The Evergreen State College – Olympia, WA

Predesign Study

Critical Power, Safety, and Security Systems

June 30, 2016

FINAL SUBMITTAL

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1.0 Executive Summary

The Evergreen State College (Evergreen) is a four-year institution established in 1971 with a mission to provide an innovative public liberal arts education. The college is located on a 1,000 acre residential campus five miles northwest of downtown Olympia and currently serves approximately 5,000 students, with 250 staff and faculty.

The campus facilities and infrastructure have been expanded and renovated in its nearly 50 year history, but now, more than ever, Evergreen must address its failing power systems and obsolete and inadequate safety and security systems. These aging systems are now nearing or have surpassed their useful life. As a result, Evergreen is more vulnerable to equipment failures, natural and man-made disasters, and other emergencies resulting in significant impacts on personal safety, property, and continuity of operations. A recent failure of the power distribution system caused a 24-hour power outage affecting the entire campus and disrupting campus events and operations and requiring expensive emergency repairs.

Recognizing the current vulnerability and in keeping with its commitment to maintaining a safe and secure learning environment, Evergreen has engaged in planning efforts to identify deficiencies and vulnerabilities in the existing campus power, safety, and security systems. These efforts have identified the need to replace existing fire alarm, security and telephone systems with modern network-based systems. However, it is imperative that the existing power and network infrastructure on which these new systems will depend also be upgraded and enhanced to ensure these critical systems operate reliably and continually even during power outages, natural disasters, or other emergency events. Without this investment, Evergreen will be impaired in its ability to monitor, evaluate and respond to emergencies and other events affecting its students, staff, faculty, and visitors.

The Predesign Team reviewed the operational needs and goals of the institution and determined the best option is to implement a project during the 2017 - 2019 biennium with the following scope of work:

- New main electrical switchgear to provide reliable power distribution to the entire campus and building to house the switchgear and protect it from the elements.
- Expanded building power distribution system including larger capacity standby generators to replace existing standby generators, automatic transfer switches, panels and new uninterruptible power supplies to ensure critical safety and security applications remain operational during power outages.
- Replacement of existing fire alarm and access control systems to improve ability to monitor, evaluate, and respond to emergencies, and prevent access to buildings and critical spaces during events.

- Improvements to telecommunications spaces and supporting power and mechanical systems to meet current standards and properly support safety, security, and communications systems.
- Upgrade existing network infrastructure to provide required bandwidth and capacity and eliminate single points of failure.

The estimated costs for the project assume a standard design bid build approach. A detailed cost breakdown is included in Section 4.0 of this report

Consultant Services:	$1,464,632
Construction Costs (including contingency, sales tax):	$7,318,499
Equipment Costs (including sales tax):	$1,808,522
Artwork:	$30,603
Other Costs:	$195,952
Project Management:	$383,324
Estimated Project Total – Phase 1 (including escalation):	**$11,199,532**

2.0 Project Analysis

2.1 Operational Needs

Evergreen has an immediate and urgent need to replace or upgrade critical power, security, and safety systems. Recent events underscore the risks of continuing to rely on systems that are obsolete and failing or are nearing the end of their useful life. These events have proven the existing systems can no longer be maintained in a manner that provides reliable operation and which adequately protects the campus and its occupants. Resolving these deficiencies will enable Evergreen to mitigate the potential risks of personal injury, property damage, and prolonged interruption of operations.

Power Distribution System

Campus operations rely on a 50-year old medium voltage (15kV) power distribution system. In its current state, the system is a significant liability and cannot be considered reliable based on its age and history of failures. The recent failure on Saturday, March 26, 2016, of the Evergreen-owned switchgear which distributes power provided from Puget Sound Energy (PSE) to campus resulted in a 24-hour campus-wide power outage. Due to the age and uniqueness of the equipment involved, the power outage and downstream effect damaged additional equipment, disrupted campus operations, and imposed significant financial costs.

As evidenced by this event, the existing conditions of the switchgear are unsafe and present safety hazards and security concerns. System maintenance and operational resources with specialized expertise have been required to diagnose problems and keep these legacy systems functioning. The facilities staff has to manually perform tasks that used to be electronically performed when the switchgear was in good working condition. This exposes technicians to unnecessary risk of injury during manual operation while the equipment is energized.

Alarm Systems

Evergreen's existing electronic security and safety systems are not providing accurate, complete, and timely information to ensure the proper response in the event of an emergency. The existing fire alarm, alerting, and communications systems are obsolete and in many cases these systems are no longer supported by the manufacturer and spare parts or technical support are not available, rendering them unmaintainable.

Beyond the maintainability of these systems, their lack of integration hinders Evergreen's ability to effectively identify alarms, assess potential threats, communicate information, and provide an effective response. Further, the closed proprietary nature of the access control and alarm monitoring system prohibits Evergreen from adding new or additional alarm points or customizing the operator interface. With a more flexible and accessible alarming system, Evergreen could add sensors to provide alerts when water, steam, or gas systems leak, or when

the temperature in refrigeration systems exceeds limits, thus avoiding costly repairs, shutdowns, and interruptions to operations. This limitation was a factor recently when an 8-inch fire sprinkler pipe burst releasing 200,000 gallons of water and flooding the tunnel system and portions of the Central Utility Plant, Library archives, and Seminar 1 buildings resulting in $1.9 million in damages and requiring some classes to be canceled and rescheduled.

Access Control

Over 400 doors on the campus are currently controlled through an automated electronic lock system. The system controls access to building entries and other critical spaces. The system also provides the capability of automatically locking doors in case of an emergency. However, Evergreen is currently unable to execute a conditional lockdown* of the campus because the system does not operate reliably and is not able to consistently secure all doors during lockdowns or other emergency situations. As a closed proprietary system, the Evergreen maintenance staff is not permitted access to the programming of the system and must rely upon outside contractors to troubleshoot and resolve problems with the system.

Telephony Systems

Campus voice communications relies upon a telephone system that is no longer supported by the manufacturer. It must be replaced within five years to avoid service interruptions and prolonged outages. To bring the system up to current technologies, it will need to be replaced with a system that operates over the network.

Network Infrastructure

Previous studies have recommended migrating mission critical safety, security, and communications applications onto a common network infrastructure to enable Evergreen to customize and integrate these systems and leverage their investment in network infrastructure and support resources. However, it is imperative that the supporting network and power infrastructure be highly available and fault tolerant and remain operational during a power outage. Otherwise, events that disrupt, damage, or impair the power and network infrastructure will impact the ability of these critical applications to function and could significantly reduce Evergreen's ability to operate effectively, provide support services, and respond to emergency situations. The current network equipment lacks redundancy and contains single points of failure that could significantly impact the applications operating on the network. The network cabling infrastructure requires additional capacity and bandwidth to accommodate additional safety and security applications and increased traffic they will put on the network.

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* At Evergreen, a "conditional lockdown" automatically locks all building entries, but allows Police Services to use an access control keycard to override a locked door and enter a building.

2.2 Project Description

Agency Name:	The Evergreen State College
Agency Code:	376
Project Number:	30000613
Project Title:	Critical Power, Safety, and Security Systems at The Evergreen State College
Agency Contact:	The Evergreen State College 2700 Evergreen Pkwy NW Olympia, WA 98505 Jeanne Rynne, Director of Facilities Services Phone: (360) 867-6115 Email: rynnej@evergreen.edu
Mission:	The scope of the project will support The Evergreen State College's mission to provide an innovative liberal arts public education by providing a reliable power and network infrastructure and ensuring a safe and secure learning environment for its students, staff, and visitors.
Goals of the Project:	• Replace aging and failing campus main electrical switchgear to increase reliability of campus power system and safety of workers • Renovate and expand critical power systems to support the increased loads from the security, safety, and communications systems and to ensure these essential systems remain operational during power outages • Improve Evergreen's ability to monitor and assess risks and potential threats, and respond effectively to emergencies • Reliable and consistent automatic lockdown operation to secure all building entries and other critical spaces during emergency events • Create a high capacity and reliable campus network to accommodate new network-based safety, security, and communications applications

Facilities: The scope of the project will affect all existing facilities on the campus including administrative, instructional, and maintenance buildings.

Previous Action Taken: Previously select emergency and capital projects have been implemented to respond to specific equipment failures.

Over the course of several biennia Evergreen has completed minor works electrical improvements including:

- Re-established redundant electrical feeders to residential housing
- Replaced residential electrical cabling
- Replaced transformers in residential buildings and established proper grounding
- Installed new electrical feeder to serve the Child Care Center, Pump Station, and parking lot lighting and create spare capacity for future use

"The Evergreen State College Security and Life Safety Assessment" prepared by Hargis Engineers and KMB Design Groups included a comprehensive assessment of the existing electronic safety and security systems. The study identified deficiencies in the current systems and provided recommendations and prioritized projects for implementation. As recommended in the report, the fire alarm system in the Lab I facility is being replaced as minor works preservation project, but due to financial constraints, the other recommendations in the report have not been implemented. As a result, the remaining recommended fire alarm, access control, and alerting system improvements are included in the scope of this project.

The campus main electrical switchgear needs are identified in the "*Capital Improvement Recommendations for the Medium Voltage Systems at The Evergreen State College"* prepared by Richard J. Davis, P.E. in February 2016. No known maintenance or upgrades to the switchgear have been done since the document was written.

The condition of the existing telephone system was evaluated and recommendations for replacing the system were described and documented in the "*Stakeholders Telecommunications Findings and Review*" and the "*Voice Communications Strategic Planning*" documents published by the COMGroup consulting firm in 2014.

2.3 Alternatives

The Predesign Team reviewed the operational needs of Evergreen and the goals of the Critical Power, Safety, and Security project and determined that there are no viable alternatives to implementing the full scope of the project. The following describes the implications and risks of doing nothing and resorting to performing the work as ongoing maintenance.

A "do nothing" approach increases the risk that equipment failures, natural or man-made disasters, or other significant emergency events could potentially lead to property damage, disruption of servicers, or personal injuries - or even loss of life - to staff and students. For instance, without upgrading the incoming campus main electrical switchgear it will likely continue to have failures at more regular intervals. The result of a major failure to the campus main electrical switchgear will have a serious impact to the operation of the campus. If a failure significantly damages the switchgear the entire campus could be without power for an extended period of time. This could have long-term impacts involving emergency project appropriations, temporary utility provisions, and long lead times to obtain replacement equipment. Lead times for medium voltage switchgear can be up to six months at times.

Currently, the existing standby generators do not provide power to all of the network equipment and security systems housed in the campus telecommunications spaces. Without upgrading the existing standby generators and associated equipment, the campus network and the systems that depend on the network will not be operational in the event of a power outage.

Since replacement parts are no longer available for the existing fire alarm system in Seminar 1, any equipment failures may not be repairable or may require an extended period of time to complete. Although the existing fire alarm system could be replaced in the Seminar 1 Renovation project, the construction is not scheduled to occur until the 2019 – 2021 biennium at the earliest. In the interim, if the existing fire alarm system fails, the entire facility will be without an operating fire alarm system and a fire watch will be required. The fire watch will entail the costs of having the facility patrolled by personnel equipped and prepared to take action in the event of a fire. An investment in replacing the existing fire alarm system now can be preserved by maintaining the new system and incorporating any additional requirements into the scope of the renovation project.

If the issues with the lack of accurate reporting from the existing fire alarm systems and the code violations with the annunciator panels are not addressed, then Evergreen and McLane Fire Department will continue to be limited in their ability to provide a timely and effective response.

Taking no action means critical building systems (e.g. gas, water, or HVAC) will continue to go unmonitored. Due to the existing limitations of the existing disparate alarm systems, other alarms and alerts may go unnoticed or ignored and hamper responses to emergency events.

A plan that does not address the limitations of the existing access control system results in critical spaces, staff, and resources remaining vulnerable to unauthorized access. Exterior doors to buildings and critical spaces will not be able to be reliably locked and secured and Evergreen will be unable to create secure places inside of buildings for shelter during events such as an active shooter on campus.

Without the network infrastructure upgrades and enhancements, the network will not have the capacity and redundancy required to support new network-based security and communications applications. Without a viable network, the phone system cannot be replaced and without a replacement system, the existing phone system will be unsupported and parts and service will be unattainable. If there is an equipment failure the system will fail and may be unrepairable or out of service for an indefinite period of time.

The longer the essential infrastructure work is delayed the more the risks of damage to property, personal safety, and disruption of the program are increased and the higher the costs to maintain or repair the obsolete and failing systems.

2.3.1 Non-Preferred Alternative: Campus Main Electrical Switchgear Installed in Underground Vault

The Predesign team considered an alternative of installing the campus main electrical switchgear in the underground vault below the existing campus main electrical switchgear. Similar to the switchgear building preferred alternate, this non-preferred alternative is intended to protect the new switchgear from water leaking into the switchgear and damaging the equipment. Also similar to the preferred alternate, this alternative would replace all of the existing campus main electrical switchgear that serves the main campus feeders.

The initial cost to install the new switchgear in the underground vault is lower than the cost to build an above ground switchgear building to install the switchgear, but there are also significant drawbacks to this approach. The industry standard medium voltage switchgear with vacuum circuit breakers is called metal clad switchgear which is what is currently installed on campus. Metal clad switchgear will not fit in the underground vault. Only proprietary switchgear with a much smaller footprint is able to be installed in the vault and still provide the proper working clearances. This type of switchgear utilizes fuses instead of vacuum circuit breakers for the overcurrent protection and would typically be used only where there are significant space requirements. The narrow switchgear is difficult to install and test because of the reduced size and there is very little space within each section to work. Because of the difficulty installation and testing will be more costly.

Installing the new switchgear in the underground vault would protect the equipment better than the existing installation, but this approach provides no significant advantage - other than initial cost - over the preferred alternate of installing new switchgear above ground within a building. More significantly, the recent fire sprinkler pipe rupture which flooded the tunnel and

vault system could have ruined switchgear installed in an underground vault. The switchgear could be installed on a platform in the underground vault to limit this risk, but the additional height of the platform would restrict the distance between the top of the equipment and the ceiling of the vault and limit the ability to adequately service and repair the equipment.

See the Appendix F for a more comprehensive comparison of this non-preferred alternative.

2.4 Scope of Project

The preferred alternative includes the following scope of work to support the goals of the Critical Power, Safety, and Security Systems project.

2.4.1 Campus Main Electrical Switchgear Replacement

The scope for the campus main electrical switchgear replacement includes a new building constructed around the existing electrical switchgear enclosure and uses a phased approach to replace the medium voltage switches. The pre-design is based around metal clad medium voltage switchgear with vacuum circuit breakers. These switches are comparable to the existing switches but will include newer technology and added protection for workers. The switchgear should be specified with remote racking for the circuit breakers and infrared windows so that there is little or no need to test or maintain the equipment when energized.

Since the existing switchgear is redundant, which is common to medium voltage campus infrastructures, the campus load can be served by half of the existing switchgear. The redundancy in the system typically allows for maintenance of the system, while the equipment is de-energized, without losing power to the campus. This will allow half of the existing switchgear to be replaced without a major power outage to the campus. Once the first half is replaced the campus load can be transferred to the new switchgear and the second half can be replaced. Temporary feeds will be provided for the selected critical loads during construction. There are a number of advantages to this approach that include being able to reuse existing medium voltage feeder cabling and core drills to access the vault and tunnel system below the switchgear. The feeders from the utility point of service will be replaced to the new switch lineups since the location of the main circuit breakers is changing.

The switchgear building will provide an added level of security and protection from the environment. It will also allow maintenance of the switchgear without the risk of electric shock since the switchgear can be worked on in a controlled environment while it is de-energized.

Scope includes:

- New switchgear building around existing switchgear enclosure
- Replace aging and failing campus main electrical switchgear with new switchgear in the same location the existing switchgear sits
- Cabling for new utility connections to switchgear
- Reconnect existing campus feeders to new switchgear

2.4.2 Fire Alarm Upgrades

Seminar 1 Building

The scope of work for the fire alarm system includes replacing the existing non-addressable fire alarm system in the Seminar 1 building which is obsolete and can no longer be adequately

supported. The new system will be an intelligent, software-controlled addressable fire alarm and detection system. It will include a control panel with a network interface for reporting status over the campus optical fiber network, and a remote annunciator located at the fire department response point.

The detection devices will consist of addressable smoke detectors, heat detectors, manual pull stations, sprinkler system water flow, and tamper and pressure switches located in accordance with NFPA 72 and the Fire Code.

Annunciating devices will be a combination of ADA compliant audible and audible/visual devices in accordance with NFPA 72 and the Fire Code and horns will be used for audible notification.

Building Improvements

At building entrances, existing annunciators which are not code compliant will be replaced with new addressable annunciator panels to present complete and accurate information to aid the fire department in response efforts.

Existing fire alarm systems will be audited and commissioned to verify the systems are reporting accurate information.

Fire Alarm Network Improvements

Network connectivity will be established to all campus fire alarm panels to replace existing proprietary reporting mechanisms which limit the information presented at the Police Services Dispatch Center. Rather than providing only general information about the location of the device in alarm, such as a building wing or floor, the new network system will provide the dispatch operator with the exact location of the device in alarm, such as the room number, to improve monitoring and response times.

The network system will also enable dispatch operators remote access to the building fire alarm control panel to change settings or acknowledge and silence alarms.

The scope of the network improvements includes installation of network interface modules in existing fire alarm panels to connect to the campus optical fiber network. The existing multimode optical fiber cabling will be extended to fire alarm control panels where optical fiber cabling is currently not available at the panel.

2.4.3 Access Control and Monitoring System

The predesign scope includes a new network-based access control and alarming system capable of integrating access control, alarm monitoring, video surveillance, and temperature monitoring capabilities into a single comprehensive system. The existing proprietary access control system will be replaced with an open architecture system to allow Evergreen more flexibility in servicing, maintaining, expanding, and enhancing the system. The new system will resolve the

current system's inability to reliably secure building perimeters and critical spaces during emergencies and provide Police Services with the ability to effectively and reliably execute campus lockdowns.

The project will include a new network-based door controller to control the approximately 400 existing electronic doors distributed across 13 buildings located in the upper campus.

The new system will include new alarm input modules to consolidate the current set of existing disparate alarming systems onto a unified monitoring platform to provide accurate and reliable reporting of events and provide Evergreen with a flexible and scalable alarming platform that can be easily expanded and modified to monitor additional systems and situations.

The existing door controller and alarm input modules will be replaced with new network-based units. The scope preserves the investment in existing electronic door hardware, card reader and security devices, power supplies, and cabling infrastructure.

The scope will include additional cabling and pathways where required, and the existing cabling will re-terminated onto the new door controllers.

The project also includes programming of the system software, developing the database of authorized users, integration of existing alarms, and an overhaul of the automated lockdown operation.

2.4.4 Building Power Distribution and Critical Power Systems

The pre-design scope is to provide optional standby power (National Electric Code (NEC) Section 702 (2015)) to allow critical security, life safety, and communications system to remain operational in the event of a primary power outage. The NEC defines different types of "emergency power" and requires that they be separated on a different automatic transfer switch (ATS) and panels. The buildings at Evergreen typically have a mix of Life Safety (NEC 700) and Optional Standby (NEC 702) loads. This requirement has been around for some time, but L&I has recently been enforcing it more stringently.

Some of the buildings on campus meet the NEC requirements and have separated types of "emergency power" loads while other buildings have a mix of Life Safety and Optional Standby loads on the same ATSs and panels. In most cases when electrical equipment is "touched" or affected by a project the authority having jurisdiction will require it to be upgraded.

Through the use of generators, ATSs, uninterruptible power supplies (UPS) and panelboards, backup power will be supplied to the telecommunications spaces to achieve a minimum of two hours of runtime in the event of a normal power outage. This standby generator power is critical to keeping the campus communications functioning properly in the event of a power outage.

Scope includes:

- Replacing existing generators with larger generators
- Replacing existing ATSs with larger ATSs

- Adding new ATSs and panels to separate emergency loads into Life Safety (LS), NEC 700, and Optional Standby (SB), NEC 702, systems
- Replacing existing panels with larger panels
- Providing panels for Optional Standby power to new network infrastructure and cooling
- Providing conduit and conductors between electrical equipment and the new network infrastructure and cooling

Table 1: Critical Power Scope of Work

Building	Added Load (kW)	Existing Generator Size (kW)	New Generator Size (kW)	Separate NEC 700 & NEC 702 Loads	Added 480/277V EMDP Panel Size (A)	Added ATS(s) Size(s) (A)	Added Transformer Size (kVA)	Added 208/120V Panel Size (A)	Notes
Library	114.8	265	400	No	400	250	150	(1) 400, (3) 100	
CAB	15.6	300	-	No	-	-	-	-	
CRC	7.5	125	-	Yes	-	125	-	100	
Communications	7.4	125	-	Yes	-	125	-	100	
Seminar 2	84.5	125	250	No	-	150	150	(1) 400, (5) 100	Existing system is not separated, but an additional ATS will be provided off of the new generator for NEC 702 Loads.
Seminar 1	10	60	80	Yes	150	125	(1) 30, (1) 45	(1) 150, (1) 100	
CUP	2.2	50	-	Yes	-	125	30	100	
Lab I	21.2	100	150	No	250	150	75	100	
Lab II	12.6	125	-	No	-	-	45	100	Existing system is not separated, but an additional ATS will be provided off of the new generator for NEC 702 Loads.
Lecture Hall	-	-	-	-	-	-	-	-	Telecommunications spaces and generator provided with building upgrade
Long House	4.8	-	-	-	-	-	-	100	Emergency power is fed from Seminar 1 generator
Childcare	2.6	-	-	-	-	-	-	-	UPS only

2.4.5 Telecommunications Spaces and Infrastructure Improvements

The Evergreen campus includes over 30 telecommunications spaces which house equipment and cabling for the critical safety, security, and communications systems. The spaces are essential for maintaining the operation of the systems and must contain the necessary infrastructure and backup systems to ensure critical systems operate reliably and without interruption. The scope of work will address current deficiencies and bring telecommunications spaces up to current standards for dedicated secure environmentally controlled spaces to ensure reliable performance for security and safety systems and provide the ability to safely access and maintain equipment.

The scope for the telecommunications spaces and supporting infrastructure includes the improvements described below and summarized in Table 2.

- Construct a total of four new telecommunications spaces in the Seminar 1, Campus Recreation Center, Central Utility Plant, and Science Lab I buildings to replace existing spaces that are inadequate and unable to be upgraded to provide the necessary environmental, security, and supporting infrastructure required for the network-based security and safety systems housed within the spaces. The new spaces will be sized to accommodate current and future technologies and allow the equipment to be accessed and maintained. The new Seminar 1 space will be coordinated with the Seminar 1 predesign currently in progress. The existing Seminar 1 space must be replaced now so Police Services can transition to T-COMM911 Criminal Justice Information public safety system which requires additional space in a physically secure telecommunications room to meet federal regulations.
- Install drip pans and other measures in susceptible telecommunications rooms to shunt water from overhead drain lines away from the telecommunications racks and equipment and mitigate potential for damage to critical equipment and prevent system outages.
- Replace existing air-conditioning units serving telecommunications spaces that are nearing or exceeding their end of useful life and new air-conditioning units in telecommunications spaces currently without active cooling systems. The air-conditioning systems will be specified with increased cooling capacity to handle the additional heat generated by new switches supporting the network-based security, safety, and communications systems. The air-conditioning units will maintain the required operating temperatures and protect the network equipment from premature failure.
- Upgrade and replace existing network switches to increase network capacity and bandwidth and improve network resiliency and fault tolerance by reducing single points of failure and thereby ensuring reliable and continuous operation of critical security and safety systems.
- Install new grounding infrastructure in telecommunications rooms where grounding and bonding is deficient. Scope includes busbars and bonding conductors per NEC and industry standards to provide equipotential electrical system and protect equipment and ensure reliable system performance.

- Upgrade the optical fiber backbone cabling to spaces currently connected to the campus network with older low bandwidth multimode fiber. The new optical fiber cabling will be high bandwidth single-mode optical fiber cabling installed from the data center in the Library Building to provide bandwidth and capacity required to effectively transport security and safety systems.
- New battery-powered uninterruptible power supplies (UPS) units in telecommunications spaces to provide temporary battery power to keep network switches running until generator power is available. In smaller telecommunications spaces without generator power, the UPS units will be sized to provide temporary power for a minimum of two hours.

