd</sup> Floor – 434.947.1659

**Richmond**

6606 West Broad Street, Suite 500  
Richmond, Virginia 23230-1717  
Phone: 804.254.7242  
Fax: 804.254.7257

**Alexandria**

2550 Huntington Avenue, Suite 310  
Alexandria, Virginia 22303-1410  
Phone: 703.329.3200  
Fax: 703.329.8141