Table 2: Summary of Telecommunications Spaces Improvements

: Building	Room	Cooling	Backbone Cabling	Grounding	Cable Management	Pathway	Other
Library	0434	1.5 Ton AC Unit					Implement measures to mitigate risks of water damage
Library	2404	1.5 Ton AC Unit					
Library	2702	3.0 Ton AC Unit					
Library	2019	1 Ton AC Unit					Implement measures to mitigate risks of water damage
Library	4003B	1 Ton AC Unit					
Library	1000D	1.5 Ton AC Unit					
Library	0206					Additional pathway	
Library	0447	1 Ton AC Unit		Improve Grounding and Bonding			
College Activities Building (CAB)	218	1.5 Ton AC Unit					
College Recreation Center (CRC)	102A	.5 Ton AC Unit	12-stand Single-mode OFC 200-pair UTP	Improve Grounding and Bonding	Additional Cable Management		
College Recreation Center (CRC)	132B	1 Ton AC Unit	12-stand Single-mode OFC 200-pair UTP	Construct new Telecommunications Room			

Building	Room	Cooling	Backbone Cabling	Grounding	Cable Management	Pathway	Other
Communications	212C	1 Ton AC Unit					
Seminar II PSC	E1114	.5 Ton AC Unit					
Seminar II PTS	B1108	1 Ton AC Unit			Additional Cable Management		
Seminar II A2	A2111	1.5 Ton AC Unit					
Seminar II B2	B2111	1 Ton AC Unit					
Seminar II C2	C2111	1 Ton AC Unit					
Seminar II C4	C4105	.5 Ton AC Unit					
Seminar II D2	D2111	1 Ton AC Unit					
Seminar II D4	D4105	1 Ton AC Unit					
Seminar II E2	E2111	1 Ton AC Unit					
Seminar II E4	E4105	.5 Ton AC Unit					
Seminar I	3160	1 Ton AC Unit	12-stand Single-mode OFC 200-pair UTP	Construct new Telecommunications Room			
Central Utility Plant (CUP)	011A	Exhaust Fan	12-stand Single-mode OFC200-pair UTP	Construct new Telecommunications Room			

Building	Room	Cooling	Backbone Cabling	Grounding	Cable Management	Pathway	Other
Lab I	1065A	1.5 Ton AC Unit		Improve Grounding and Bonding			
Lab I	2031	1 Ton AC Unit	12-stand Single-mode OFC 200-pair UTP	Construct new Telecommunications Room			
Lab II	2243A	1 Ton AC Unit	12-stand Single-mode OFC		Install Additional Cable Management	Install Additional Pathway	
Lab II	2245	new unit in 2014					
Arts Annex	1113	Exhaust Fan					
Long House	1008B	.5 Ton AC Unit		Improve Grounding and Bonding	Install Additional Cable Management	Install Additional Pathway	
Childcare	109A	Exhaust Fan		Improve Grounding and Bonding	Install Additional Cable Management	Install Additional Pathway	
Housing Community Center (HCC)	113Z	Exhaust Fan		Improve Grounding and Bonding			
MOD Laundry	320	Exhaust Fan		Improve Grounding and Bonding	Equipment rack and cable management	Install Additional Pathway	
Ag Lab	109	Exhaust					

		Fan					
Building	**Room**	**Cooling**	**Backbone Cabling**	**Grounding**	**Cable Management**	**Pathway**	**Other**
MOD Shops	102		12-stand Single-mode OFC				
Shop	109	Exhaust Fan		Improve Grounding and Bonding			

2.4.6 Network Upgrades and Enhancements

Existing network switches will be replaced or upgraded in all telecommunications spaces to provide the required network bandwidth and capacity to all buildings so the security, safety, and communications systems can operate effectively over the network.

The new switches will be equipped with redundant power supplies to provide resiliency and fault tolerance and reduce single points of failure.

2.5 Issues Identification

The following issues are anticipated to require additional research, discovery, and design coordination, or will be addressed by other projects:

- Additional review of record drawings and site surveys will be required to adequately field verify and document the existing conditions prior to issuing construction documents for bid.
- The availability of existing loading criteria at the generator and panel level is limited. A metering study will be required to verify existing conditions for permitting and to validate system sizing and equipment selections. Washington State Department of Labor and Industries (L&I) plan reviewers typically like to see the demand metering data taken within a year of the review.
- Because of the limitations in replacing electrical equipment in existing buildings and routing new conduits into existing facility buildings, the new installation will need to be coordinated in detail so as to not pose a risk to operations. Where existing underground ducts cannot be reused, conduits may need to enter at the exterior of a building and transition vertically to route overhead to the new equipment.
- The scope of this project impacts a variety of essential campus services. The phases of the project will need to be scheduled and sequenced to minimize impacting campus operations.
- The new telecommunications spaces in this project will require renovating existing spaces to accommodate these new functions. The locations for these new spaces have yet to be identified, but the locations will need to be carefully considered so as to not adversely impact existing program spaces.
- Technology continues to evolve and change. Although the project goals, approach, and basis of design will remain consistent, the requirements and specifications of the equipment may change over the course of the design and implementation phases.

2.6 Prior Planning and History

Prompted by the critical need to increase reliability of the medium voltage system, Richard J. Davis, P.E., the College Engineer, completed the "*Capital Improvement Recommendations for the Medium Voltage Systems*" report, dated February 3, 2016. The report identified equipment

deficiencies related to both age and obsolescence and included recommended systemic improvements for purposes of planning and issuing funding requests.

Recognizing the need to address problems with reporting and monitoring and code deficiencies of the current security and safety systems, Evergreen contracted Hargis Engineers and the KMB Design Groups to create *"The Evergreen State College Security and Life Safety Assessment"* which evaluated the current conditions of the electronic security and safety system. The report identified potential risks and vulnerabilities associated with each system and assigned priorities. The high priority projects in this report included the fire alarm and the access control and alarming system. Further, the report emphasized the importance of upgrading the network infrastructure to support the safety, security, and communications applications that are converging onto the network.

The condition of the existing telephone system and recommendations for replacing the system are described and documented in the "*Stakeholders Telecommunications Findings and Review*" and the "*Voice Communications Strategic Planning*" documents published by the COMGroup consulting firm in 2014.

The goals of this project directly support the emergency preparedness actions and operations required to restore campus safety and security in response to an emergency or disaster included in Evergreen's "*Comprehensive Emergency Management Plan, 2013*" and "*Emergency Response Handbook—2013"*.

In 2014, Evergreen published a *"Business Continuity Plan"* in compliance with the Directive by the Governor 13-02 regarding Continuity of Government Operations Preparation. The scope of this project will provide the infrastructure necessary to maintain the functions and systems identified in the *"Business Continuity Plan"* as critical to operate effectively during events such as natural disasters, technology failures, human errors, or terrorism.

The scope of this project furthers the objectives identified in Evergreen's most recent Strategic Plan published in March 2015 to develop, renovate, and maintain critical campus facilities and to effectively employ technology to create and sustain a safe environment and improve efficiency and effectiveness of campus operations.

2.7 Stakeholders

Internal Stakeholders

- College Administration and Board of Trustees
- Student Body
- Facilities Services – Lab II Building Room 1254, Jeanne Rynne
- Maintenance Services – Lab II Building, Room 1254, Mike Drennon
- Computing & Communications, Library 1607, Antonio Alfonso
- Telecommunications – Library 1811, Richard Schneider

- Network Services – Lab I Building, Room 618 Michael Partlow
- Police Services – Seminar 1 Building, Chief of Police, Ed Sorger
- Coordinator of Emergency Response Planning – Library 1129, William Mikesell
- Director of Business Services - Library 1127, David Kohler

External Stakeholders

- McLane Black Lake Fire Department

  125 Delphi RD NW
  Olympia, WA 98502
  Fire Chief: Steve North

2.8 Implementation Approach

The project will be implemented using a traditional design bid build method of delivery and will include a bid package consisting of the following components:

- Medium voltage electrical improvements
- Standby power generators
- Fire alarm upgrades
- Replacement of existing access control system
- Improvements to telecommunications spaces and network infrastructure

The project will impact the existing electrical, security, and safety systems, and the operations that depend on them. The work will need to be carefully planned, phased, and coordinated to minimize the impact on critical ongoing operations that must be maintained throughout construction. Electrical system outages will be required to accomplish the installation as well as for cutovers from old to new electrical and communications systems. However, these impacts will need to be managed carefully and minimized through coordinated work sequencing and installation of temporary utilities. Detailed coordination and planning with facility and operations staff will be required.

2.9 Project Management

Management Organization

The Evergreen project team consists of administration, facilities, and technology representatives to support the planning, needs assessment, and implementation approach for each phase of the project.

The Facilities Services department at Evergreen is organized to perform contract and construction administration. The department staff includes professional engineers and project coordinators with years of experience managing capital projects.

Evergreen will provide management for the project including contractual engagement for the architect, engineers and consultants, and the awarded construction contract. They will also be responsible for the management of the technical and programmatic needs identified by the project stakeholders and will work with the design team to finalize the design requirements.

The design team will produce the construction drawings and specifications and Evergreen will manage the bidding and contracting process. The project will be awarded to a general contractor with subcontracts to specialty contractors and suppliers as required by the project. The Facilities Service department and the design team will provide the construction administration and observe the contractor's progress and verify the work is performed in compliance with the construction documents.

Evergreen will be responsible for managing the overall project schedule and budget and has budget and accounting professionals for the management of progress payment billing and retainage accounting.

The Evergreen Facilities Services department and the design team will coordinate the closeout process and ensure all documentation and administrative requirements are fulfilled in a timely fashion.

2.10 Schedule

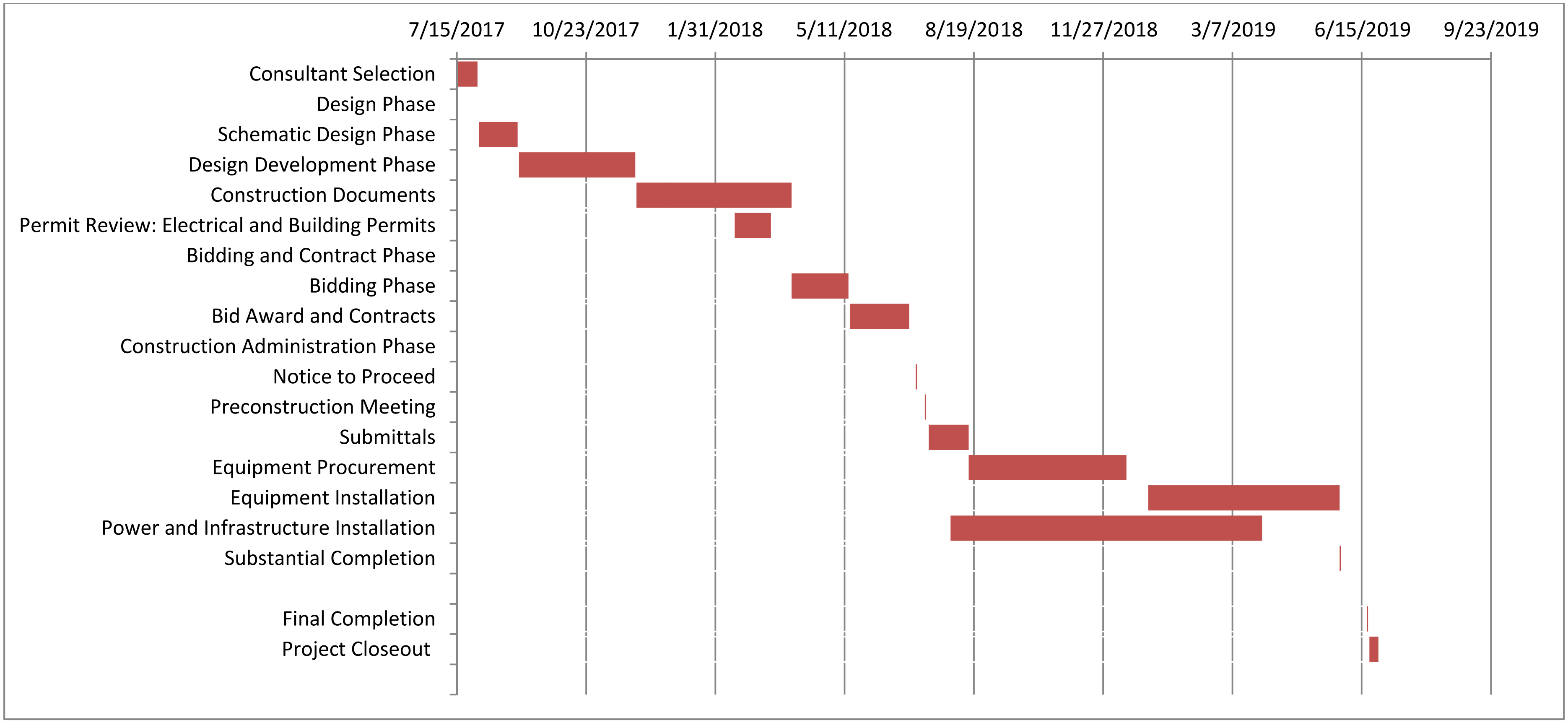
The current project approach is to design, construct, and install all of the proposed infrastructure and equipment during the 2017 – 2019 biennium. The following schedule and major milestones assume that authorization will be provided to the design team on July 1, 2017, to proceed with the design phase of the project.

	Duration	Start	Finish
Consultant Selection	30 days	7/1/2017	7/31/2017
Design Phase	226 days	8/1/2017	3/31/2018
Bidding Phase	44 days	3/31/2018	5/14/2018
Construction	328 days	7/5/2018	5/29/2019
Substantial Completion	1 day	5/30/2019	5/30/2019
Final Completion	1 day	6/20/2019	6/20/2019
Project Closeout	7 days	6/21/2019	6/28/2019

THE EVERGREEN STATE COLLEGE

HARGIS

Critical Power, Safety, and Security Systems



3.0 Program Analysis

3.1 Assumptions

The following assumptions are integral to the programmatic requirements, project timelines, and phasing approaches in this Predesign Study:

- Construction will be phased and completed over one biennium from 2017-2019.
- The existing medium voltage feeders will be reconnected to the new campus main electrical switchgear without needing to be extended.
- Generators, where noted to be replaced, will be installed outside each building.
- Generator system emissions controls will be "standard" for standby systems only operating during power outages, less than 50 hours per year.
- An official ORCAA submittal will only be required for the new Library generator per ORCAA Rule 4.1 (b) (26). None of the other proposed generator engines are larger than 500 horsepower.
- It is assumed that some existing building generators have the capacity to be used to support the new telecommunications and cooling loads. Demand meters should be installed on these systems to verify this assumption.
- Replacement of electrical equipment within individual buildings will often include replacing equipment in the same location, requiring additional downtime to accomplish. Initial discussions with project stakeholders indicated that this would have to be coordinated, but could typically be accommodated.
- Security, safety, and telephony systems are essential services for the operation of Evergreen and the safety and wellbeing of the faculty, staff, students, and visitors. These services must not be interrupted and must remain operational for a minimum of two hours in the event of power outages to allow time for operational decisions to be made. Other critical facilities and applications must remain operational for up to four hours or more. It is also imperative that should these services be interrupted, that they can be restored within 24 hours to avoid impacts to the safety and operation of the Evergreen campus.
- Telecommunications spaces house safety and security systems and associated infrastructure, and must comply with minimum requirements for these spaces as defined by industry standards and best practices to ensure the systems can be adequately maintained and operate reliably even during power outages and other events.
- Telecommunications rooms need to be sized to accommodate network and security cabling and equipment. Telecommunications rooms must be secured, dedicated spaces and cannot be shared with other building systems such as mechanical and electrical equipment to prevent unauthorized access and unnecessary risk to the network infrastructure and security systems.
- Evaluation of and recommendations for the existing telecommunications rooms' infrastructure including physical dimensions, security, cable management, and bonding and grounding system are based upon the Telecommunications Industry of America (TIA) 569-C

Commercial Building Standard for Telecommunications Pathways and Spaces, BICSI Telecommunications Distribution Methods Manual (TDMM), and other industry standards documents which specify design requirements for typical telecommunications spaces and rooms.

- Critical spaces on campus include: The Data Center and Telephone Rooms in the Library, President's Board Room, the Emergency Operations Center in the Lecture Halls building, KAOS radio studio, Police Services, and the Red Cross Mass Care Shelter in the Campus Recreation Center. Power and communications services must remain operational in these spaces during power outages and emergency events.
- Alarms and alerts must be presented in a clear, comprehensible display so that operators at the Police Service Dispatch Center can easily assess possible emergency situations and provide a quick and appropriate response to the alarm. Alarms and alerts need to be prioritized and organized so that the most critical alarms are easily identified by the operator and less urgent alarms are recorded or logged so as to avoid overloading the operator and leading to more important alarms being missed or ignored.
- Voice over IP telephones will require 30% to 40% more power than older analog telephones which also increases the heat generated, requiring additional cooling capacity.
- Exposure to excessive heat can damage equipment and lead to premature failure. To prolong the life of security and safety equipment and ensure reliable operation, the proper ambient temperature must be constantly maintained in the Telecommunications Spaces housing this critical equipment. The acceptable temperature range in Telecommunications Spaces was based on the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Thermal Guidelines for data centers and the ANSI/TIA-569-D Telecommunications Pathways and Spaces standard. For the purpose of this project, the range of acceptable temperature for telecommunications spaces is as follows:

    - Equipment Rooms and critical spaces 64 – 81°F
    - Typical Telecommunications Rooms and spaces 41 – 95°F

- The electrical and cooling requirements for the Telecommunications Spaces are based on the Hewlett Packard 5400R series Ethernet switches with redundant power supplies.
- LEED certification is not required for this infrastructure project.

3.2 Existing Facilities Inventory

3.2.1 Campus Main Electrical Switchgear

At over 50 years in age, the existing medium voltage electrical switchgear at Evergreen has surpassed its economic and useful life and needs to be replaced. The equipment is critical to the operation of the campus and is unsafe to work on and operate manually, posing a safety concern for personnel. Keeping the existing systems operational requires ongoing facilities' resources – and creativity - for regular troubleshooting and repair. Working with Evergreen facilities personnel, we reviewed the existing campus main electrical switchgear and associated cabling at Evergreen, via non-invasive observation. The existing campus main electrical switchgear is installed within a fenced area in the southeast portion of the campus. The enclosed switchgear is installed directly above an underground vault and all of the feeder cables are routed directly into the bottom of each switch. There are two almost redundant lineups of switchgear so that the campus load can be served from either half of the switchgear. When the switchgear was originally installed there was a tie breaker between the two sections, but it has since failed and the configuration of the equipment has been modified to maintain redundancy. In lieu of the tie breaker Evergreen brought in a second utility feed from PSE so that each half of the switchgear has a separate feed. The PSE feeders to the equipment are both coming off of the same PSE circuit and a single set of PSE cables that are spliced outside of the switchgear yard. Drawings of the existing switchgear can be found in the Appendix of this report.

The switchgear has failed on more than one occasion with a major failure of the switchgear tie breaker in 2000, with other periodic failures of individual circuit breakers and mercury switches since. The most recent failure to the switchgear was an arcing event that occurred on March 26, 2016, which resulted in a 24-hour loss of power to the campus for repairs. The outage was caused by a water leak in the enclosure which short-circuited the primary feeder

Photo 1: Damaged Primary Feeder

Electrical maintenance testing and electrical metering was not performed as part of this effort. It appeared that the meters installed with each circuit breaker were not functioning properly and were showing incorrect loads and voltages. Because of the equipment vintage, the availability of spare parts, and the system not truly being redundant, the facilities personnel are challenged to effectively respond to maintenance requests on the failing system.

3.2.2 Building Power Distribution and Critical Power Systems

Most buildings on campus have an existing stand-alone standby generator power system to provide power to life safety and other loads in the event of a loss of normal power. Typically, these systems consist of a building generator, ATS(s), transformer(s), and panels. Hargis reviewed existing building one-line drawings and visited many of the campus buildings to determine the existing conditions for standby generator power in each building. A summary of the existing generator and ATS infrastructure is included in tables in the Appendix.

The NEC defines different types of “emergency power” and requires that they be separated on different ATSs and panels. The buildings at Evergreen typically have a mix of Life Safety (NEC 700) and Optional Standby (NEC 702) loads. Some of the buildings on campus meet the current NEC code requirements and have separated the different types of “emergency power”. Other

buildings met code when they were installed and are “grandfathered” in with a mix of Life Safety and Optional Standby loads on the same ATSs and panels.

Demand meters were not installed as part of this study so the loads on the existing generator standby power systems for each building are unknown. L&I plan reviewers typically like to see the demand within a year of the review.

3.2.3 Fire Alarm

Evergreen’s fire alarm system is configured with all campus fire alarm signals reporting to Police Services Dispatch Center in Seminar 1 building. The fire alarm systems consist of older conventional and newer addressable fire alarm control panels. System field devices consist of a mix of smoke and heat detection, manual pull stations, duct smoke detection, as well as the fire sprinkler systems. Some of the fire alarm panels also monitor non-fire alarm devices like panic buttons at point-of-sale stations or system failure alarms in lab buildings. Each of the fire alarm panels on the campus connect back to the Police Services Dispatch Center using either traditional copper or optical fiber network cabling. The campus optical fiber backbone cabling can be used to connect the remaining fire alarm panels not currently on the network, but in some cases, new optical fiber cabling will need to be installed from the building telecommunications room to the fire alarm panel.

Some of the newer addressable panels use zone outputs and conventional style relay monitor modules connected to the older copper wiring to report to the Police Services Dispatch Center. The existing copper connections can only operate as a one-way communication and do not allow the operators in the dispatch center to remotely acknowledge, clear, or silence alarms.

Some of the fire alarm panels are providing inaccurate and incomplete information to the Dispatch Center. In these cases, the fire alarm devices are not programmed correctly and report alarms in one area of the building when the device is located in a different area. In many cases, the existing annunciator panels located on the exterior of buildings are not functioning (non-code compliant) or do not provide all of the information that is available from the fire alarm system which can delay the proper response from the Fire Department.

3.2.4 Access Control

The existing Millennium® access control and alarm system controls access approximately 400 exterior and interior doors on the campus to protect persons and property by preventing unauthorized access to secured spaces. The system monitors doors and reports if they are left open or forced open and the system also monitors and reports a variety of panic and other alarms. However, the system currently is not able to provide a graphic representation of the location of the alarm to aid in responding. The system was first deployed in 2007 as a proof of concept and has been expanded over time. The system includes door controllers, card readers, power supplies, cabling, software, and electronic door hardware. An emergency lockdown

procedure can be initiated from the Police Services Dispatch Center to automatically lock the exterior doors of all the buildings on the campus. However, the system is not well coordinated with the electronic door hardware and the lockdown procedure does not consistently automatically lock all exterior doors and in some cases the lockdown can be overridden by the ADA door operator button. In addition, not all critical spaces, resources, and staff are protected by the access control system allowing the potential for unauthorized persons to access these areas. The Millennium® system is a proprietary system requiring a third party vendor to maintain, modify, or expand the system and its capabilities which restricts Evergreen's ability to expand and enhance the system's capabilities and improve their ability to protect students and staff and identify potential threats or security risks.

3.2.4 Telecommunications Spaces

The predesign team completed an inventory and assessment of the telecommunications rooms and spaces and documented existing conditions and deficiencies. The information gathered included the physical dimensions, condition of campus backbone cabling and pathways, presence of cabling management and physical security, and a review of the existing primary and critical electrical power systems, cooling, and ventilation systems present in the spaces. A summary of the inventory is included in the Appendix.

The existing telecommunications spaces on the Evergreen campus have evolved over time and represent up to 4 generations of telecommunications technology. Some of these spaces are small rooms with limited space for installing equipment and may not provide adequate access and clearances to properly maintain and support equipment or provide ability to add or expand equipment and cabling. These smaller rooms have limited electrical power circuits and typically do not contain battery-backed Uninterruptible Power Supply (UPS) units or generator power to provide temporary power or protect equipment from power fluctuations. Some of the small rooms are not dedicated telecommunications spaces and were built inside existing electrical or storage rooms that were not originally designed to house telecommunications equipment. These spaces may not be adequately secured and may also be used for storage or contain other systems including electrical panels, junction boxes, and cable TV equipment which increases the risk that unauthorized persons may access the space and intentionally or accidently modify or damage the equipment resulting in outages and impacts to security and safety systems.

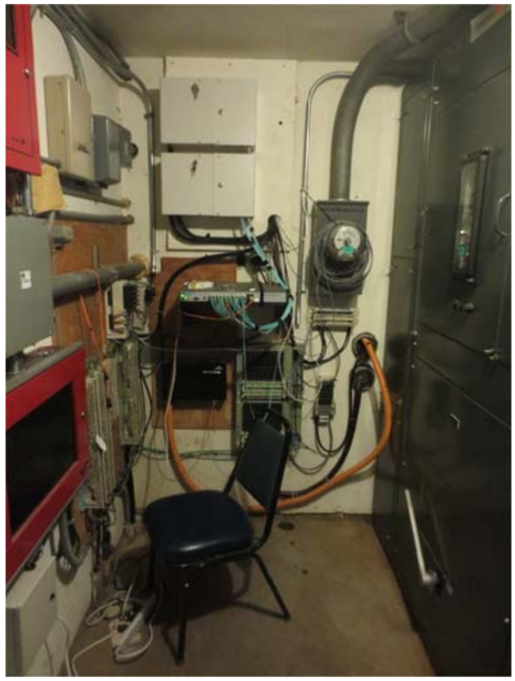


Photo 2: Example of small shared Telecommunications Room – MOD Laundry

The standard telecommunications rooms on campus are dedicated spaces and contain equipment racks for mounting network equipment and range in size from 50 square feet up to over 200 square feet. The standard rooms typically contain overhead cable tray, cable management systems, and spare pathways to support and facilitate modifications or expansion of the cabling systems. Most standard telecommunications rooms also contain telecommunications grounding busbars bonded to building grounding systems to protect the equipment. However there are instances where telecommunications spaces contain insufficient grounding and bonding systems which can create a difference of ground potential between system components and could impact system performance or damage equipment. There are also instances where existing spaces do not include acceptable cable management system limiting the ability to properly support and maintain cabling. Some of the existing cabling pathways are at capacity and additional cabling cannot be added without removing existing cabling or creating new cabling pathways to the space. Standard telecommunications rooms are typically secured with manual locks and keys.

Photo 3: Standard Telecommunications Room with grounding busbar and pathway

Some rooms have risks of potential water infiltration and require drainage troughs placed beneath overhead water pipes or other measures to mitigate and prevent water leakage and damage to the equipment within the room and prevent prolonged system outages.

The temperature in the telecommunications spaces is maintained using conductive cooling, exhaust fans, and active cooling systems. Smaller rooms rely on conductive cooling to maintain the temperature of the space. A Standard telecommunications room with heat loads less than 2,000 watts is typically cooled using exhaust fans. Active cooling is typically provided in the larger spaces using mini or conventional split system air conditioning units. The units appear to be sized appropriately for the current heat loads and keep the temperature of the rooms within the acceptable range. However, the majority of the existing air conditioning units are nearing the end of their useful life and need to be replaced to avoid failures and emergency replacements. Also the heat loads in the telecommunications spaces will increase as more Power over Ethernet (PoE) switches are deployed to power the increasing number of wireless access points, IP telephones, and other network attached devices. Finally, the active AC units are typically not connected to standby generator power which could lead to temperatures rising beyond the acceptable range if a power outage extends beyond 2 -3 hours.

3.2.5 Network Infrastructure

A comprehensive system of underground utility tunnels connects the core buildings on the Upper Campus. However, cabling pathways are constricted and congested at tunnel intersections where mechanical, electrical, and others systems cross each other. In areas below the library the pathway available for telecommunications is at capacity and prohibits more cabling from being installed. The tunnel system does not extend to Lower Campus or the Longhouse on the periphery of the Upper Campus. The pathway from the tunnel to these buildings consists of a system of underground conduits and cast concrete vaults.

Single-mode and multimode optical fiber backbone cabling is installed in a hierarchical star topology from the Machine Room located in the basement of the Library building out to the academic, administrative, and housing facilities on the campus. The majority of the buildings on the campus are connected to the Machine Room with both single-mode and multimode optical fiber. However, the Seminar 1, CRC, and CUP buildings and office wing of Lab building lack single-mode fiber and are restricted to operating over an older 62.5/125 micron multimode cabling which cannot support additional applications or applications requiring higher bandwidth. Single-mode cabling is required to all the buildings on campus in order to provide the bandwidth and capacity for current and future applications operating on the network.

The current hierarchical star topology does not include redundant cabling or geographically diverse pathways. The centralized connection of all optical fiber cabling to the Machine Room in the Library represents a single point of failure and potential for campus-wide service outages if the Machine Room is taken off line or the cabling is damaged.

3.2.6 Network and Telephony Equipment

The campus is served by a single K-20 Internet service which terminates in the Library Machine Room on the K-20 router. The WAN router lacks a redundant power supply and the K-20 Internet connection is a single point of failure that could impact the entire campus. Fortunately circuit failures haven't historically been a problem for the College. The Hewlett Packard 8200zl Layer 3 core switch provides 1 Gigabit (Gb) connections from the Machine Room to the individual telecommunications rooms in the buildings on Olympia campus via the optical fiber backbone cabling. However, the core switch contains a single system support module and cannot be upgraded with redundant modules. There are redundant 10 Gb connections from the core switch to two of the five server cabinets in the Machine Room, but the remaining three cabinets do not have redundant connections to the core switch. The data center network, the general campus network, and the housing network share a single large Ethernet domain which creates a single fault domain and increases the risk of a system-wide outage.

The standard telecommunications rooms include Hewlett Packard chassis-based expandable 5412 and 5406 layer 2 access switches with fixed-port switches in the smaller telecommunications rooms. The current network switches provide Power over Ethernet (PoE) as

necessary to support over 600 upper campus wireless access points and IP cameras. The need for PoE power from network switches will increase as the wireless and IP camera systems grow and when VoIP phones and other network powered equipment are deployed. The network switches do not have redundant processors, line modules, power supplies, or network connections which increases the risk that an equipment failure or damage to cabling could lead to system outages and significant impacts to operations.

Campus telephone service is provided by a Nortel Communications Server 1000 Private Branch Exchange (PBX) located in a room in the basement level B-wing of the Library building. Voice communication is distributed from this location over twisted-pair copper backbone cables to over 1500 telephones distributed across the campus in academic and administrative locations.

Photo 4: Existing Nortel PBX

The existing telephones are line powered from the PBX. The PBX system includes battery-backed power supplies which can provide two hours of temporary power in the event of a power outage. The telephone system can also be powered from the standby generator to provide additional run time.

As noted in the ComGroup "*Technical Findings and Review*", the Nortel product line is now owned by another manufacturer and support is limited. The system cannot be enhanced or upgraded and it is becoming difficult to obtain spare parts. The lack of support and available

spare parts increases the risk that events or system failures will impact daily operations of the College and could potentially result in system-wide communications interruptions with longer time periods required to resolve the issues.

Due to the limitations of the existing PBX, the recommendation of the ComGroup "*Technical Findings and Review"* is to replace the Nortel system with a Voice over IP (VoIP) telephone system within five years. The new VoIP telephone system will include traditional analog and VoIP telephones and will provide Evergreen with a system using current technology and enhanced features that will expand the capabilities of the telephone system and better support the operational, security, and safety needs of the campus. The VoIP telephones will operate over the campus Local Area Network (LAN) and cabling infrastructure. However, since a VoIP telephone system relies on the network to operate, it is imperative that the network and its supporting infrastructure be highly available and fault tolerate to ensure the VoIP telephone system operates reliability and provides consistent service. Since the new VoIP telephones will be powered over the network by PoE switches located in the telecommunications spaces, if primary power is lost and there is not UPS or generator power available, all VoIP telephones connected to a PoE switch will not operate until 15 minutes after power has been restored and the switches have restarted and the network connections have been reestablished.

3.3 Space Requirements

3.3.1 Campus Main Electrical Switchgear Building

Space requirements for the proposed new campus main electrical switchgear building were driven by the space requirements for the anticipated equipment to be housed within it as well as the space required to selectively remove the existing equipment while maintaining power to the campus. The switchgear building is anticipated to house equipment only, and will not include space for staff or associated support spaces.

The core function of the new campus main electrical switchgear building is to provide an added level of security and protection for the critical equipment that feeds power to the entire campus. The building will provide the necessary space and working clearance for new campus main electrical switchgear. One switch compartment without a circuit breaker will be installed in each half of the switchgear to allow for future electrical system growth. In addition there will be space to add two additional sections to each half of the switchgear for future growth. The amount of space for future use is partly due to the fact that the existing switchgear has five empty spaces for future use and the building will be sized to fit around the existing switchgear.

The preferred site location for the proposed campus main electrical switchgear building is at the southeast portion of campus where the existing campus main electrical switchgear sits. This site location was selected so that the existing core drills and access to the underground electrical vault can be reused. The location is inside a fenced area to keep students away from the new building.

The following campus main electrical switchgear building space requirements are anticipated:

Program Area:	Approximately 1,500 square feet
Room Finishes - *Wall:*	Concrete block, Gypsum wallboard
Room Finishes - *Floor:*	Sealed concrete, epoxy coated
Doors:	3' x 7' opening for personnel; coiling door for equipment access
Construction/Type:	Hollow Metal Door; Hollow Metal Frame
Hardware:	Panic Hardware
Windows:	Viewing window to Electrical Room
Electrical:	General purpose and equipment power
Telecommunications:	Limited network connectivity for telephone and system monitoring
Security/CCTV:	Security Cameras
Electrical/Lighting:	LED or fluorescent industrial
Computer/Equipment:	None anticipated

HVAC:	Heat and ventilation system to meet equipment requirements and maintain required temperature
Plumb/Fire Protection:	Fire sprinklers
Envelope:	Per Energy Code Requirements

- Roof – R-30 continuous insulation above deck
- Concrete Wall – R-9.5 continuous insulation
- Metal Building Wall – R-13 plus R-13 continuous insulation
- Slab – R-10 for 24 inches below
- Doors – U-0.37

3.3.2 New Telecommunications Rooms

A total of four new telecommunications spaces will be built to address deficiencies in the current facilities and provide the required space and infrastructure to adequately support the critical safety, security, and communications systems. The new rooms will replace the existing telecommunications spaces located in the Seminar 1, CRC, CUP, and Science Lab I buildings. The rooms will be sized and equipped in accordance with the TIA 569-C Commercial Building Standard for Telecommunications Pathways and Spaces and industry best practices.

The following furnishings, finishes, equipment and space requirements are anticipated for each new telecommunications room.

Program Area:	Approximately 1,200 square feet
Room Finishes - *Wall:*	Gypsum wallboard with 3/4” fire retardant plywood backboard
Room Finishes - *Floor:*	Sealed concrete, epoxy coated
Doors:	3’ x 7’ opening
Construction/Type:	Hollow Metal Door; Hollow Metal Frame
Hardware:	Card Access Control, Panic Hardware, electronic door strike
Windows:	None
Electrical:	General purpose and equipment power
Telecommunications:	Horizontal station cabling for end users and system devices
	Backbone cabling for campus network connectivity
Security/CCTV:	None
Electrical/Lighting:	LED or fluorescent industrial
Computer/Equipment:	Equipment racks, network switches, uninterruptible power supplies, access control panels and power supplies, grounding and bonding system

HVAC:	Heat and ventilation system to meet equipment requirements and maintain required temperature
Plumb/Fire Protection:	Fire sprinklers

3.4 Future Requirements

The proposed project contributes directly to infrastructure improvements goals listed in the Goals and Objectives section of the 2008 Campus Master Plan. The scope of this project also addresses the recommended projects and renovations identified in Table 6.3 of the Campus Master Plan of improving, enhancing safety systems and ensuring code compliance.

The power and network infrastructure improvements included in this project will support long-range facilities needs by providing capacity for future building construction and renovation projects. The project also contributes to establishing a design standard for future telecommunications spaces and infrastructure supporting security, safety, and communications systems.

The new access control system included in this project will position Evergreen to expand the system in the future to control and secure additional doors. At a minimum the expansion of the system should include all critical spaces not currently secured with electronic locking hardware such as the KAOS radio studio, President's Board Room, the Emergency Operations Center in the Lecture Halls building, and the Red Cross Mass Care Shelter. The system could be expanded in the future to monitor additional building systems and provide alarms when systems have failed or malfunctioned.

The scope of the project provides the network infrastructure for the future telephone system replacement. Without the infrastructure improvements included in the project, the new network-based phone system will not be feasible.

3.5 Codes and Regulations

The following codes are applicable to the proposed work:

- International Building Code with Washington State Amendments
- International Mechanical Code with Washington State Amendments
- International Fire Code with Washington State Amendments
- National Electrical Code
- WAC 296-46B: Electrical Safety Standards, Administration and Installation
- Washington State Energy Code
- International Electrical Testing Agency (NETA)

L&I will be providing Electrical Plan Review, permitting, and inspection services for the project as required by Washington Administrative Code.

Electrical utility service will be in accordance with Puget Sound Energy standards and requirements.

Environmental/air quality permitting will not be required for the new generators in accordance with the Olympia Regional Clean Air Agency (ORCAA) and Department of Ecology requirements.

4.0 Project Budget Analysis

4.1 Narrative of Assumptions

The scope of work for the project consists of the following components:

- Medium Voltage Power Distribution
- Building Power Distribution and Critical Power Systems
- Fire Alarm System
- Access Control System
- Telecommunications Spaces
- Network Equipment

The project will be constructed during the 2017 – 2019 state funding biennium.

RSMeans CostWorks and local distributor pricing were used to produce the electrical and systems cost opinions.

Distances between electrical infrastructure and new telecommunications loads and cooling equipment were estimated for the electrical cost opinion.

General Contractor overhead and profit is included at 7%, but it is possible that the General Contractor for the project is the Electrical Contractor since the majority of the work is electrical in nature.

4.2 Outline Specifications and Materials and Methods

4.2.1 Mechanical

Building Fire Protection

New services for fire protection and sewer will be brought to the switchgear building. A double detector check valve assembly and wet pipe sprinkler riser will be provided inside the building for the sprinkler system. The standpipe drain for the sprinkler riser will be connected to the sewer system. No domestic water systems are programmed for the building at this time. Coordination with the utilities will be done during the design phase.

Building HVAC

The new switchgear building will be provided with heat and ventilation only. Heating will be provided by electric wall-hung unit heaters sized to maintain the building at 50 F at design winter outdoor temperature. Roof exhaust fans will be provided for ventilation with make-up air through wall louvers equipped with motorized dampers.

4.2.2 Electrical

Facility Electrical Utility Service

The existing primary power utility service will be reconnected to the new campus main electrical switchgear. Primary electrical service modifications will be coordinated, as necessary, with Puget Sound Energy. The existing service at 12,470 Volts, 3 phase, is intended to be reused.

Medium Voltage Power Distribution

Campus main electrical switchgear will be installed in the new switchgear building. Switchgear will be metal clad with vacuum circuit breakers. Switchgear will include remote racking of circuit breakers for worker protection and infrared windows to allow for thermal testing without the worker being exposed to live electrical parts. Equipment will be provided in 36" wide sections to match the existing size.

The switchgear will have two redundant lineups with each consisting of a main breaker, five feeder breakers, one spare feeder section, and a tie breaker.

Manufacturer: Square D, Eaton, Siemens, or equivalent.

Standby Generators

New standby power diesel engine generators will be provided at multiple new buildings on campus. The generators are various sizes and will be provided with sub-base fuel tanks to supply 24 hours of fuel at full load. The generators will be enclosed in two quiet site enclosures to reduce the sound emissions. Exhaust for each generator will be routed through a silencer provided with the generator package. The height of each stack will meet the local code requirements and will be determined during the design phase.

Emissions controls will need to be confirmed with the environmental permitting agency (ORCAA) as part of the permitting process. The generators will operate in emergency mode only (plus maintenance and testing) for up to 50 hours per year during times where utility power is not available. Federal regulations allow for EPA Tier 2 emissions controls. During the permit review process, ORCAA may require additional emissions controls.

Manufacturers: Cummins Power Systems, Caterpillar, MTU

Low Voltage (<600 Volts) Power Distribution

Power distribution equipment will generally consist of panelboards, switchboards, and similar equipment, as well as conduit and wire.

Panelboards and switchboards will utilize bolt-on, molded case circuit breakers and have copper bus. Enclosures will be suitable for the installation (e.g. NEMA 1 indoors, NEMA 3R outdoors).

Conduit for feeders will be rigid galvanized steel (RGS) where installed outside a building, and EMT within buildings where not subject to physical damage. Wiring will be insulated copper conductors.

Lighting

Building lighting will be provided in accordance with IES recommendations. The lighting and lighting controls will meet the State of Washington Non-Residential Energy Code (NREC). The primary lighting source will be LED for optimal energy efficiency and total cost of ownership.

Branch Power and Receptacles

Branch circuits will be provided for equipment and receptacles requiring power. Duplex receptacles will be installed as required throughout the switchgear building and new Telecommunications rooms to meet convenience requirements as well as all owner-required equipment needs. Wiring devices will be industrial grade.

4.2.3 Fire Alarm

Cost estimates are based on an addressable fire alarm and detection system manufactured by Edwards. Depending on the requirements, the system will include initiating devices, alarm notification appliances, control panels, annunciators, auxiliary control devices, power supplies, batteries, wiring and ancillary devices. The system equipment will have the following specifications:

- The Fire Alarm Control Panel with modular construction and solid state microprocessor based electronics.
- LCD Remote Annunciator panels with key activated controls to allow silencing, resetting, and activating of alarms.
- Manual Stations shall be constructed of red Lexan with raised white lettering.
- Photoelectric smoke detectors with a plug-in base and visual indication of detector actuation.
- Addressable analog thermal heat detectors with rate of rise feature accomplished using electronic dual thermistors.
- Visual notification devices with xenon strobes and synchronized in accordance with NFPA 72 chapter 4 and rated to UL 1971 standards.
- Audible signal appliances designed to produce a minimum sound output of 85dbA at 10’, or 15dbA above ambient, whichever is greater.

4.2.4 Access Control and Alarming

The cost model for the network-based access control and alarming system is based on a system manufactured by S2 Security. The system shall control access to buildings and secured spaces and assumes the existing electronic door hardware, card readers, and associating cabling will be

reused. The access control system includes the capability of remotely locking all exterior doors to prevent entry to buildings during an emergency.

The system shall include a network controller to manage and monitor the system. Door controller panels shall make and manage access control decisions with data provided by the network controller. Door controller shall be solid-state appliances with capacity for seven access control, inputs, outputs, and temperature sensors boards. The door controllers can support up to 32 doors and up to 56 supervised inputs and includes an on-board network port, and it shall manage the communication between the controller and the connected inputs, outputs, and readers. Communication between the door controller and the network controller shall be encrypted and authenticated. Door controller panels shall provide offline availability to maintain access control capabilities when network connectivity is lost. The system panels shall be powered by ULC S318-96-listed power supplies for 12V DC and 24V DC applications.

The system shall include software licensing and support plan will be included for a duration of three years.

4.2.5 Telecommunications Spaces

The four new telecommunications spaces will be constructed within existing buildings and cabling to these new spaces will follow existing tunnel pathways. The project costs do not include new trenching and underground pathways for these spaces. The costs assume miscellaneous pathways costs for new riser conduits and sleeves into the new spaces.

The construction costs for the new telecommunications spaces assumes some demolition of existing spaces will be required to provide the required dimensions of the new room.

The costs assume the materials in the new telecommunications rooms are typical for commercial buildings including the following:

- Standard 19-inch racks equipped with vertical and horizontal cable management panels to support installation of network equipment and cabling.
- The optical fiber backbone cabling will consist of one (1) 12-strand zero water peak single mode optical fiber cabling.
- Cabling pathways will be designed in compliance with ANSI/TIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces.
- The cable tray will be a welded steel wire mesh basket-style cable management system.
- Grounding and bonding infrastructure will include 1/4” copper busbars bonded to NEC recognized grounds.

4.2.6 Network Equipment

The costs for the network equipment are based on Hewlett Packard 5405 and 5412 6-slot and 12-slot chassis style Ethernet switches. The switches support Gigabit and 10-Gigabit interfaces. The switches include IEEE 802.3at Power over Ethernet Plus (PoE+) ports providing up to 30 W per port to devices such as IP, wireless access points, and security cameras. The switches provide layer 2 switching and layer 3 routing services and are equipped with redundant power supplies to provide uninterrupted power and hot-swapping of the power supplies.

4.3 Cost Estimate Form C-100

The following pages include the C-100, Agency/Institution Cost Estimate for the Preferred Alternate.

5.0 Master Plan and Policy Coordination

5.1 Master Plans

The proposed project contributes directly to infrastructure improvements goals listed in the Goals and Objectives section of the 2008 Campus Master Plan and 2014 Master Plan update. The scope of this project also addresses the recommended projects and renovations identified in Table 6.3 of the Campus Master Plan of improving, enhancing safety systems, and ensuring code compliance.

The power and network infrastructure improvements included in this project will also support long-range facilities planning by providing power and network capacity for future building construction and renovation projects.

The project also establishes a design standard for future telecommunications spaces and infrastructure supporting security, safety, and communications systems.

5.2 Other Significant State Requirements

The scope of the project will contribute to the Results Washington goal of healthy and safe communities by promoting public and work safety and reducing incidents of injuries on the job and in the community.

This project directly supports the Directive by the Governor 13-02 regarding Continuity of Government Operations Preparation by enabling Evergreen to maintain essential functions and services during an emergency or disaster.

OFM

376 - The Evergreen State College
Cost Estimate Summary
2017-19 Biennium

*

Cost Estimate Number: 80
Cost Estimate Title: IT Infrastructure

Report Number: CBS003
Date Run: 6/29/2016 2:09PM

Contact Info **Contact Name:** Azeem Hoosein **Contact Number:** 360.867.6041

Statistics

Gross Sq. Ft.:	0
Usable Sq. Ft.:	0
Space Efficiency:	
MACC Cost per Sq. Ft.:	0
Escalated MACC Cost per Sq. Ft.:	0
Remodel?	Yes
Construction Type:	College Classroom Facilities
A/E Fee Class:	B
A/E Fee Percentage:	11.55%

Schedule

	Start Date	End Date
Predesign:	01-2016	06-2016
Design:	07-2017	03-2018
Construction:	07-2018	06-2019
Duration of Construction (Months):	11	

Cost Summary Escalated

Acquisition Costs Total			**0**
Pre-Schematic Design Services		0	
Construction Documents		515,474	
Extra Services		369,165	
Other Services		437,345	
Design Services Contingency		135,699	
Consultant Services Total			**1,464,632**
Site work		64,663	
Related Project Costs		0	
Facility Construction		6,055,946	
Construction Contingencies		612,143	
Non Taxable Items		0	
Sales Tax		585,749	
Construction Contracts Total			**7,318,499**
Maximum Allowable Construction Cost(MACC)	**6,120,609**		
Equipment		1,661,935	
Non Taxable Items		0	
Sales Tax		144,588	
Equipment Total			**1,806,522**
Art Work Total			**30,603**
Other Costs Total			**195,952**
Project Management Total			**383,324**
Grand Total Escalated Costs			**11,199,532**
Rounded Grand Total Escalated Costs			**11,200,000**

Additional Details

Alternative Public Works Project:	No
State Construction Inflation Rate:	3.08%
Base Month and Year:	06-2016
Project Administration By:	AGY
Project Admin Impact to DES that is NOT Included in Project Total:	$0

OFM

376 - The Evergreen State College
Cost Estimate Detail
2017-19 Biennium

*

Cost Estimate Number:	80	**Analysis Date:**	June 27, 2016
Cost Estimate Title:	IT Infrastructure		
Detail Title:	IT Infrastructure		
Location:	Thurston County		

Contact Info **Contact Name:** Azeem Hoosein **Contact Number:** 360.867.6041

Statistics

Gross Sq. Ft.:
Usable Sq. Ft.:
Rentable Sq. Ft.:
Space Efficiency:
Escalated MACC Cost per Sq. Ft.:
Escalated Cost per S. F. Explanation

Construction Type:	College Classroom Facilities
Remodel?	Yes
A/E Fee Class:	B
A/E Fee Percentage:	11.55%
Contingency Rate:	10.00%
Contingency Explanation	

Projected Life of Asset (Years):	50
Location Used for Tax Rate:	Thurston County
Tax Rate:	8.70%
Art Requirement Applies:	Yes
Project Administration by:	AGY
Higher Education Institution?:	Yes
Alternative Public Works?:	No

Project Schedule

	Start Date	End Date
Predesign:	01-2016	06-2016
Design:	07-2017	03-2018
Construction:	07-2018	06-2019
Duration of Construction (Months):	11	
State Construction Inflation Rate:	3.08%	
Base Month and Year:	6-2016	

Project Cost Summary

MACC:	$ 5,706,564
MACC (Escalated):	$ 6,120,609
Current Project Total:	$ 10,471,896
Rounded Current Project Total:	$ 10,472,000
Escalated Project Total:	$ 11,151,667
Rounded Escalated Project Total:	$ 11,152,000

ITEM	Base Amount	Sub Total	Escalation Factor	Escalated Cost
CONSULTANT SERVICES				
Construction Documents				
A/E Basic Design Services				500,263
SubTotal: Construction Documents				**515,474**
Extra Services				
Civil Design (Above Basic Services)	10,000			
Commissioning (Systems Check)	20,000			
Site Survey	10,000			
Testing	25,000			
Voice/Data Consultant	100,000			
Constructability Review Participation	20,000			
Environmental Mitigation Services (EIS)	15,000			
Haz Mat Consultant	35,000			
Cost Estimator	20,000			
Security	100,000			
SubTotal: Extra Services		**355,000**	1.0399	**369,165**
Other Services				
Bid/Construction/Closeout				224,756
Staffing	90,000			
Electrical Meter Study	40,000			
Reimbursable Expenses	35,000			
As-Built Ducumentation	20,000			
		409,756	1.0727	
SubTotal: Other Services				**437,345**
Design Services Contingency				
Design Services Contingency	126,502			
SubTotal: Design Services Contingency		**126,502**	1.0727	**135,699**
Total: Consultant Services		**1,391,521**	1.0525	**1,464,632**
CONSTRUCTION CONTRACTS				
Site work				
G10 - Site Preparation	47,284			
G20 - Site Improvements	13,764			
SubTotal: Site work		**61,048**	1.0592	**64,663**
Facility Construction				
A10 - Foundations	77,843			
B10 - Superstructure	49,268			
B20 - Exterior Closure	125,600			
B30 - Roofing	35,473			
C10 - Interior Construction	50,377			
C30 - Interior Finishes	54,754			
D30 - HVAC Systems	686,831			
D40 - Fire Protection Systems	41,656			
D50 - Electrical Systems	4,129,618			
General Conditions	394,096			
SubTotal: Facility Construction		**5,645,516**	1.0727	**6,055,946**
Construction Contingencies				
Allowance for Change Orders	570,656			
SubTotal: Construction Contingencies		**570,656**	1.0727	**612,143**

ITEM	Base Amount	Sub Total	Escalation Factor	Escalated Cost
CONSTRUCTION CONTRACTS				
Sales Tax		**546,118**	1.0726	**585,749**
Total: Construction Contracts		**6,823,338**	1.0726	**7,318,499**
Maximum Allowable Construction Cost (MACC)		**5,706,564**	1.0700	**6,120,609**
EQUIPMENT				
E10 - Network Switches (FIO)	1,277,800			
E10 - UPS (FOIC)	271,500			
SubTotal:		**1,549,300**	1.0727	**1,661,935**
Sales Tax		**134,789**	1.0727	**144,588**
Total: Equipment		**1,684,089**	1.0727	**1,806,522**
ART WORK				
Total: Art Work		**30,603**	1.0000	**30,603**
OTHER COSTS				
Hazardous Material Remediation/Removal	100,000			
Historic and Archeological Mitigation	10,000			
Permit and Plan Check	75,000			
Total: Other Costs		**185,000**	1.0592	**195,952**
PROJECT MANAGEMENT				
Agency Project Management	357,345			
Total: Project Management		**357,345**	1.0727	**383,324**

OFM

Cost Estimate Summary and Detail

2017-19 Biennium

*

Cost Estimate Number: 80
Cost Estimate Title: IT Infrastructure

Report Number: CBS003
Date Run: 6/29/2016 2:09PM

Parameter	Entered As	Interpreted As
Associated or Unassociated	Unassociated	Unassociated
Biennium	2017-19	2017-19
Agency	376	376
Version	*	All Versions-All Version Sources
Project Classification	*	All Project Classifications
Capital Project Number	*	All Project Numbers
Cost Estimate Number	80	80
Sort Order	Cost Estimate Title	Title
Include Page Numbers	Y	Yes
For Word or Excel	N	N
User Group	Agency Budget	Agency Budget
User Id	37600AHFS376	37600AHFS376

THE EVERGREEN
STATE COLLEGE

PROBABLE CONSTRUCTION COST ESTIMATE

for

The Evergreen State College
Critical Power, Safety, and Security Systems
OLYMPIA, WA

PROJECT PHASE: Pre-Design

Prepared for :
Hargis Engineers, Inc.

State Project Number:
Hargis Project Number: 15084
Original Submission: Monday, June 20, 2016
Updated Tuesday, June 28, 2016

J B Iringan Consulting
(Cost Estimating)
121 60th Place SE
Everett, WA 98203

Tel: 425.789.1939
Cell: 425.879.4002

SUMMARY

Project :	:	**The Evegreen State College**
	:	**Critical Power, Safety, and Security Systems**
Design Engineer:	:	Hargis Engineers Inc.
Estimator :	:	Hargis Engineers Inc/J B Iringan Consulting
Design Phase:	:	Pre-Design Estimate Submittal
Date:	:	June 28, 2016

	ITEMS DESCRIPTION				TOTAL
I	**CRITICAL POWER, SAFETY & SECURITY SYSTEMS**				**2,775,129**
II	**NEW MV SWITCHGEAR BUILDING (35' x 45')**				**1,377,275**
TOTAL DIRECT COST					**$4,152,403**
	General Conditions including Site Supervision			9.00%	373,716
	GC's Overhead and Profit (Main office), B&O Taxes & Insurance			7.00%	316,828
	Design/Estimating Contingency & Phasing allowance			15.00%	726,442
TOTAL PROBABLE CONSTRUCTION COST @ TODAY'S BID					**$5,569,390**
	Add for Escalation to Mid Point of Construction (Dec, 2018) @ 2.8% per year			7.25%	403,733
TOTAL ESCALATED BID COST					**$5,973,123**
Network Switches - Equipment to be Furnished & Installed by Owner (FIO)		1	LS		**$1,277,800**
UPS - Equipment to be Furnished by Owner & Installed by Contractor (FOIC)		1	LS		**$271,500**
TOTAL EQUIPMENT COST (PROVIDED BY OWNER)					**$1,549,300**
	Add for Escalation to Mid Point of Construction (Dec, 2018) @ 2.8% per year			7.25%	112,311
TOTAL ESCALATED EQUIPMENT COST					**$1,661,611**
TOTAL ESCALATED BID & EQUIPMENT COSTS					**$7,634,733**

Notes:
An Electrical Contractor may assumed to serve as a General Contractor in this type of work.
This estimate is based on prevailing union wage rate and open to public bid.
Does not include sales tax, change orders, soft cost nor HazMat Abatement

Legends:

FPA	Foot print area
RA	Roof area
XWA	Exterior wall area
PR	Pair
EA	Each
LS	Lump sum
Loc	Location
FIO	Furnished & Installed by Owner
FOIO	Furnished by Owner & Installed by Contractor

Project : **The Evegreen State College**
: **Critical Power, Safety, and Security Systems**
Design Engineer : Hargis Engineers Inc.
Estimator : Hargis Engineers Inc/J B Iringan Consulting
Design Phase : Pre-Design Estimate Submittal
Date : June 20, 2016

ITEMS DESCRIPTION	Quantity	Unit	Unit Cost	Sub-Total	TOTAL
I CRITICAL POWER SAFETY & SECURITY SYSTEMS					
Div 2 Selective Demolition & Preparation					**18,290**
Demo & clear existing area for four (4) new IDF rooms	4	Loc	1,500.00	6,000	
Load, haul & dispose demolished materials	18	CY	100.00	1,778	
Misc demo - allow	1	LS	2,000.00	2,000	
Temp wall & dust protection - allow	304	LF	28.00	8,512	
Div 6 Wood & Plastics					**13,200**
3/4" Thick Fire retardant plywood	1,760	SF	3.50	6,160	
2x6 wood studs @ 16" OC wall framing	1,760	SF	4.00	7,040	
Div 7 Thermal Protection					**2,672**
Sound batt insulation to new wall	1,760	SF	0.95	1,672	
Caulking, Sealant & fire penetration - allow	1	LS	1,000.00	1,000	
Div 8 Openings					**14,800**
New 3x7 HM door, frame & HW	4	EA	2,500.00	10,000	
Add for magnetic door hold open	4	EA	1,200.00	4,800	
Div 9 Finishes					**17,776**
5/8" GWB to new walls	1,760	SF	3.50	6,160	
Susp GWB Ceiling	480	SF	10.00	4,800	
Paint GWB & plywood walls	3,520	SF	1.20	4,224	
Paint GWB Ceilings	1,760	SF	1.20	2,112	
Paint doors & frames	4	EA	120.00	480	
Div 23 HVAC					**480,493**
Packaged Split system AC unit	26	EA	18,480.50	480,493	
Div 26 Power & Distribution					**817,559**
Library	1	LS	263,860.00	263,860	
CAB	1	LS	6,969.00	6,969	
CRC	1	LS	28,330.00	28,330	
Communications	1	LS	28,330.00	28,330	
Seminar 1	1	LS	106,845.00	106,845	
Seminar 2	1	LS	219,324.00	219,324	
Campus Utility Plant	1	LS	20,117.00	20,117	
Lab 1	1	LS	116,596.00	116,596	
Lab 2	1	LS	12,140.00	12,140	
Longhouse	1	LS	15,048.00	15,048	
Div 27 Telecommunications					**291,585**
Telecommunications Spaces	1	LS	268,485.00	268,485	
UPS - (Furnished by owner) installion by contractor	1	FOIC	23,100.00	23,100	

Project : **The Evegreen State College**
: **Critical Power, Safety, and Security Systems**
Design Engineer : Hargis Engineers Inc.
Estimator : Hargis Engineers Inc/J B Iringan Consulting
Design Phase : Pre-Design Estimate Submittal
Date : June 20, 2016

ITEMS DESCRIPTION	Quantity	Unit	Unit Cost	Sub-Total	TOTAL
Network switches	0	FIO	-	0	
Div 28 Fire Alarm Sytem & Access Control					**1,118,754**
Access control & monitoring	1	LS	767,154.00	767,154	
Building fire alarm	1	LS	84,685.00	84,685	
Fire alarm network	1	LS	266,915.00	266,915	
TOTAL POWER & IT UPGRADE DIRECT COST				2,775,129	**2,775,129**
II NEW MV SWITCHGEAR BUILDING (35' x 45')					
Div 2 Site Preparation					**19,500**
Clear & Grub - allow	1	LS	1,500.00	1,500	
Misc site demo - allow	1	LS	2,000.00	2,000	
Metal bracing to strengthen exist vault below new switchgear building	1	LS	16,000.00	16,000	
Div 3,4,5,7,8 & 9			152.58		**240,318**
Foundations - continuous perimeter footing	1,575	PFA	30.00	47,250	
Slab on grade - 6" thick reinforced w/ 6" thick gravel base	1,575	PFA	9.50	14,963	
Roof framing - steel columns, beams, OW roof joist & metal decking	1,575	RA	25.00	39,375	
Exterior wall closure 20' high: 6" conc wall, furring w/ 5/8" GWB	3,360	XWA	28.00	94,080	
Exterior entry doors, fram & HW	2	PR	3,150.00	6,300	
Metal Louvers	0	EA	1,950.00	0	
Roofing - Mod bit membrane roofing system w/ 4" rigid insul	1,575	RA	18.00	28,350	
Interior partitions & doors	0	SF	18.00	0	
Misc painting - allow	1	LS	10,000.00	10,000	
Div 21 & 23 - Mechanical					**93,725**
Heating & Ventilation	1	LS	16,675.00	16,675	
Sound attenuation	1	LS	28,750.00	28,750	
Generator accessories	1	LS	23,000.00	23,000	
Fire Protection	1	LS	25,300.00	25,300	
Div 26, 27 &28 - Electrical					**1,012,732**
Building Power & Lighting	1	LS	60,000.00	60,000	
Building Telecom	1	LS	25,000.00	25,000	
Building Security	1	LS	20,000.00	20,000	
Switchgear	1	LS	907,732.00	907,732	
Div 32 Exterior Improvements					**11,000**
Seal asphalt	1	LS	5,000.00	5,000	
Patch & Repair asphalt paving - allow	1	LS	5,000.00	5,000	
Remove/reinstall or repair perimeter fence - allow	1	LS	1,000.00	1,000	
TOTAL NEW MV SWITCHGEAR BUILDING DIRECT COST				1,377,275	**1,377,275**

mechanical **cost opinion**

HARGIS
1201 third avenue, suite 600
seattle, washington 98101
t 206.448.3376 w hargis.biz
mechanical
electrical
telecommunications
security
energy

Critical Power, Security, and Life Safety Systems

The Evergreen State College

BASIS OF OPINION Pre-Design

PREPARED BY Paul Robaidek

DATE June 30, 2016

JOB NUMBER 15-084

CHECKED BY Patrick Shannon

OVERHEAD & PROFIT 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Air Conditioning									
Packaged Split System AC Unit	26	EA	9,895.00	257,270	6,175.00	160,550	417,820	62,673.00	480,493
Total Air Conditioning							417,820	62,673	480,493

electrical **cost opinion**

Critical Power, Security, and Life Safety Systems

The Evergreen State College

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mechanical
electrical
telecommunications
security
energy

BASIS OF OPINION Pre-Design | **PREPARED BY** Mark M | **DATE** June 30, 2016

JOB NUMBER 15084 | **CHECKED BY** Erik S | **OVERHEAD & PROFIT** 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Medium Voltage Switchgear									
Demo of Existing Switchgear	1	LS	5,000.00	5,000	30,000.00	30,000	35,000	5,250.00	40,250
Swgr - Vaccum Breaker, NEMA 1 Indoor	1	EA	647,800.00	647,800	40,250.00	40,250	688,050	103,207.50	791,258
Connect Utility Feed	1	EA	7,675.00	7,675	2,325.00	2,325	10,000	1,500.00	11,500
500KCMIL Cable - 100' ea (3) 1/C cable	200	LF	32.25	6,450	10.95	2,190	8,640	1,296.00	9,936
Cable Tray - 9" Wide w/ 9" Rung Spacing	50	LF	16.85	843	8.80	440	1,283	192.38	1,475
Reterminate at Existing Feeders & Tie Breakers	12	EA	500.00	6,000	1,280.00	15,360	21,360	3,204.00	24,564
Temporary Power	1	LS	20,000.00	20,000	5,000.00	5,000	25,000	3,750.00	28,750
Total MV Switchgear							**789,333**	**118,399.88**	**907,732**

electrical **cost opinion**

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HARGIS
mechanical
electrical
telecommunications
security
energy

Critical Power, Security, and Life Safety Systems

The Evergreen State College

BASIS OF OPINION Pre-Design **PREPARED BY** Mark M **DATE** June 20, 2016

JOB NUMBER 15084 **CHECKED BY** Erik S **OVERHEAD & PROFIT** 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Standby Generators									
Library									
Gen - 400kW w/ 24hr Base Tank, WP Encl, Quiet Site 2	1	EA	105,000.00	105,000	6,000.00	6,000	111,000	16,650.00	127,650
EDP Panelboard - 480V, 600A MCB	1	EA	7,675.00	7,675	2,325.00	2,325	10,000	1,500.00	11,500
ATS SB (NEC 702) - 250A, 480V, 3-Pole, SE Rated	1	EA	6,000.00	6,000	520.00	520	6,520	978.00	7,498
Xfmr - 150kVA, 480-208Y/120V	1	EA	4,750.00	4,750	1,300.00	1,300	6,050	907.50	6,958
EDP Panelboard - 208V, 400A MCB	1	EA	3,225.00	3,225	550.00	550	3,775	566.25	4,341
IDF Panelboard - 208V, 100A MCB, 24ckt	3	EA	1,275.00	3,825	940.00	2,820	6,645	996.75	7,642
250A Circuit Breaker - MDP feed to new ATS	1	EA	4,500.00	4,500	500.00	500	5,000	750.00	5,750
600A Feeder - (2) 3"RGS-4#350, #1G	200	LF	105.00	21,000	55.00	11,000	32,000	4,800.00	36,800
400A Feeder - 4"RGS-3#500, #3G	50	LF	49.66	2,483	31.16	1,558	4,041	606.15	4,647
250A Feeder - 3"RGS-4#250, #4G	110	LF	41.00	4,510	27.00	2,970	7,480	1,122.00	8,602
100A Feeder - 1 1/2"EMT-4#1, #8G	900	LF	9.70	8,726	7.83	7,047	15,773	2,365.88	18,138
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	1600	LF	3.21	5,136	6.89	11,024	16,160	2,424.00	18,584
Temporary Power	1	LS	5,000.00	5,000			5,000	750.00	5,750
TOTAL LIBRARY									**263,860**

electrical **cost opinion**

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BASIS OF OPINION Pre-Design **PREPARED BY** Mark M **DATE** June 20, 2016

JOB NUMBER 15084 **CHECKED BY** Erik S **OVERHEAD & PROFIT** 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Standby Generators									
College Activities Building (CAB)									
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	600	LF	3.21	1,926	6.89	4,134	6,060	909.00	6,969
TOTAL CAB									**6,969**
College Recreation Center (CRC)									
ATS LS (NEC 700)- 125A, 480V, 3-Pole, SE Rated	1	EA	4,000.00	4,000	340.00	340	4,340	651.00	4,991
LS Panelboard (NEC 700) - 480V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
Xfmr - 30kVA, 480-208Y/120V	1	EA	1,475.00	1,475	980.00	980	2,455	368.25	2,823
LS Panelboard (NEC 700) - 208V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
Cut Over LS (NEC 700) Loads	1	LS	2,000.00	2,000	3,000.00	3,000	5,000	750.00	5,750
125A Circuit Breaker - MDP feed to new ATS	1	EA	2,000.00	2,000	350.00	350	2,350	352.50	2,703
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	600	LF	3.21	1,926	6.89	4,134	6,060	909.00	6,969
TOTAL CRC									**28,330**

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BASIS OF OPINION Pre-Design | **PREPARED BY** Mark M | **DATE** June 20, 2016

JOB NUMBER 15084 | **CHECKED BY** Erik S | **OVERHEAD & PROFIT** 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Standby Generators									
Communications									
ATS LS (NEC 700)- 125A, 480V, 3-Pole, SE Rated	1	EA	4,000.00	4,000	340.00	340	4,340	651.00	4,991
LS Panelboard (NEC 700) - 480V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
Xfmr - 30kVA, 480-208Y/120V	1	EA	1,475.00	1,475	980.00	980	2,455	368.25	2,823
LS Panelboard (NEC 700) - 208V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
Cut Over LS (NEC 700) Loads	1	LS	2,000.00	2,000	3,000.00	3,000	5,000	750.00	5,750
125A Circuit Breaker - MDP feed to new ATS	1	EA	2,000.00	2,000	350.00	350	2,350	352.50	2,703
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	600	LF	3.21	1,926	6.89	4,134	6,060	909.00	6,969
TOTAL COMMUNICATIONS									**28,330**

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JOB NUMBER 15084 **CHECKED BY** Erik S **OVERHEAD & PROFIT** 15%

	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Standby Generators									
Seminar 2									
Gen - 250kW w/ 24hr Base Tank, WP Encl, Quiet Site 2	1	EA	85,000.00	85,000	5,000.00	5,000	90,000	13,500.00	103,500
ATS SB (NEC 702) - 150A, 480V, 3-Pole, SE Rated	1	EA	4,750.00	4,750	365.00	365	5,115	767.25	5,882
Xfmr - 150kVA, 480-208Y/120V	1	EA	4,750.00	4,750	1,300.00	1,300	6,050	907.50	6,958
EDP Panelboard - 208V, 400A MCB	1	EA	3,225.00	3,225	550.00	550	3,775	566.25	4,341
IDF Panelboard - 208V, 100A MCB, 24ckt	5	EA	1,275.00	6,375	940.00	4,700	11,075	1,661.25	12,736
150A Circuit Breaker - MDP (51E1) feed to new ATS	1	EA	2,500.00	2,500	400.00	400	2,900	435.00	3,335
400A Feeder - 4"RGS-3#500, #3G	50	LF	49.66	2,483	31.16	1,558	4,041	606.15	4,647
150A Feeder - 2"RGS - 4#1/0, #6G	300	LF	18.13	5,439	15.32	4,596	10,035	1,505.25	11,540
100A Feeder - 1 1/2"EMT-4#1, #8G	2000	LF	9.70	19,390	7.83	15,660	35,050	5,257.50	40,308
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	1750	LF	3.21	5,618	6.89	12,058	17,675	2,651.25	20,326
Temporary Power	1	LS	5,000.00	5,000			5,000	750.00	5,750
TOTAL SEMINAR 2									**219,323**

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BASIS OF OPINION Pre-Design | **PREPARED BY** Mark M | **DATE** June 20, 2016

JOB NUMBER 15084 | **CHECKED BY** Erik S | **OVERHEAD & PROFIT** 15%

	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Standby Generators									
Seminar 1									
Gen - 80kW w/ 24hr Base Tank, WP Encl, Quiet Site 2	1	EA	39,000.00	39,000	3,125.00	3,125	42,125	6,318.75	48,444
ATS LS (NEC 700)- 125A, 480V, 3-Pole, SE Rated	1	EA	4,000.00	4,000	340.00	340	4,340	651.00	4,991
LS Panelboard (NEC 700) - 480V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
Xfmr - 30kVA, 480-208Y/120V	1	EA	1,475.00	1,475	980.00	980	2,455	368.25	2,823
LS Panelboard (NEC 700) - 208V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
Cut Over LS (NEC 700) Loads	1	LS	2,000.00	2,000	3,000.00	3,000	5,000	750.00	5,750
125A Circuit Breaker - MDP feed to new ATS	1	EA	2,000.00	2,000	350.00	350	2,350	352.50	2,703
SB Panelboard (NEC 702) - 480V, 150A MCB, 24ckt	1	EA	2,400.00	2,400	1,225.00	1,225	3,625	543.75	4,169
Xfmr - 50kVA, 480-208Y/120V	1	EA	3,250.00	3,250	1,250.00	1,250	4,500	675.00	5,175
SB Panelboard (NEC 702) - 208V, 150A MCB, 24ckt	1	EA	3,775.00	3,775	1,225.00	1,225	5,000	750.00	5,750
100A Feeder - 1 1/2"RGS-4#1, #8G	300	LF	14.21	4,263	12.57	3,771	8,034	1,205.10	9,239
100A Feeder - 1 1/2"EMT-4#1, #8G	200	LF	9.70	1,939	7.83	1,566	3,505	525.75	4,031
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	450	LF	3.21	1,445	6.89	3,101	4,545	681.75	5,227
Temporary Power	1	LS	3,000.00	3,000			3,000	450.00	3,450
TOTAL SEMINAR 1									**106,845**

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BASIS OF OPINION Pre-Design **PREPARED BY** Mark M **DATE** June 20, 2016

JOB NUMBER 15084 **CHECKED BY** Erik S **OVERHEAD & PROFIT** 15%

	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Standby Generators									
Campus Utility Plant (CUP)									
ATS LS (NEC 700)- 125A, 480V, 3-Pole, SE Rated	1	EA	4,000.00	4,000	340.00	340	4,340	651.00	4,991
LS Panelboard (NEC 700) - 480V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
Xfmr - 30kVA, 480-208Y/120V	1	EA	1,475.00	1,475	980.00	980	2,455	368.25	2,823
LS Panelboard (NEC 700) - 208V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
100A Feeder - 1 1/2"EMT-4#1, #8G	300	LF	9.70	2,909	7.83	2,349	5,258	788.63	6,046
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	100	LF	3.21	321	6.89	689	1,010	151.50	1,162
TOTAL CUP									**20,116**
Lab 1									
Gen - 150kW w/ 24hr Base Tank, WP Encl, Quiet Site 2	1	EA	52,000.00	52,000	4,200.00	4,200	56,200	8,430.00	64,630
EDP Panelboard - 480V, 250A MCB	1	EA	5,600.00	5,600	1,925.00	1,925	7,525	1,128.75	8,654
ATS SB (NEC 702) - 150A, 480V, 3-Pole, SE Rated	1	EA	4,750.00	4,750	365.00	365	5,115	767.25	5,882
Xfmr - 75kVA, 480-208Y/120V	1	EA	2,375.00	2,375	1,250.00	1,250	3,625	543.75	4,169
SB Panelboard - 208V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
150A Circuit Breaker - MDP feed to new ATS	1	EA	2,500.00	2,500	400.00	400	2,900	435.00	3,335

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JOB NUMBER 15084 **CHECKED BY** Erik S **OVERHEAD & PROFIT** 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Standby Generators									
250A Feeder - 4"RGS-4#250, #4G	100	LF	40.11	4,011	26.38	2,638	6,649	997.35	7,646
150A Feeder - 2"EMT - 4#1/0, #6G	100	LF	16.63	1,663	14.37	1,437	3,100	465.00	3,565
100A Feeder - 1 1/2"EMT-4#1, #8G	170	LF	9.70	1,648	7.83	1,331	2,979	446.89	3,426
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	800	LF	3.21	2,568	6.89	5,512	8,080	1,212.00	9,292
Temporary Power	1	LS	3,000.00	3,000			3,000	450.00	3,450
TOTAL LAB 1									**116,596**
Lab 2									
Xfmr - 45kVA, 480-208Y/120V	1	EA	1,750.00	1,750	1,100.00	1,100	2,850	427.50	3,278
SB Panelboard BXX - 208V, 150A MCB, 32ckt	1	EA	2,400.00	2,400	1,225.00	1,225	3,625	543.75	4,169
100A Feeder - 1 1/2"EMT-4#1, #8G	60	LF	9.70	582	7.83	470	1,052	157.73	1,209
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	300	LF	3.21	963	6.89	2,067	3,030	454.50	3,485
TOTAL LAB 2									**12,140**

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BASIS OF OPINION Pre-Design | **PREPARED BY** Mark M | **DATE** June 20, 2016

JOB NUMBER 15084 | **CHECKED BY** Erik S | **OVERHEAD & PROFIT** 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Standby Generators									
Longhouse									
Xfmr - 45kVA, 480-208Y/120V	1	EA	1,750.00	1,750	1,100.00	1,100	2,850	427.50	3,278
SB Panelboard - 208V, 100A MCB, 24ckt	1	EA	1,275.00	1,275	940.00	940	2,215	332.25	2,547
100A Feeder - 1 1/2"EMT-4#1, #8G	400	LF	9.70	3,878	7.83	3,132	7,010	1,051.50	8,062
30A Feeder - 3/4"EMT-4#10, #10G (2ckts)	100	LF	3.21	321	6.89	689	1,010	151.50	1,162
TOTAL LONGHOUSE									**15,048**
Total Standby Generators							**710,921**	**106,638**	**817,559**

electrical **cost opinion**

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BASIS OF OPINION Pre-Design **PREPARED BY** Paul Robaidek **DATE** June 30, 2016

JOB NUMBER 15-084 **CHECKED BY** Patrick Shannon **OVERHEAD & PROFIT** 15%

	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Telecommunications Spaces									
LIBRARY									
0434									
Water damage mitigation	1	LS	2,250.00	2,250	1,850.00	1,850	4,100	615.00	4,715
2019									
Water damage mitigation	1	LS	2,250.00	2,250	1,850.00	1,850	4,100	615.00	4,715
0206									
Cable Tray	150	LF	15.00	2,250	16.00	2,400	4,650	697.50	5,348
Raceway and Cabling Supports	500	LF	5.00	2,500	3.95	1,975	4,475	671.25	5,146
0447									
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754

electrical **cost opinion**

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BASIS OF OPINION Pre-Design **PREPARED BY** Paul Robaidek **DATE** June 30, 2016

JOB NUMBER 15-084 **CHECKED BY** Patrick Shannon **OVERHEAD & PROFIT** 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Telecommunications Spaces									
COLLEGE RECREATION CENTER									
CRC 102A									
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Singlemode Optical Fiber Cable (12-strand)	2,500	LF	1.25	3,125	2.50	6,250	9,375	1,406	10,781
Copper Backbone Cabling	2,500	LF	3.20	8,000	2.05	5,125	13,125	1,969	15,094
Cable Tray	20	LF	15.00	300	16.00	320	620	93.00	713
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	412.50	3,163
Site Pathway	2,500	LF	1.00	2,500	1.25	3,125	5,625	844	6,469
CRC 132B									
Equipment Rack	2	EA	185.00	370	130.00	260	630	95	725
Conduit and Cable Pathways	1	LS	750.00	750	675.00	675	1,425	214	1,639
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	413	3,163
Cable Tray	25	LF	15.00	375	16.00	400	775	116	891
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Copper Backbone Cabling	2,500	LF	3.20	8,000	2.05	5,125	13,125	1,969	15,094
Optical fiber Backbone Cabling	2,500	LF	1.25	3,125	2.50	6,250	9,375	1,406	10,781
Site Pathway	2,500	LF	1.00	2,500	1.25	3,125	5,625	844	6,469

electrical **cost opinion**

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JOB NUMBER 15-084 **CHECKED BY** Patrick Shannon **OVERHEAD & PROFIT** 15%

	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Telecommunications Spaces									
SEMINAR II									
PTS B1108									
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	413	3,163
SEMINAR I									
3160									
Equipment Rack	2	EA	185.00	370	130.00	260	630	95	725
Conduit and Cable Pathways	1	LS	750.00	750	675.00	675	1,425	214	1,639
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	413	3,163
Cable Tray	25	LF	15.00	375	16.00	400	775	116	891
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Copper Backbone Cabling	1,500	LF	3.20	4,800	2.05	3,075	7,875	1,181	9,056
Optical fiber Backbone Cabling	1,500	LF	1.25	1,875	2.50	3,750	5,625	844	6,469
Site Pathway	1,500	LF	1.00	1,500	1.25	1,875	3,375	506	3,881

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Telecommunications Spaces									
CENTRAL UTILITY PLANT									
011A									
Equipment Rack	2	EA	185.00	370	130.00	260	630	95	725
Conduit and Cable Pathways	1	LS	750.00	750	675.00	675	1,425	214	1,639
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	413	3,163
Cable Tray	25	LF	15.00	375	16.00	400	775	116	891
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Copper Backbone Cabling	2,500	LF	3.20	8,000	2.05	5,125	13,125	1,969	15,094
Optical fiber Backbone Cabling	2,500	LF	1.25	3,125	2.50	6,250	9,375	1,406	10,781
Site Pathway	1	LS	1,650.00	1,650	2,750.00	2,750	4,400	660	5,060

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BASIS OF OPINION	Pre-Design	**PREPARED BY**	Paul Robaidek	**DATE**	June 30, 2016
JOB NUMBER	15-084	**CHECKED BY**	Patrick Shannon	**OVERHEAD & PROFIT**	15%

	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Telecommunications Spaces									
LAB 1									
1065A									
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
3160									
Equipment Rack	2	EA	185.00	370	130.00	260	630	95	725
Conduit and Cable Pathways	1	LS	750.00	750	675.00	675	1,425	214	1,639
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	413	3,163
Cable Tray	25	LF	15.00	375	16.00	400	775	116	891
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Copper Backbone Cabling	1,500	LF	3.20	4,800	2.05	3,075	7,875	1,181	9,056
Optical fiber Backbone Cabling	1,500	LF	1.25	1,875	2.50	3,750	5,625	844	6,469
Site Pathway	1,500	LF	1.00	1,500	1.25	1,875	3,375	506	3,881
LAB 2									
2243A									
Optical fiber Backbone Cabling	2,500	LF	1.25	3,125	2.50	6,250	9,375	1,406	10,781
Site Pathway	1	LS	1,650.00	1,650	2,750.00	2,750	4,400	660	5,060

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JOB NUMBER 15-084 **CHECKED BY** Patrick Shannon **OVERHEAD & PROFIT** 15%

	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Telecommunications Spaces									
LONG HOUSE									
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	413	3,163
Conduit and Cable Pathways	1	LS	500.00	500	350.00	350	850	128	978
CHILDCARE									
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	413	3,163
Conduit and Cable Pathways	1	LS	500.00	500	650.00	650	1,150	173	1,323
HOUSING COMMUNITY CENTER (HCC)									
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Cable Management	1	LS	2,025.00	2,025	725.00	725	2,750	413	3,163
MOD Shops									
Optical fiber Backbone Cabling	5,000	LF	1.25	6,250	2.50	12,500	18,750	2,813	21,563
Site Pathway	5,000	LF	1.00	5,000	1.25	6,250	11,250	1,688	12,938
SHOPS BUILDING									
Grounding and Bonding	1	LS	850.00	850	675.00	675	1,525	228.75	1,754
Total Telecommunications Spaces							233,465	35,020	268,485

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description		quantity		material cost		labor cost		engineering opinion		
		number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Network Switches and UPS										
LIBRARY										
0434										
	HP 5412R	2	EA	30,000.00	60,000.00	-	-	60,000		60,000
	20 kVA UPS	1	EA	13,800.00	13,800.00	1,200.00	1,200.00	15,000		15,000
2404						-	-			
	HP 5412R	2	EA	30,000.00	60,000.00	-	-	60,000		60,000
	20 kVA UPS	1	EA	13,800.00	13,800.00	1,200.00	1,200.00	15,000		15,000
2702										
	HP 5412R	4	EA	30,000.00	120,000.00			120,000		120,000
	20 kVA UPS	2	EA	13,800.00	27,600.00	1,200.00	2,400.00	30,000		30,000
2019										
	HP 5412R	1	EA	30,000.00	30,000.00			30,000		30,000
	HP 5406R	1	EA	15,000.00	15,000.00			15,000		15,000
	10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
4003B										
	HP 5412R	1	EA	30,000.00	30,000.00			30,000		30,000
	HP 5406R	1	EA	15,000.00	15,000.00			15,000		15,000
	10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
1000D										
	HP 5412R	2	EA	30,000.00	60,000.00			60,000		60,000
	20 kVA UPS	1	EA	13,800.00	13,800.00	1,200.00	1,200.00	15,000		15,000
0206										
	HP 5412R	2	EA	30,000.00	60,000.00			60,000		60,000
	HP 5406R	2	EA	15,000.00	30,000.00			30,000		30,000
	HP 5500-24G-PoE+	1	EA	3,200.00	3,200.00			3,200		3,200

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Network Switches and UPS									
Cisco 3900	1	EA	20,000.00	20,000.00			20,000		20,000
0447									
HP5406R	1	EA	15,000.00	15,000.00			15,000		15,000
COLLEGE ACTIVITIES BUILDING									
218									
HP 5412R	2	EA	30,000.00	60,000.00			60,000		60,000
HP 5406R	1	EA	15,000.00	15,000.00			15,000		15,000
20 kVA UPS	1	EA	13,800.00	13,800.00	1,200.00	1,200.00	15,000		15,000
KAOS									
HP 5500-24G-PoE+	1	EA	3,200.00	3,200.00			3,200		3,200
1500VA UPS	1	EA	1,000.00	1,000.00	200.00	200.00	1,200		1,200
COLLEGE RECREATION CENTER					-	-			
102A									
HP 5406R	1	EA	15,000.00	15,000.00			15,000		15,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
132B									
HP 5500-24G-PoE+	1	EA	3,200.00	3,200.00			3,200		3,200
1500VA UPS	1	EA	1,000.00	1,000.00	200.00	200.00	1,200		1,200

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Network Switches and UPS									
COMMUNICATIONS					-	-			
212C									
HP 5412R	1	EA	30,000.00	30,000.00			30,000		30,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
SEMINAR II					-	-			
E1114 PSC									
HP 5412R	1	EA	30,000.00	30,000.00			30,000		30,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
B1108 PTS									
HP 5412R	1	EA	30,000.00	30,000.00			30,000		30,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
A2111									
HP 5412R	2	EA	30,000.00	60,000.00			60,000		60,000
20 kVA UPS	1	EA	13,800.00	13,800.00	1,200.00	1,200.00	15,000		15,000
B2111									
HP 5412R	1	EA	30,000.00	30,000.00			30,000		30,000
HP 5406R	1	EA	15,000.00	15,000.00			15,000		15,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
C2111									
HP 5412R	1	EA	30,000.00	30,000.00			30,000		30,000
HP 5406R	1	EA	15,000.00	15,000.00			15,000		15,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Network Switches and UPS									
C4105									
HP 5406R	1	EA	15,000.00	15,000.00			15,000		15,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
D2111									
HP 5412R	1	EA	30,000	30,000			30,000		30,000
HP 5406R	1	EA	15,000	15,000			15,000		15,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
D4105									
HP 5406R	1	EA	15,000	15,000			15,000		15,000
E2111									
HP 5412R	1	EA	30,000	30,000			30,000		30,000
HP 5406R	1	EA	15,000	15,000			15,000		15,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
E4105									
HP 5406R	1	EA	15,000	15,000			15,000		15,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
SEMINAR I					-	-			
3160									
HP 5412R	1	EA	30,000	30,000			30,000		30,000
HP 5406R	1	EA	15,000	15,000			15,000		15,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500

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description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Network Switches and UPS									
CENTRAL UTILITY PLANT					-	-			
011A									
HP 5406R	1	EA	12,000	12,000			12,000		12,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
LAB 1					-	-			
1065A									
HP 5412R	2	EA	30,000	60,000			60,000		60,000
20 kVA UPS	1	EA	13,800.00	13,800.00	1,200.00	1,200.00	15,000		15,000
2031									
HP 5412R	1	EA	30,000	30,000			30,000		30,000
10 kVA UPS	1	EA	8,000.00	8,000.00	500.00	500.00	8,500		8,500
LAB 2					-	-			
2243A									
HP 5412R	1	EA	30,000	30,000			30,000		30,000
20 kVA UPS	1	EA	13,800.00	13,800.00	1,200.00	1,200.00	15,000		15,000
2245									
HP 5412R	1	EA	30,000	30,000			30,000		30,000
20 kVA UPS	1	EA	13,800.00	13,800.00	1,200.00	1,200.00	15,000		15,000

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Network Switches and UPS									
ARTS ANNEX					-	-			
1113									
HP 5500-24G-PoE+	1	EA	3,200	3,200			3,200		3,200
1500VA UPS	1	EA	1,000.00	1,000.00	200.00	200.00	1,200		1,200
LONG HOUSE					-	-			
1008B									
HP 5406R	1	EA	15,000	15,000			15,000		15,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
CHILDCARE					-	-			
109A									
HP 5406R	1	EA	12,000	12,000			12,000		12,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
HOUSING COMMUNITY CENTER (HCC)					-	-			
113Z									
HP 5406R	1	EA	15,000	15,000			15,000		15,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Network Switches and UPS									
FARM HOUSE					-	-			
HP 5406R	1	EA	12,000	12,000			12,000		12,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
AG LAB					-	-			
109									
HP 5406R	1	EA	12,000	12,000			12,000		12,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
SHOPS BUILDING									
127									
HP 5406R	1	EA	12,000	12,000			12,000		12,000
5 kVA UPS	1	EA	4,250.00	4,250.00	500.00	500.00	4,750		4,750
Total Network Switches and UPS							1,572,400		1,572,400

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Access Control System									
General Provisions	1	LS	1,850.00	1,850	875.00	875	2,725	408.75	3,134
Enterprise Controller	2	EA	32,200.00	64,400	3,750.00	7,500	71,900	10,785.00	82,685
Programming and Integration	1	LS			5,000.00	5,000	5,000	750.00	5,750
LIBRARY									
Door Controller	27	EA	6,150.00	166,050	395.00	10,665	176,715	26,507	203,222
Alarm Input Module	6	EA	550.00	3,300	65.00	390	3,690	554	4,244
Alarm and Lockdown Integration	1	LS			450.00	450	450	68	518
Pathways and Cabling	1	LS	225.00	225	325.00	325	550	83	633
Cabling terminations	102	EA			95.00	9,690	9,690	1,454	11,144
Programming	1	LS			525.00	525	525	79	604
COLLEGE ACTIVITIES BUILDING									
Door Controller	4	EA	6,150.00	24,600	395.00	1,580	26,180	3,927	30,107
Alarm Input Module	2	EA	550.00	1,100	65.00	130	1,230	185	1,415
Alarm and Lockdown Integration	1	LS			275.00	275	275	41	316
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	8	EA			95.00	760	760	114	874
Programming	1	LS			85.00	85	85	13	98

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description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Access Control System									
COLLEGE RECREATION CENTER									
Door Controller	3	EA	6,150.00	18,450	395.00	1,185	19,635	2,945	22,580
Alarm Input Module	2	EA	550.00	1,100	65.00	130	1,230	185	1,415
Alarm and Lockdown Integration	1	LS			275.00	275	275	41	316
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	12	EA			95.00	1,140	1,140	171	1,311
Programming	1	LS			135.00	135	135	20	155
COMMUNICATIONS									
Door Controller	4	EA	6,150.00	24,600	395.00	1,580	26,180	3,927	30,107
Alarm Input Module	2	EA	550.00	1,100	65.00	130	1,230	185	1,415
Alarm and Lockdown Integration	1	LS			275.00	275	275	41	316
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	16	EA			95.00	1,520	1,520	228	1,748
Programming	1	LS			270.00	270	270	41	311
SEMINAR II									
Door Controller	16	EA	6,150.00	98,400	395.00	6,320	104,720	15,708	120,428
Alarm Input Module	6	EA	550.00	3,300	65.00	390	3,690	554	4,244
Alarm and Lockdown Integration	1	LS			275.00	275	275	41	316
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	66	EA			95.00	6,270	6,270	941	7,211
Programming	1	LS			350.00	350	350	53	403

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description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Access Control System									
SEMINAR I									
Door Controller	2	EA	6,150.00	12,300	395.00	790	13,090	1,964	15,054
Alarm Input Module	2	EA	550.00	1,100	65.00	130	1,230	185	1,415
Alarm and Lockdown Integration	1	LS			275.00	275	275	41	316
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	8	EA			95.00	760	760	114	874
Programming	1	LS			135.00	135	135	20	155
CENTRAL UTILITY PLANT									
Door Controller	1	EA	6,150.00	6,150	395.00	395	6,545	982	7,527
Alarm Input Module	2	EA	550.00	1,100	65.00	130	1,230	185	1,415
Alarm and Lockdown Integration	1	LS			275.00	275	275	41	316
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	3	EA			95.00	285	285	43	328
Programming	1	LS			95.00	95	95	14	109
LAB 1									
Door Controller	6	EA	6,150.00	36,900	395.00	2,370	39,270	5,891	45,161
Alarm Input Module	3	EA	550.00	1,650	65.00	195	1,845	277	2,122
Alarm and Lockdown Integration	1	LS			350.00	350	350	53	403
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	25	EA			95.00	2,375	2,375	356	2,731
Programming	1	LS			270.00	270	270	41	311

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Access Control System									
LAB 2									
Door Controller	7	EA	6,150.00	43,050	395.00	2,765	45,815	6,872	52,687
Alarm Input Module	2	EA	550.00	1,100	65.00	130	1,230	185	1,415
Alarm and Lockdown Integration	1	LS			350.00	350	350	53	403
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	25	EA			95.00	2,375	2,375	356	2,731
Programming	1	LS			270.00	270	270	41	311
ARTS ANNEX									
Door Controller	6	EA	6,150.00	36,900	395.00	2,370	39,270	5,891	45,161
Alarm Input Module	1	EA	550.00	550	65.00	65	615	92	707
Alarm and Lockdown Integration	1	LS			350.00	350	350	53	403
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	22	EA			95.00	2,090	2,090	314	2,404
Programming	1	LS			270.00	270	270	41	311
LONG HOUSE									
Door Controller	3	EA	6,150.00	18,450	395.00	1,185	19,635	2,945	22,580
Alarm Input Module	1	EA	550.00	550	65.00	65	615	92	707
Alarm and Lockdown Integration	1	LS			275.00	275	275	41	316
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	9	EA			95.00	855	855	128	983
Programming	1	LS			135.00	135	135	20	155

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	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Access Control System									
CHILDCARE									
Door Controller	1	EA	6,150.00	6,150	395.00	395	6,545	982	7,527
Alarm Input Module	1	EA	550.00	550	65.00	65	615	92	707
Alarm and Lockdown Integration	1	LS			95.00	95	95	14	109
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	4	EA			95.00	380	380	57	437
Programming	1	LS			65.00	65	65	10	75
SHOPS BUILDING									
Door Controller	1	EA	6,150.00	6,150	395.00	395	6,545	982	7,527
Alarm Input Module	1	EA	550.00	550	65.00	65	615	92	707
Alarm and Lockdown Integration	1	LS			95.00	95	95	14	109
Pathways and Cabling	1	LS	85.00	85	95.00	95	180	27	207
Cabling terminations	8	EA			95.00	760	760	114	874
Programming	1	LS			65.00	65	65	10	75
Total Access Control Systems							667,090	100,064	767,154

electrical **cost opinion**

Critical Power, Security, and Life Safety Systems

The Evergreen State College

1201 third avenue, suite 600
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BASIS OF OPINION Pre-Design **PREPARED BY** Paul Robaidek **DATE** June 30, 2016

JOB NUMBER 15-084 **CHECKED BY** Patrick Shannon **OVERHEAD & PROFIT** 15%

	quantity		material cost		labor cost		engineering opinion		
description	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Fire Alarm System									
Seminar 1 Building Fire Alarm									
General Provisions	1	LS	5,200.00	5,200.00			5,200.00	780	5,980
Architectural Allowance	1	LS	2,200.00	2,200.00	2,200.00	2,200.00	4,400.00	660	5,060
Selective Demolition	1	SF			6,950.00	6,950.00	6,950.00	1,043	7,993
Wires and Cables	3,960	LF	.37	1,465.20	.53	2,098.80	3,564.00	535	4,099
Fire Alarm Relay Control	2	EA	125.00	250.00	125.00	250.00	500.00	75	575
Manual Stations	12	EA	110.00	1,320.00	100.00	1,200.00	2,520.00	378	2,898
Speaker/Strobes	53	EA	120.00	6,360.00	125.00	6,625.00	12,985.00	1,948	14,933
Smoke Detectors	48	EA	160.00	7,680.00	125.00	6,000.00	13,680.00	2,052	15,732
Heat Detectors	4	EA	110.00	440.00	125.00	500.00	940.00	141	1,081
Duct Smoke Detectors	2	EA	300.00	600.00	600.00	1,200.00	1,800.00	270	2,070
Tamper/flow switch	11	EA	150.00	1,650.00	150.00	1,650.00	3,300.00	495	3,795
Annunciator Panel	2	EA	1,500.00	3,000.00	1,000.00	2,000.00	5,000.00	750	5,750
Extender (NAC) Panel	4	EA	600.00	2,400.00	500.00	2,000.00	4,400.00	660	5,060
Commissioning	1	EA			8,400.00	8,400.00	8,400.00	1,260	9,660
Total Seminar 1 Building Fire Alarm							73,639	11,046	84,685

electrical **cost opinion**

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DATE June 30, 2016

JOB NUMBER 15-084
CHECKED BY Patrick Shannon
OVERHEAD & PROFIT 15%

description	quantity		material cost		labor cost		engineering opinion		
	number	unit	unit cost	total	unit cost	total	subtotal	OH&P	total
Fire Alarm Network									
General Provisions	1	LS	5,200.00	5,200.00			5,200.00	780	5,980
Architectural Allowance	1	LS	2,200.00	2,200.00	2,200.00	2,200.00	4,400.00	660	5,060
Electrical Connections For Equipment	1	EA	150.00	150.00	300.00	300.00	450.00	68	518
Selective Demolition	7	EA			1,050.00	7,350.00	7,350.00	1,103	8,453
Fire Alarm Addressable Panel - Small	1	EA	9,500.00	9,500.00	2,500.00	2,500.00	12,000.00	1,800	13,800
Network Card	7	EA	2,000.00	14,000.00	3,000.00	21,000.00	35,000.00	5,250	40,250
Network Infrastructure	7	LS	1,700.00	11,900.00	1,900.00	13,300.00	25,200.00	3,780	28,980
Fire Alarm Work Station	1	LS	30,000.00	30,000.00	3,500.00	3,500.00	33,500.00	5,025	38,525
Annunciator Panel	10	EA	1,500.00	15,000.00	1,000.00	10,000.00	25,000.00	3,750	28,750
Commissioning	10	EA			8,400.00	84,000.00	84,000.00	12,600	96,600
Total Fire Alarm Network							232,100	34,815	266,915

6.0 Facility Operations and Maintenance Requirements

6.1 Operating Budget Impacts

The critical power, safety, and security systems included in this project will require regularly scheduled maintenance to ensure reliable system operation and performance. However, since the scope is largely comprised of replacing existing systems, the annual operating expense will not increase significantly. Further, new operating expenses will be offset by savings from current maintenance and support costs spent maintaining and repairing obsolete and failing equipment. For example, the new campus main electrical switchgear will have electronic remote racking which will reduce the personnel time currently spent manually racking and de-racking circuit breakers.

Although the new campus main electrical switchgear building and telecommunications spaces represent increased square footage requiring maintenance and upkeep, these costs are negligible in comparison to existing general operating and maintenance costs and will have no appreciable impact on the operating budget.

The regular testing of the new campus main electrical switchgear, replacement generators, and fire alarm systems will be conducted using existing maintenance staff and will be incorporated within the current maintenance schedule.

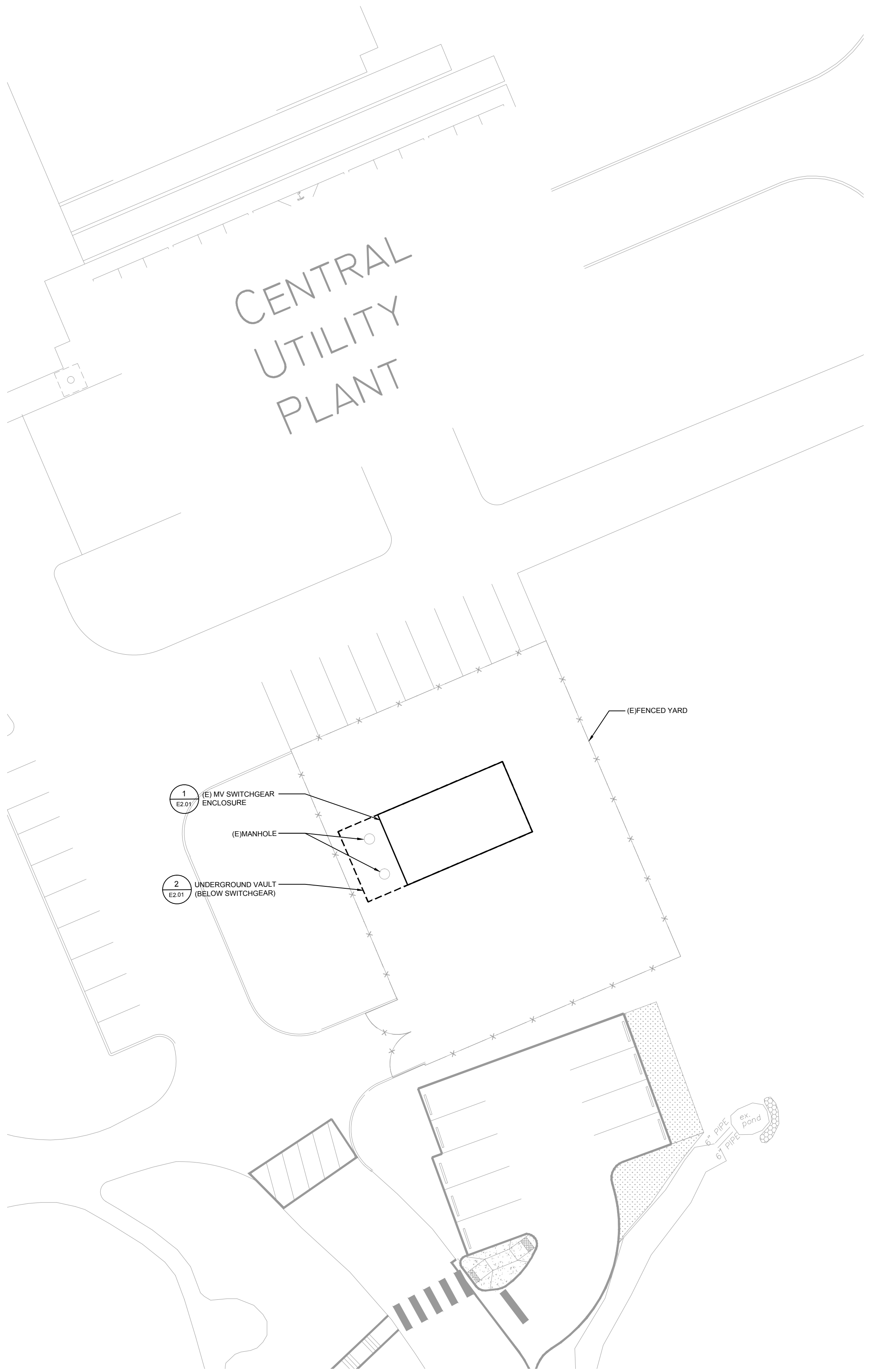
The annual operating budget of the Computing and Communications and Network Services department will need to cover the additional responsibilities and costs of supporting and maintaining an expanded network infrastructure and applications operating on the network. However, some of these additional operating expenses may be covered by transferring the costs currently budgeted for maintaining the obsolete systems being replaced to the Network Services budget. Also, by converging the fire alarm, access control, and telephone systems onto common network architecture, Evergreen will be able to leverage the investment they have made in network support staff and resources to the support of network-based systems and realize cost efficiency and economy of scale by consolidating costs and support requirements and eliminating expenses from supporting independent systems and non-standard equipment.

It is anticipated that an additional 1/3 FTE will be required in the Network Services department to support and administer the additional network equipment and the network-based safety and security applications. Alternatively Evergreen could elect to purchase maintenance contracts for their core network switches and larger UPS units.

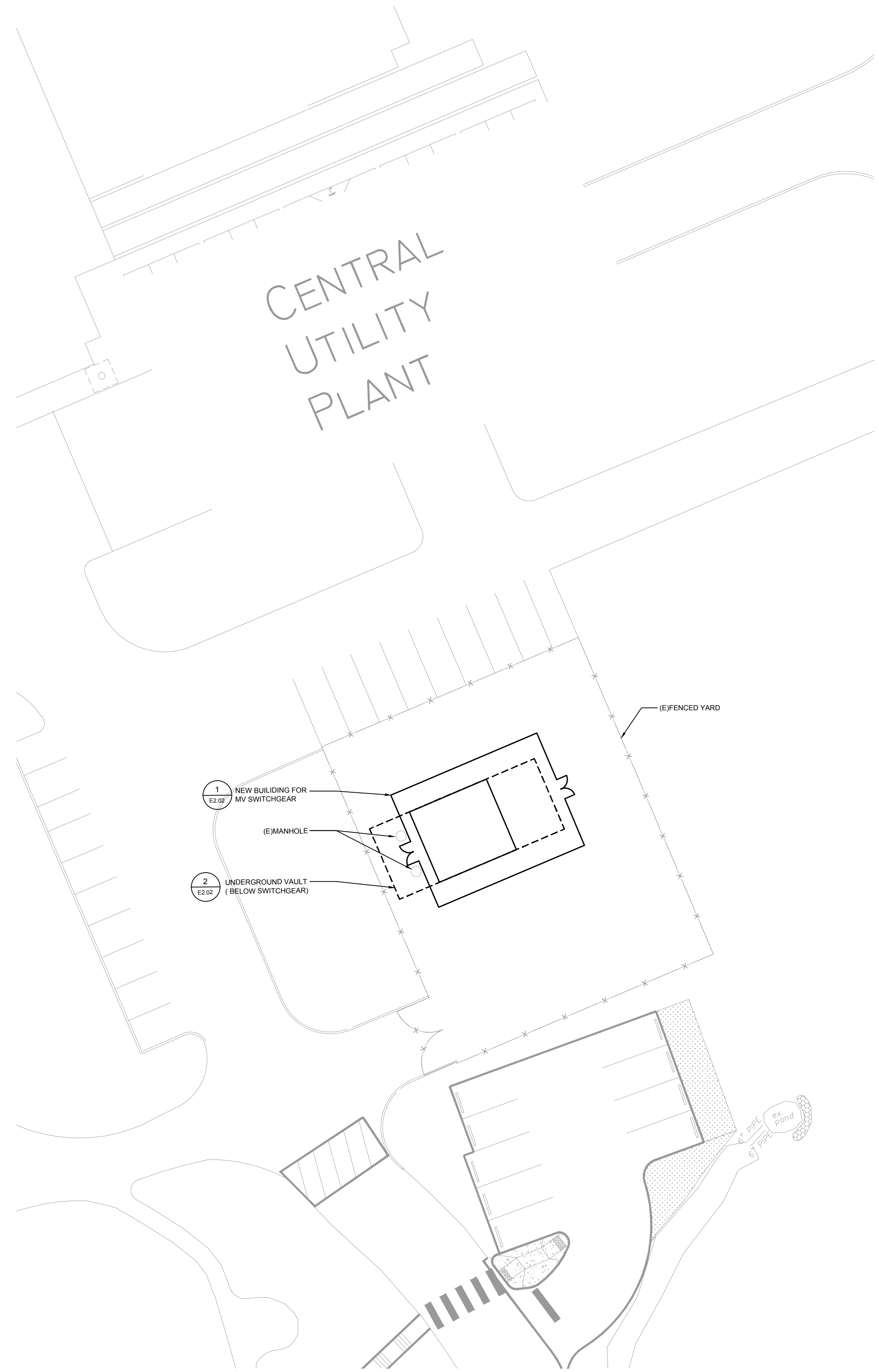
7.0 Project Drawings and Diagrams

7.1 Electrical Drawings

7.2 Systems Drawings



N 1 E1.01 **(E) MV SWITCHGEAR FENCE YARD**
SCALE: 1/16" = 1'-0"



N 2 E1.01 **(N) MV SWITCHGEAR FENCE YARD**
SCALE: 1/16" = 1'-0"

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PROFESSIONAL STAMP

CRITICAL POWER, SAFETY AND SECURITY SYSTEMS PRE-DESIGN

THE EVERGREEN STATE COLLEGE

2700 Evergreen Parkway NW
Olympia, WA 98505

REV.	RELEASE	DATE
		06/20/16

HARGIS PROJECT NO.	15084
DRAWN BY	
CHECKED BY	
APPROVED BY	
SHEET TITLE	

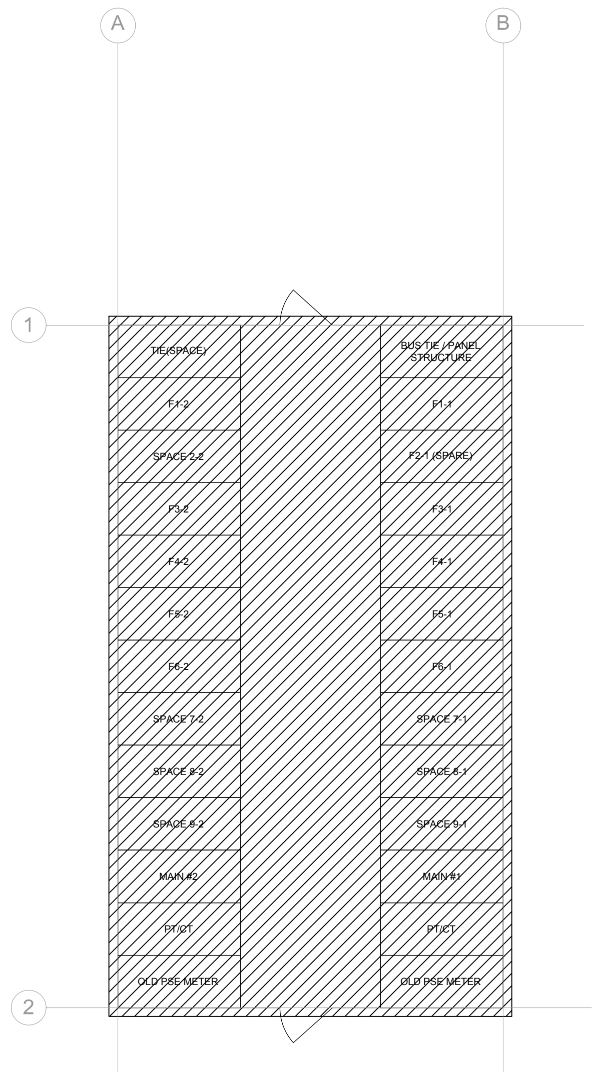
ELECTRICAL
PARTIAL SITE PLANS

SHEET NUMBER

E1.01

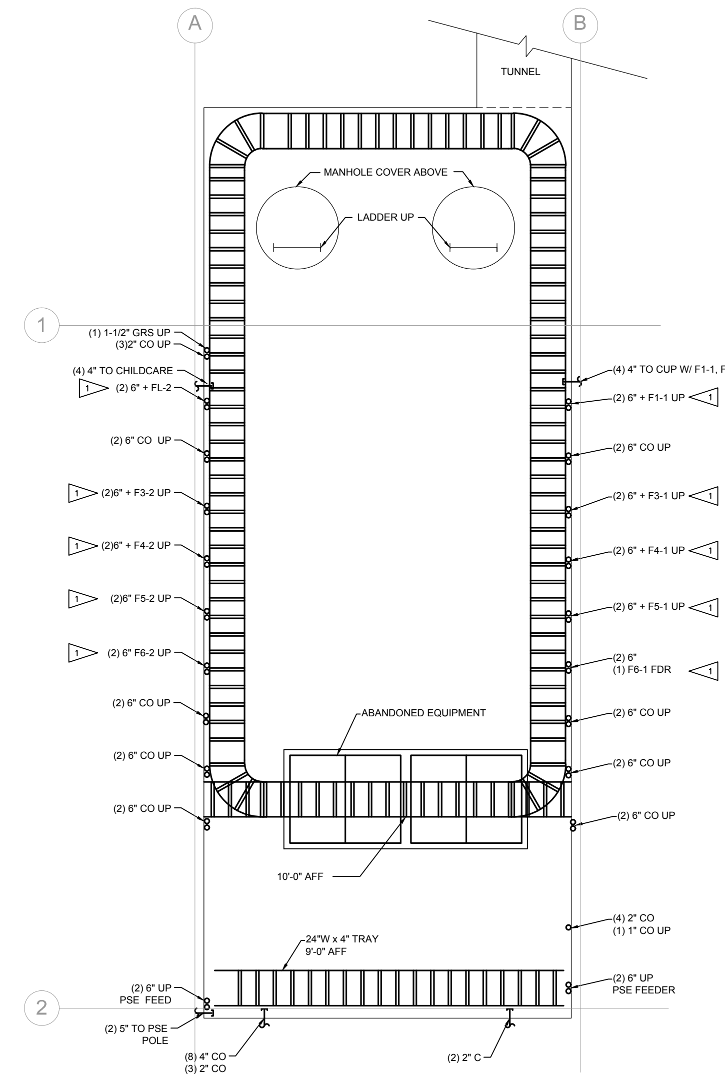
FLAG NOTES:

1. DISCONNECT EXISTING MV CABLES FROM SWITCH AND LEAVE IN PLACE TO TERMINATE AT NEW SWITCHGEAR.



(LOCATED IN ENCLOSURE ABOVE VAULT)

1 E2.01 **MV SWITCHGEAR ENCLOSURE - DEMO**
SCALE: 1/4" = 1'-0"



2 E2.01 **UNDERGROUND VAULT FLOOR PLAN - DEMO**
SCALE: 1/4" = 1'-0"

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PROFESSIONAL STAMP

CRITICAL POWER, SAFETY AND SECURITY SYSTEMS PRE-DESIGN

THE EVERGREEN STATE COLLEGE

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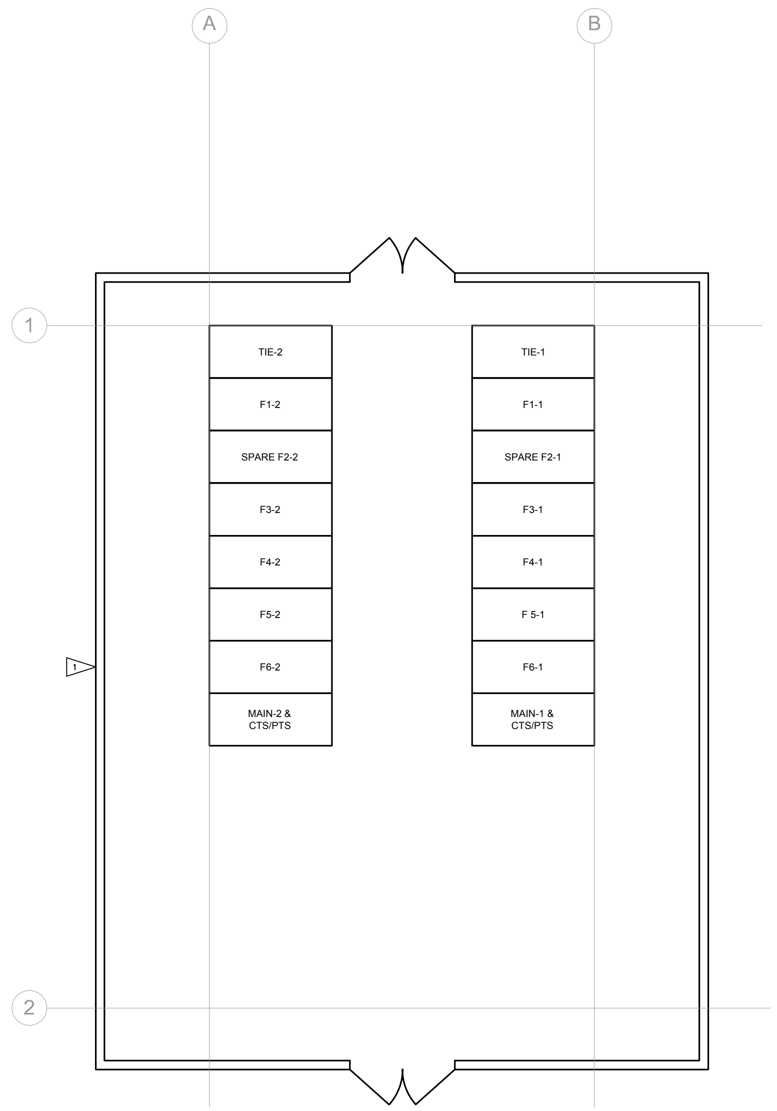
Olympia, WA 98505

REV.	RELEASE	DATE
		06/20/16

HARGIS PROJECT NO.	15084
DRAWN BY	
CHECKED BY	
APPROVED BY	
SHEET TITLE	ELECTRICAL ENLARGED PLANS - DEMO
SHEET NUMBER	ED2.01

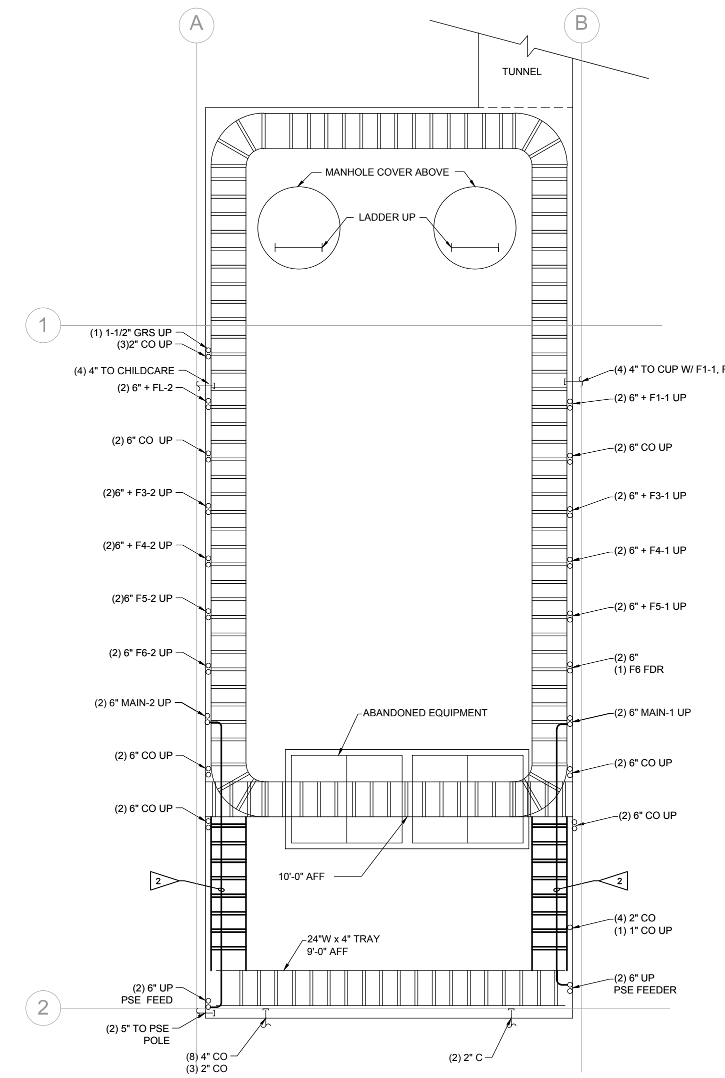
FLAG NOTES:

1. PROVIDE SWITCHGEAR WITHIN NEW BUILDING. LINE UP SWITCHES SO THE EXISTING CORE DRILLS CAN BE REUSED.
2. PROVIDE CABLE AND CABLE TRAY FROM UTILITY EQUIPMENT TO SWITCHGEAR MAIN CIRCUIT BREAKER.



(LOCATED ABOVE VAULT)

MV SWITCHGEAR BUILDING 1 E2.01
SCALE: 1/4" = 1'-0"



UNDERGROUND VAULT FLOOR PLAN 2 E2.01
SCALE: 1/4" = 1'-0"

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PROFESSIONAL STAMP

CRITICAL POWER, SAFETY AND SECURITY SYSTEMS PRE-DESIGN

THE EVERGREEN STATE COLLEGE

2700 Evergreen Parkway NW
Olympia, WA 98505

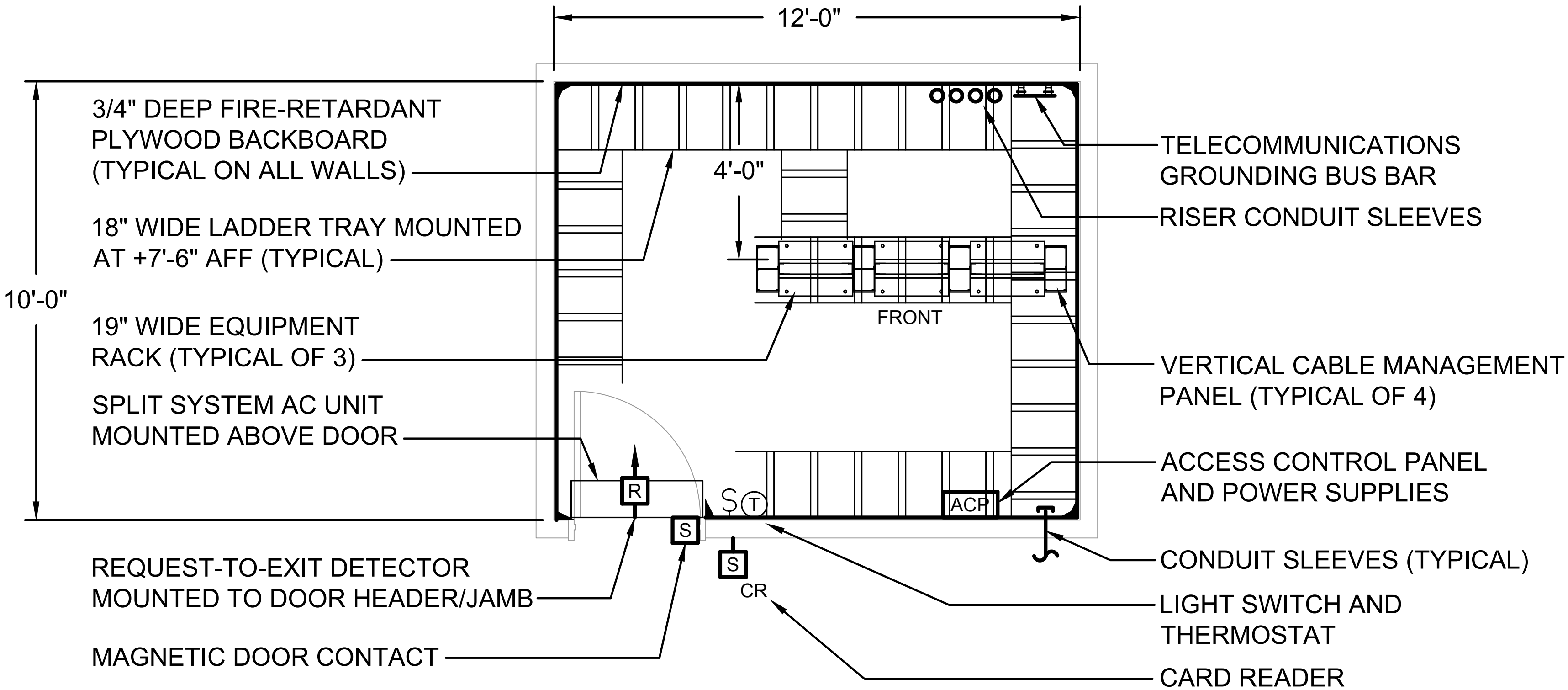
REV.	RELEASE	DATE
		06/20/16

HARGIS PROJECT NO. 15084
DRAWN BY
CHECKED BY
APPROVED BY
SHEET TITLE

ELECTRICAL ENLARGED PLANS

SHEET NUMBER

E2.01



TYPICAL TELECOMMUNICATIONS ROOM

SCALE: 1/4" = 1'-0"

HARGIS PROJECT NO.	15084
DRAWN BY	AC
CHECKED BY	PR
REFERENCE DRAWING	
RELEASE DATE	6/20/2016
SKETCH TITLE	TYPICAL TELECOMMUNICATIONS ROOM
SKETCH NUMBER	

CRITICAL POWER, SAFETY AND SECURITY SYSTEMS PRE-DESIGN

THE EVERGREEN STATE COLLEGE

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8.0 Appendix

A. Predesign Checklist
B. Department of Archaeology and Historic Preservation (DAHP) Exemption
C. Telecommunications Room Matrix
D. Network Diagram
E. Site Pathways
F. Critical Facilities
G. Non-Preferred Alternative: Campus Main Electrical Switchgear Installed in Underground Vault
H. The Evergreen State College Security and Life Safety Assessment
I. Capital Improvement Recommendations for the Medium Voltage Systems
J. Stakeholders Telecommunications Findings and Review
K. Voice Communications Strategic Planning

HARGIS

Appendix A -Predesign Checklist

APPENDIX A: PREDESIGN CHECKLIST

A predesign should include the content detailed here. OFM will approve limited scope predesigns on a case-by-case basis.

❖ Executive Summary

❖ Problem Statement, Opportunity or Program Requirement

- ☐ Identify the problem, opportunity or program requirement that the project addresses and how it will be accomplished.
- ☐ Identify and explain the statutory or other requirements that drive the project's operational programs and how these affect the need for space, location or physical accommodations. Include anticipated population projections (growth or decline) and assumptions.
- ☐ Explain the connection between the agency's mission, goals and objectives; statutory requirements; and the problem, opportunity, or program requirements.
- ☐ Describe in general terms what is needed to solve the problem.
- ☐ Include any relevant history of the project, including previous predesigns that did not go forward to design or construction.

❖ Analysis of Alternatives (including the preferred alternative)

- ☐ Describe all alternatives that were considered, including the preferred alternative. Include:
  - ☐ A no action alternative.
  - ☐ Advantages and disadvantages of each alternative. Please include a high-level summary table with your analysis.
  - ☐ Cost estimates for each alternative.
    - ☐ Provide enough information so decision makers have a general understanding of the costs.
    - ☐ Complete OFM's Life Cycle Cost Model (RCW 39.35B.050).
  - ☐ Schedule estimates for each alternative. Estimate the start, midpoint, and completion dates.

❖ Detailed Analysis of Preferred Alternative

  - ☐ Nature of space – how much of the proposed space will be used for what purpose (i.e., office, lab, conference, classroom, etc.)
  - ☐ Occupancy numbers.
  - ☐ Basic configuration of the building, including square footage and the number of floors.
  - ☐ Space needs assessment. Identify the guidelines used.
- ☐ Site Analysis
  - ☐ Identify site studies that are completed or under way.
  - ☐ Location.

- ☐ Building footprint and its relationship to adjacent facilities and site features. Provide an aerial view, sketches of the building site, and basic floorplans.
- ☐ Stormwater requirements.
- ☐ Ownership of the site and any acquisition issues.
- ☐ Easements and setback requirements.
- ☐ Potential issues with the surrounding neighborhood, during construction and ongoing.
- ☐ Utility extension or relocation issues.
- ☐ Potential environmental impacts.
- ☐ Parking and access issues, including improvements required by local ordinances, local road impacts, and parking demand.
- ☐ Impact on surroundings and existing development with construction lay-down areas and construction phasing.

☐ Consistency with applicable long-term plans (such as the Thurston County and Capitol Campus master plans and agency or area master plans) as required by RCW 43.88.110.

☐ Consistency with other laws and regulations

- ☐ High-performance public buildings (Chapter 39.35D RCW).
- ☐ Greenhouse gas emissions reduction policy (RCW 70.235.070).
- ☐ Archeological and cultural resources (Executive Order 05-05 and Section 106 of the National Historic Preservation Act of 1966).
- ☐ Americans with Disabilities Act implementation (Executive Order 96-04).
- ☐ Compliance with planning under Chapter 36.70A RCW, as required by RCW 43.88.0301.
- ☐ Information required by RCW 43.88.0301(1).
- ☐ Other codes or regulations.

☐ Identify problems that require further study. Evaluate identified problems to establish probable costs and risk.

☐ Identify significant or distinguishable components, including major equipment and ADA requirements in excess of existing code.

☐ Identify planned IT systems that affect the building plans.

☐ Describe planned commissioning to ensure systems function as designed.

☐ Describe any future phases or other facilities that will affect this project.

☐ Identify and justify the proposed project delivery method. For GC/CM, link to the requirements in RCW 39.10.340.

☐ Describe how the project will be managed within the agency.

- ☐ Schedule
  - ☐ Provide a high-level milestone schedule for the project, including key dates for budget approval, design, bid, acquisition, construction, equipment installation, testing, occupancy, and full operation.
  - ☐ Incorporate value-engineering analysis and constructability review into the project schedule, as required by RCW 43.88.110(5)(c).
  - ☐ Describe factors that may delay the project schedule.
  - ☐ Describe the permitting or local government ordinances or neighborhood issues (such as location or parking compatibility) that could affect the schedule.
  - ☐ Identify when the local jurisdiction will be contacted and whether community stakeholder meetings are a part of the process.

❖ Project Budget Analysis for the Preferred Alternative

- ☐ Cost estimate
  - ☐ Major assumptions used in preparing the cost estimate.
  - ☐ Summary table of Uniformat Level II cost estimates.
  - ☐ The C-100. If project costs are outside the C-100 cost control range, explain.
- ☐ Proposed funding
  - ☐ Identify the fund sources and expected receipt of the funds.
  - ☐ If alternatively financed, provide the projected debt service and fund source. Include the assumptions used for calculating finance terms and interest rates.
- ☐ Facility operations and maintenance requirements
  - ☐ Define the anticipated impact of the proposed project on the operating budget for the agency or institution. Include maintenance and operating assumptions (including FTEs).
  - ☐ Show five biennia of capital and operating costs from the time of occupancy, including an estimate of building repair, replacement, and maintenance.
- ☐ Clarify whether furniture, fixtures, and equipment are included in the project budget. If not included, explain.

❖ Predesign Appendix

- ☐ Completed Life Cycle Cost Model.
- ☐ A letter from the Department of Archaeology and Historic Preservation.

Appendix B - Department of Archaeology and Historic Preservation (DAHP) Exemption

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

June 29, 2016

Ms. Jeanne Rynne
Director of Facilities
Evergreen State College
2700 Evergreen Parkway
Olympia, WA 98505

In future correspondence please refer to:
Project Tracking Code: 2016-06-04586
Property: Evergreen College Exemptions under GEO 05-05 for 2017-19 Biennium
Re: Request for Exemptions

Dear Ms. Rynne:

Thank you for contacting the Washington State Historic Preservation Officer (SHPO) and Department of Archaeology and Historic Preservation (DAHP) regarding the above referenced proposal. Your communication on this action has been reviewed on behalf of the SHPO under provisions of Governor's Executive Order 05-05. Our review is based upon documentation provided in your submittal.

The following activities in the Capital Programs Projects 2017-19 Biennium for Evergreen State College should be considered exempted from further review by DAHP:

- Critical Power, Safety, and Security Systems upgrades
- Seminar 1 Building Renovation Predesign

We look forward to working with you on the remaining obligated Capital Programs Projects that either have impacts to historic structures or ground altering activities in the coming biennium.

These Capital Programs Projects have been reviewed on behalf of the SHPO under Governor's Executive Order 05-05. Thank you for the opportunity to review and comment. Should you have any questions, please feel free to contact me.

Sincerely,

Russell Holter
Project Compliance Reviewer
(360) 586-3533
russell.holter@dahp.wa.gov

Appendix C - Telecommunications Room Matrix

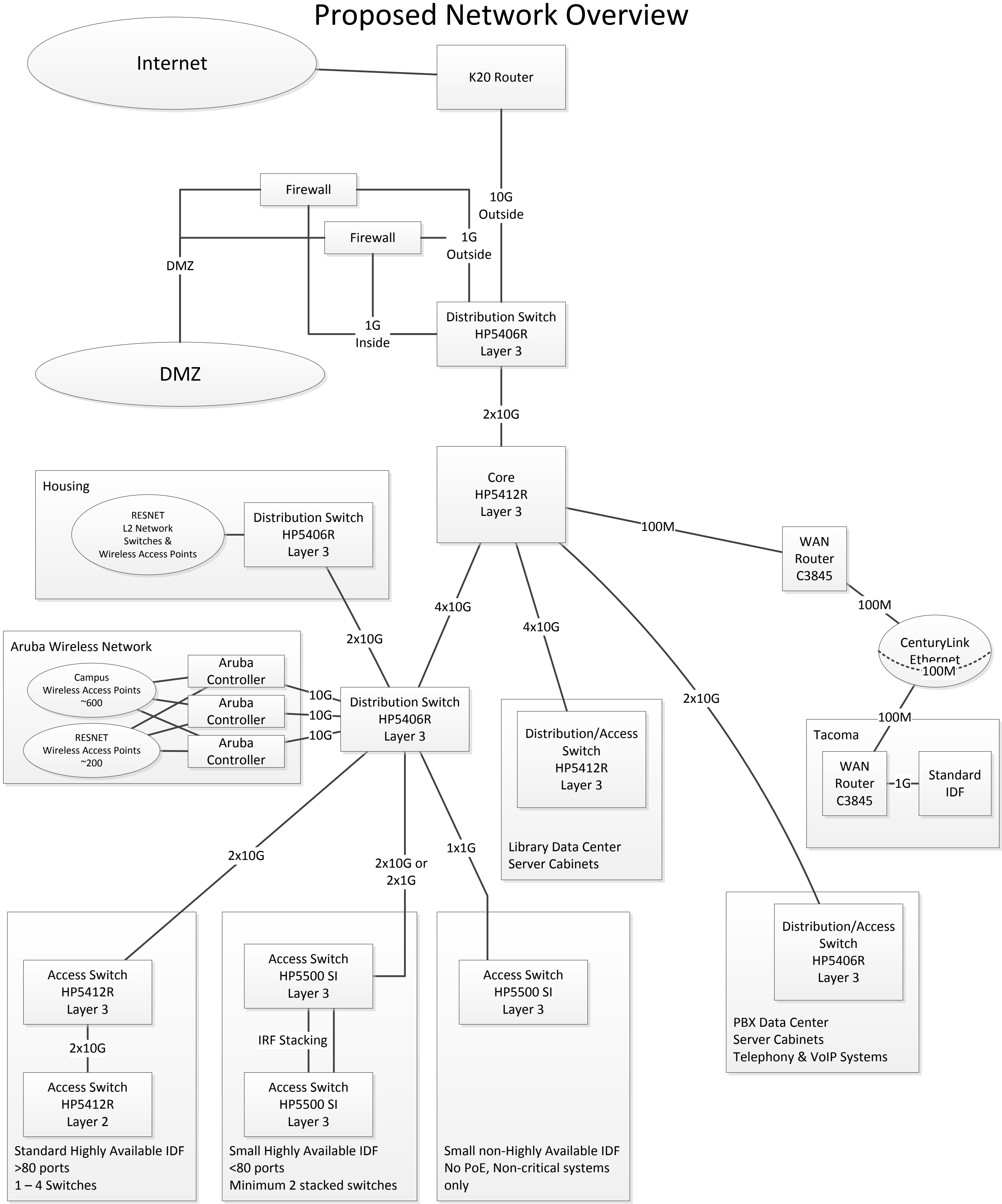
Building	Room	Notes	Racks	Grounding	Cooling	Fiber Backbone	Cable Management	Pathway	Other Issues
Library	0434	Library B - Basement	4	✓	Supply duct with diffuser	12 SM 12 MM	Cable tray and rack mtd panels	✓	Existing water leak
Library	2404	Library - 2nd Floor	4	✓	AC Unit	12 SM	Cable tray and rack mtd panels	✓	
Library	2702	2nd Floor	4	✓	AC Unit	12 SM 12 MM	Cable tray and rack mtd panels	✓	
Library	2019	Library A - 2nd Floor	4	✓	AC Unit	12 SM	Cable tray and rack mtd panels	✓	Roof drain thru room
Library	4003B	Library A - 4th Floor	2	✓	Mitsubishi Split system	12 SM	Cable tray and rack mtd panels	✓	
Library	1000D	Library A - 1st Floor,	3	✓	AC Unit	12 SM 12 MM	Cable tray and rack mtd panels	✓	
Library	0206	Main Equipment Room	10	✓	Liebart CRAC Units	Fiber Hub	Raised floor and cable tray	Constrained	
Library	0447	Houses campus PBX		Small bus bar	AC Unit	-	Cable tray and wall mounted	✓	
College Activities Building (CAB)	218		4	✓	Portable AC unit	12 SM 12 MM	Cable Tray	✓	
College Recreation Center (CRC)	102A	Small Closet w/ wall mouted rack	1	Small bus bar	No active cooling	12 MM no SM	Limited	✓	
College Recreation Center (CRC)	132B	Small Closet with (1) wall mounted PoE switch	no racks	Small bus bar	No active cooling	24 MM	Limited	✓	Space doesn't meet minimum standards
Communications	212C	Building Remodeled in 2013	3	✓	Mitsubishi Split system	24 SM	Cable tray and rack mtd panels	✓	Mitsubishi AC unit not on generator
Seminar II PSC	E1114	PSC 1st Floor	2	✓	Supply duct with diffuser	12 SM 4 MM	Cable Tray	✓	
Seminar II PTS	B1108	Bldg B. PTS	2	✓	No cooling temp = 73°	12 SM 4 MM	Wall mounted racks and cable management	✓	
Seminar II A2	A2111	2A second floor	2	✓	Exhaust Fan	12 SM 4 MM	Cable Tray	✓	
Seminar II B2	B2111	2B Second Floor	2	✓	Exhaust Fan	12 SM 4 MM	Cable Tray	✓	
Seminar II C2	C2111	2C Second Floor	2	✓	Exhaust Fan	12 SM4 MM	Cable Tray	✓	
Seminar II C4	C4105	2C 4th Floor	1	✓	Exhaust Fan	12 SM 4 MM	Cable Tray	✓	
Seminar II D2	D2111	2D second floor	2	✓	Exhaust Fan	12 SM4 MM	Cable Tray	✓	
Seminar II D4	D4105	2D fourth floor	1	✓	Exhaust Fan	12 SM 4 MM	Cable Tray	✓	
Seminar II E2	E2111	2E second floor	2	✓	Exhaust Fan	12 SM 4 MM	Cable Tray	✓	

Building	Room	Notes	Racks	Grounding	Cooling	Fiber Backbone	Cable Management	Pathway	Other Issues
Seminar II E4	E4105	2E fourth floor	1	✓	Exhaust Fan	12 SM 4 MM	Cable Tray	✓	
Seminar I	3160	Shallow Closet	1	clamped to conduit	conductive cooling	MM only no SM	Wall mtd D-rings, and loose cabling	✓	New IDF needed for expansion
Central Utility Plant (CUP)	011A	Basement Shallow space, with wall mount rack	1	Small bus bar	No cooling	12 MM	Limited	Cable tray	
Lab 1	1065A	Art Lab	2	small bus bar	Mitsubishi Split system	12 SM 12 OM3	Cable Tray	✓	
Lab 1	2031	Small Space	1	small bus bar	No Cooling	MM only no SM	Limited	At Capacity	
Lab 2	2243A	Shallow Closet	1	✓	No Cooling	Not terminated in cabinet	Wall mtd D-rings, and loose cabling	Limited	
Lab 2	2245	Floor 2	2	✓	Mitsubishi Split system	12 SM	Cable tray and rack mtd panels	✓	Remodeled in 2014 drip pan for custodial sink in room above
Arts Annex	1113	1 wall mounted rack	1	✓	Mitsubishi Split system	24 SM	Cable Tray	✓	
Long House	1008B	Wall mounted rack	1	?	Ceiling vent 71° at front of rack	12 MM 62.5 12 OM4	Limited	At Capacity	
Childcare	109A	Wall mounted rack	1	small bus bar	No cooling, temp acceptable	6 MM 6 SM	Limited	Limited	
Housing Community Center (HCC)	113Z	Fiber hub for housing units Currently on emergency generator and newer UPS	2	small bus bar	No Cooling	12 MM (to Lib DC) 6 SM to PBX	Cable Tray and rack mounted vertical panels	✓	
MOD Laundry	320	Fiber Hub for housing, Contains switch for Mods shop Shared electric room	Wall Mtd. Equipment	?	No Cooling	12 MM to HCC	wall mounted equipment	Limited	
MOD Shops	102		Wall Mtd Cabinet	✓	No Cooling	6 MM only no SM	Limited	Limited	
Shops	127	Shared Electrical/Mechanical space with wall mounted rack	1 wall mtd rack up high	Clamp to conduit	Open Space	6 SM	cable tray	✓	

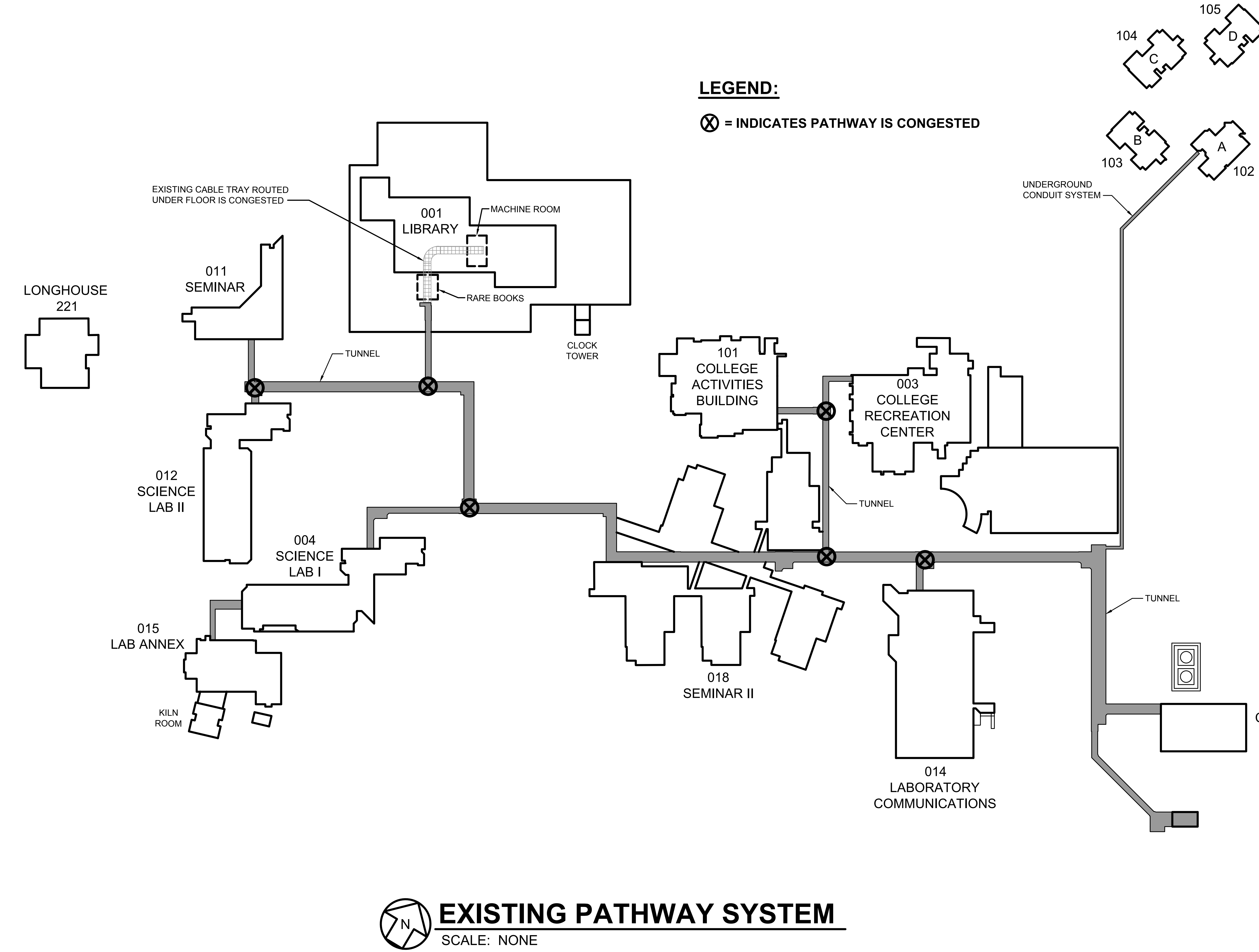
Building	**Room**	**Notes**	**Racks**	**Grounding**	**Cooling**	**Fiber Backbone**	**Cable Management**	**Pathway**	**Other Issues**
Farm House			-	small bus bar	No Cooling	4 SM	Limited	Limited	Existing enclosure will not accommodate larger switch
Farm Office		Wall mounted equipment	-	small bus bar	No Cooling	3 SM	Limited	Limited	
Ag Lab	109	Wall mounted rack	1	✓	Supply duct with diffuser	2 SM 12 MM	✓	✓	

Appendix D - Network Diagram

Proposed Network Overview



Appendix E - Site Pathways



EXISTING PATHWAY SYSTEM

SCALE: NONE

HARGIS PROJECT NO.	15084
DRAWN BY	AC
CHECKED BY	PR
REFERENCE DRAWING	
RELEASE DATE	6/20/2016
SKETCH TITLE	EXISTING PATHWAY SYSTEM
SKETCH NUMBER	

CRITICAL POWER, SAFETY AND SECURITY SYSTEMS PRE-DESIGN

THE EVERGREEN STATE COLLEGE

2700 Evergreen Parkway NW
Olympia, WA 98505

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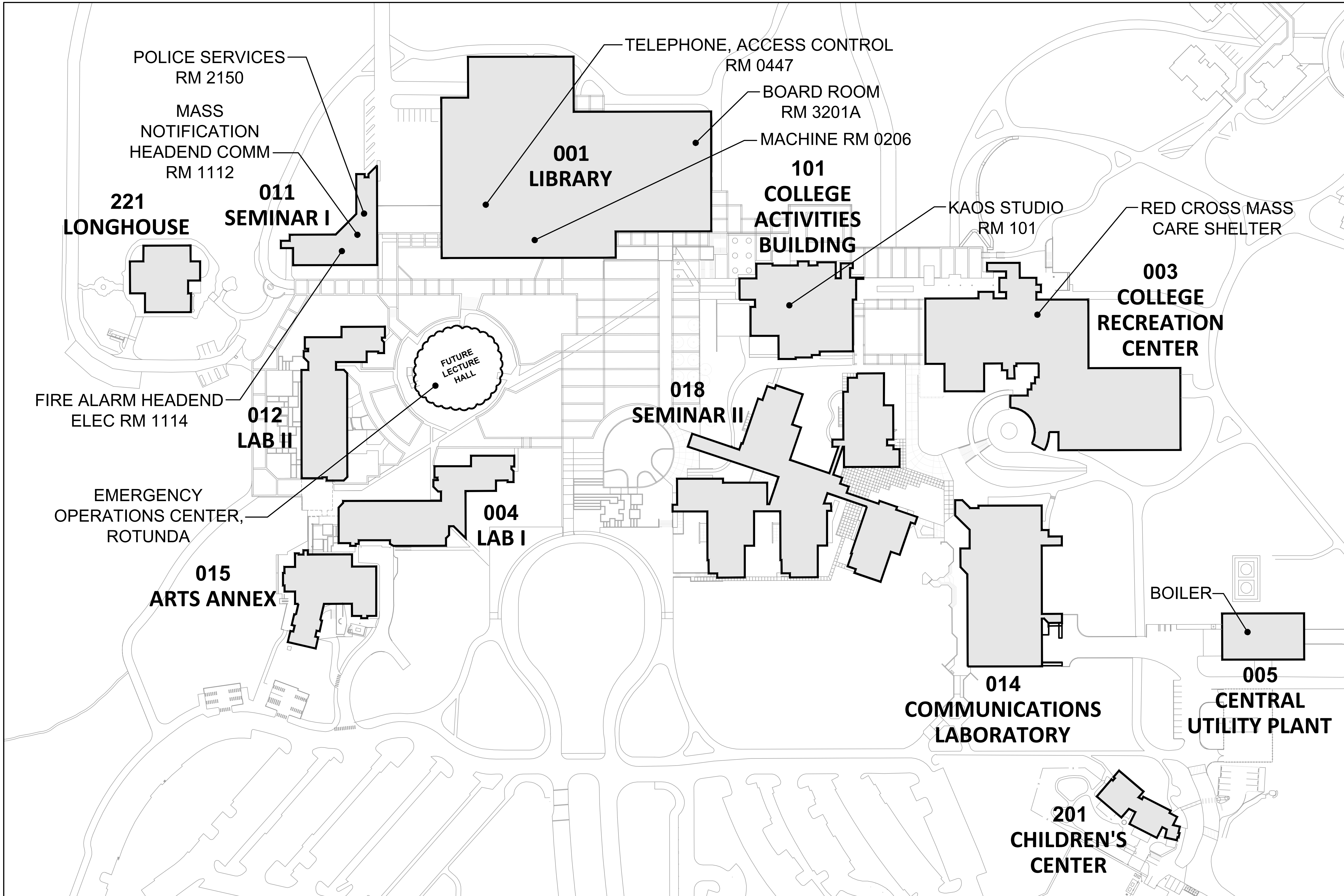
Appendix F - Critical Facilities



CRITICAL FACILITIES

SCALE: NONE

CRITICAL POWER, SAFETY AND SECURITY SYSTEMS PRE-DESIGN

THE EVERGREEN STATE COLLEGE

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HARGIS PROJECT NO.	15084
DRAWN BY	AC
CHECKED BY	PR
REFERENCE DRAWING	
RELEASE DATE	6/20/2016
SKETCH TITLE	CRITICAL FACILITIES
SKETCH NUMBER	

Appendix G - Non-Preferred Alternative: Campus Main Electrical Switchgear Installed in Underground Vault

Campus Main Electrical Switchgear Installed in New Switchgear Building vs. Below Grade Vault Comparison

System Overview:
Hargis compared the two options of installing new campus main electrical switchgear in a new building, above ground, in the same location that the existing switchgear sits and installing the switchgear in the below grade vault under the existing switchgear. If the switchgear were replaced above grade in a new building the same type of Metal Clad switchgear that is currently in use could be replaced in kind. Because of the limited space in the below grade vault a specific, proprietary, type of switchgear, referred to as Metal Enclosed switchgear, would need to be installed.

Below is a description of the criteria used to evaluate these options and some comments about the pros and cons for each option. A comparison matrix is also provided to supplement these considerations.

Equipment Construction: Type of equipment planned for installation –
The industry standard for medium voltage switchgear is Metal Clad switchgear which we believe to be the better choice here. Metal Clad switchgear utilizes vacuum circuit breakers as the overcurrent protection and Metal Enclosed switchgear utilizes fused load interrupters. Vacuum circuit breakers allow the option of servicing each protective device by disconnecting it from the bus while the bus is energized while the fused load interrupters would need to have a shutdown to de-energized bus for servicing. In the event of a fault the vacuum circuit breakers in the Metal Clad switchgear can simply be reset and the system should function normally. With the fused load interrupters at a minimum the fuses would need to be replaces, but the entire switching mechanism may also need to be replaced because they are not rated for full fault currents. In addition the vacuum circuit breakers are rated for 10,000 mechanical operations while the fused load interrupters are rated for only 500.

Cost: First cost of installation –
The first cost of installation is lower for the below grade vault option because the Metal Enclosed switchgear is less expensive than the Metal Clad switchgear. Most of the campus feeders will need to be extended to the new switchgear in the below grade vault, but the existing feeders could be re-terminated in the switchgear building option since the switchgear will be in the exact same location that it is currently installed. In addition a building to will be required for the above ground installation.

Life Cycle Cost: Total cost including maintenance for expected life of the equipment –
The life cycle costs are roughly the same for both options. The below grade vault option has a lower first cost because it utilizes Metal Enclosed switchgear as opposed to the more expensive Metal Clad switchgear. The maintenance is more difficult, and expensive, on the Metal Enclosed switchgear because of the front-to-back feeder connections and poor visibility of the termination points through infrared windows. In addition the Metal Enclosed switchgear would require a shutdown and possibly a complete section replacement to “refurbish”, while each

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security
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vacuum circuit breaker in the Metal Clad switchgear can be removed and refurbished without a shutdown or any effect to the system. With proper maintenance it is likely that the Metal Clad switchgear will have a longer usable life than the Metal Enclosed switchgear.

Site Impact: Impact to the site to accommodate construction and operation –
The impact to the site for each option is considered equal. Both options would include work in a restricted area that only qualified personnel have access to. The construction should not disrupt campus operations. Both options allow for a phased construction approach with minimal downtime for switching during construction.

Safety: Impact on electrical workers performing maintenance and/or operating equipment –
Work and maintenance performed inside the new switchgear building is safer than maintenance performed in the underground vault. The switchgear building would have egress routes at both ends and plenty of working space around the new switchgear. The underground vault allows for only one egress route into the tunnel system and limits the amount of working clearance for electricians. In addition work on the equipment in the below ground vault would be done on a platform that would introduce additional potential hazards. The Metal Clad switchgear allows thermal testing through infrared windows while one of the phases in the Metal Enclosed switchgear cannot be seen from the windows. This would require an electrician to open the energized Metal Enclosed switchgear to properly thermal test which is a safety concern at 12,470 Volts. Both areas would be secure and dry.

Electrical Availability: Ease of connecting to existing utility and campus feeders –
It will be easier to reconnect the existing feeders to the switchgear installed in the new switchgear building since it will be installed in the same location that the existing switchgear sits. The same core drills can be used and only new terminations will be required. In the below grade vault option many of the feeders would likely need to be extended to reach the new switchgear. The utility feeders will need to be replaced or extended to the new switchgear for either option.

Maintenance & Operations: Impact on long-term maintenance and operations of equipment and installation –
The maintenance of the Metal Clad switchgear in the above ground building is easier and more safe than the maintenance on Metal Enclosed switchgear in the below grade vault. Each vacuum circuit breaker in the Metal Clad switchgear can be disconnected and removed from the switchgear, while it is energized, through a remote racking system. To maintain or “refurbish” the Metal Enclosed switchgear a shutdown is necessary. As stated in the safety impacts the infrared windows in the Metal Clad switchgear allow for simple thermal testing while the Metal Enclosed switchgear would require the electrician to open the switchgear while energized to thermally test. This involves “hot work” procedures and wearing the proper personal protective equipment (PPE).

Constructability (Impact During Construction): Ease of installation of equipment –
The impact during construction to the campus is about the same for both options. A phased construction approach could be utilized with either option to allow the campus to remain energized while the new switchgear is being installed. Since the campus has redundancy, which

is typical, one set of the redundant feeders can be transferred to the new equipment while the campus is fed from the other set. A planned campus shutdown could then transfer campus power to the new equipment and the second set of campus feeders, not de-energized, could be connected to the new switchgear.

COMPARISON MATRIX - CAMPUS MAIN ELECTRICAL SWITCHGEAR INSTALLATION LOCATION

COMPARISON SCORING RANGE: 1 (NOT FAVORABLE) TO 5 (OPTIMAL)

COMPARISON CRITERIA	OPTION A - METAL CLAD SWITCHGEAR ABOVE GRADE	OPTION B - METAL ENCLOSED SWITCHGEAR IN VAULT	WEIGHTED MULTIPLIER	OPTION A - METAL CLAD SWITCHGEAR ABOVE GRADE	OPTION B - METAL ENCLOSED SWITCHGEAR IN VAULT
EQUIPMENT CONSTRUCTION	4	2	3	12	6
FIRST COST	2	4	4	8	16
LIFE CYCLE COST	3	3	3	9	9
SITE IMPACT	3	3	1	3	3
SAFETY	4	2	4	16	8
ELECTRICAL AVAILABILITY	4	2	2	8	4
MAINTENANCE & OPERATIONS	4	2	3	12	6
IMPACT DURING CONSTRUCTION	3	3	1	3	3
TOTAL:	27	21	TOTAL WEIGHTED:	71	55
RECOMMENDED OPTION	**OPTION A**			**OPTION A**	

<u>Evaluation Criteria</u>

Equipment Construction: Type of equipment planned for installation

Cost: First cost of installation

Life Cycle Cost: Total cost including maintenance for expected life of the equipment

Site Impact: Impact to the site to accommodate construction and operation

Safety: Impact on electrical workers performing maintenance and/or operating equipment

Electrical Availability: Ease of connecting to existing utility and campus feeders

Maintenance & Operations: Impact on long-term maintenance and operations of equipment and installation

Constructability (Impact During Construction): Ease of installation of equipment

Appendix H - The Evergreen State College Security and Life Safety Assessment

images courtesy of
The Evergreen State College

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SECURITY & LIFE SAFETY ASSESSMENT

01.13.15

prepared by

HARGIS

KMB design groups, inc. p.s.
architecture
education facilities group
justice facilities group
security design group

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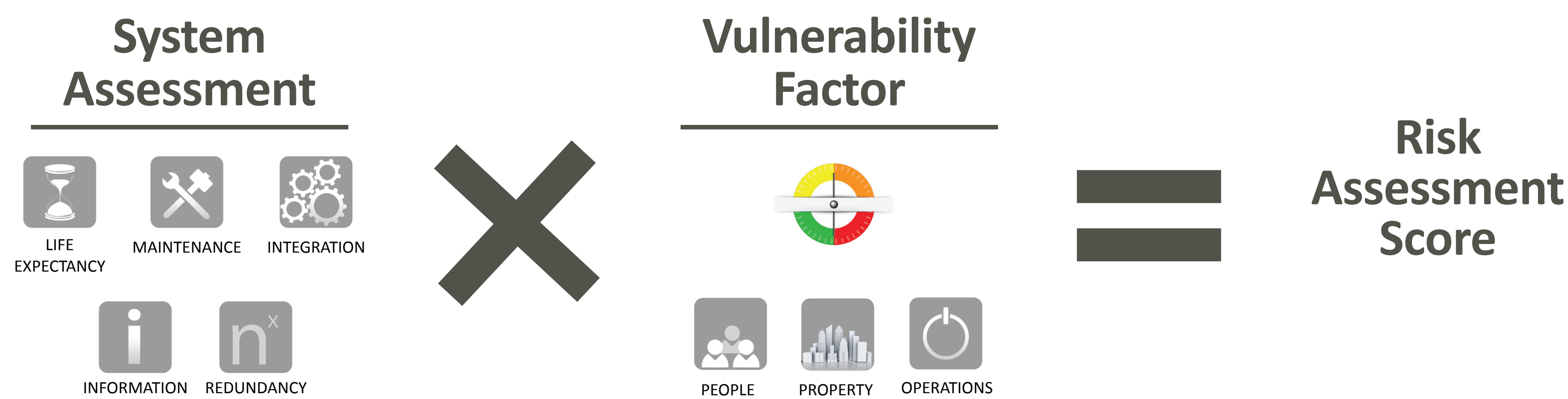
Executive Summary

The Evergreen State College (Evergreen), established in 1971, is examining the life safety and electronic security systems that serve its core academic and administrative buildings located on the upper campus. Evergreen commissioned a team of architects and engineers to conduct a system assessment that qualifies and quantifies system capabilities and maintenance criteria, and a method for assessing Evergreen's exposure to potential threats against people, property or continued operation as a result of one of these systems failing. From these combined scores, a risk assessment value was calculated to aid stakeholders in determining where to focus future capital investments.

What was measured

The systems evaluated were defined as those intended to process, transport, and provide the information necessary to identify threats, alert persons of an event, and initiate an appropriate response. The assessment was only at the system level. It was not a predictor of the likelihood of a threat, event or potential security concern; nor did it weigh one system assessment criteria over another as there are other interdependent systems not included in the scope of work, e.g. IT infrastructure. From the assessment, the following report was crafted that offers a narrative of each system's deficiency, assigns a risk assessment score and associated cost opinion for the recommended improvements.



Recommendations

It is the team's recommendation to prioritize opportunities to implement network-based technologies to enhance system performance and improve its ability to function as intended. The network-based systems present opportunities to leverage existing infrastructure to satisfy multiple objectives. We recommend Evergreen places an emphasis on aging systems and systems with severe maintenance and support concerns. These systems are impairing Evergreen's ability to accurately and effectively process the information available from these systems.

The recommendations include budgetary cost estimates for the proposed system enhancements or replacements. The cost estimates are presented as a range, as within each there are options to address discrete issues or complete larger scale projects in phases.

SYSTEM	RISK ASSESSMENT SCORE	COST OPINION
Fire Alarm	112.0	$ 890,000
Police Services Dispatch	104.0	1,160,500 - 1,239,000
Radio Systems	72.0	65,000 - 345,220
Access Control	60.7	1,449,745
Emergency Notification	58.5	312,938 - $395,438
Alarms: Panic/Duress, Motion, Pilfer, Tamper	58.0	181,800
Video Surveillance	27.0	239,815
Emergency Telephony	20.8	161,370

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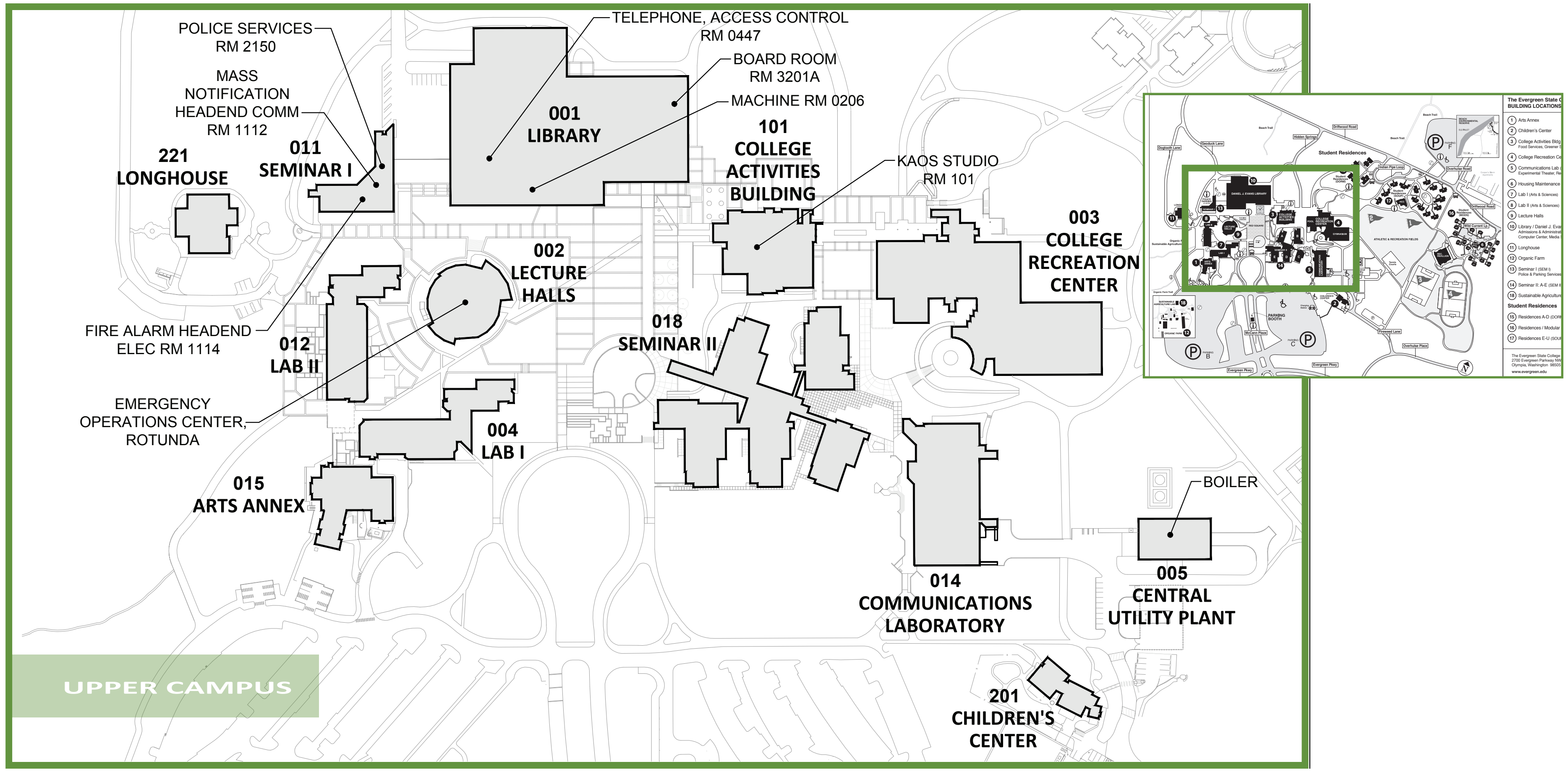
Background & Objectives



Intent

Evergreen, in their continued commitment to provide a safe and secure environment for students, staff and faculty, has engaged with Hargis Engineers and KMB design groups to complete a comprehensive study and risk assessment of the college's electronic life safety and security systems.

For the purpose of this study, electronic security systems are considered to be any equipment, material or software that uses electrical current to protect persons or property. The assessment process and methodology is intended to provide an overall assessment of the systems and is not intended to be a predictor of the likelihood of threats, events or other potential security concerns.

Systems

The study focuses on the following electronic safety and security systems and does not directly address operational, network or other physical security concerns or issues.

- Fire Alarm
- Access Control
- Alarms: Panic/Duress, Motion, Pilfer, Tamper
- Emergency Notification
- Video Surveillance
- Telephony
- Radio Systems
- IT Infrastructure
- Police Services Dispatch Center monitoring systems

Scope

The purpose of the assessment is to assist Evergreen with identifying deficiencies and vulnerabilities with the existing electronic security system; and establish a framework for prioritizing projects and future capital funding requests. The other objectives of the study are:

- Review, assess and evaluate the electronic security and life safety systems currently present on the upper campus
- Identify the capabilities, deficiencies and vulnerabilities of each system
- Assess the associated risks with the systems
- Provide recommendations for capital projects to enhance, expand, replace, or integrate security and life safety systems
- Identify the budgetary costs[1] for the recommended projects
- Establish a framework for determining which systems are the most vulnerable and should be the priority for future projects and capital funding requests

1 *Cost opinion excludes sales tax, soft cost and escalation costs*

Assessment

SCOPING & ASSESSMENT

Define

- Identify Stakeholders
- Project Scope & Requirements
- Current Standards
- Current & Future Capital Projects
- Survey Existing Conditions to Ascertain
  - Physical Inventory
  - Document Existing Conditions
- Gather Information through Stakeholder Interviews
  - Current Systems' Operating Sequence
  - Functional & Operational Objectives
  - Known Deficiencies & Vulnerabilities
  - Support & Maintenance Issues

Qualify

- Collect Record Drawings
- Code Compliance Review
- Review of Existing Documentation
  - Cameras
  - Alarms
  - Campus Fiber
  - Evergreen's Natural Hazards Mitigation Plan
  - Comprehensive Emergency Management Plan
  - Emergency Operations Plan
  - Emergency Response Handbook
  - Business Continuity Plans
  - Master Plan
- Determine Assessment Criteria & Methodology
- Identify & Assess Potential Threats & Risks

Quantify

- Develop Matrix for Rating System Performance
- Develop Framework for Measuring Vulnerability
- Assign Risk Ranking
- Calculate Risk & Rank Each System
- Develop Recommendations
- Establish a Rough Order of Magnitude & Cost Opinions

Qualifying & Quantifying

To effectively assess the eight systems that comprise Evergreen's security and life safety systems, it was important to develop a common framework to qualify and quantify each system's resilience and reliability to perform its intended function in the time of an event. Systems were rated based upon their capabilities to provide, process and transport information necessary to identify a threat and appropriately alert dispatchers, respondents and occupants of an event and its severity. The system assessment value was calculated as the summation of five criteria to quantify the probability of system failure. Additionally, the systems were evaluated on their ability to document the event for forensic efforts and prosecution, as applicable.

Systems were also ranked with regard to the risk of the consequence that could potentially occur should the system fail or not perform adequately. Quantified as the "vulnerability value," these ratings offer a means to a measure of the vulnerability a system may have in effectively mitigating a threat against persons, property and/ or operations. Then calculated as the "vulnerability multiplier" these perceived threats were quantified according to the severity each presents in comparison to each other, and then multiplied by the system assessment score to quantify the potential risk. The quantified information is followed by a narrative that describes the systems' current capabilities and functions, and lists deficiencies identified during the assessment process.

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Methodology

The methodology used to calculate a system's risks is a derivative of the classic risk assessment evaluation where risk has a direct relationship to vulnerability and probability of system failure. This is a commonly used methodology to assess risks and systems, develop security policy, procedures and action plans and is used by organizations such as the Office of Homeland Security, Sandia National Laboratory, Federal Emergency Management Agency, and the Environmental Protection Agency. The primary focus of this assessment is to identify options for Evergreen to reduce risk by reducing vulnerability through addressing security systems weaknesses, limitations or deficiencies.

The methodology employed to evaluate systems and associated risks is used for the sole purpose of assisting Evergreen with assigning a relative importance and setting spending priorities for capital projects. It is not to be considered a predictor or indicator of the likelihood or severity of specific security threats.

Probability of system failure was determined by assessing the current electronics safety and security systems' capability and assigning values from 1 to 5 for each of the assessment criteria listed. The system assessment total value provides a measure of the reliability a system may have in effectively preventing an event or protecting persons, property and operations from an event, threat or hazard.

	SYSTEM ASSESSMENT CRITERIA						VULNERABILITY VALUES				
	1 = no deficiency .... 5 = multiple, serious deficiencies					F= SUM (A:E)				J= AVG (G:I)	
	A	B	C	D	E		G	H	I		F*J
SYSTEM	AGE & LIFE EXPECTANCY	SUPPORT MAINTENANCE	INTEGRATION	REDUNDANCY	INFORMATION	ASSESSMENT CRITERIA TOTAL	LIFE OR PERSONAL SAFETY	PROPERTY LOSS	IMPACTS TO COLLEGE OPERATIONS	MULTIPLIER TOTAL	RISK ASSESSMENT SCORE
FIRE ALARM	3	3	3	3	4	16	7	7	7	7.00	**112.0**
POLICE DISPATCH	2	2	3	3	3	13	8	8	8	8.00	**104.0**
RADIO SYSTEMS	2	2	4	3	2.5	13.5	6	4	6	5.33	**72.0**
ACCESS CONTROL	2.5	3	2.5	3	3	14	3	6	4	4.33	**60.7**
EMERGENCY NOTIFICATION	2	2.5	3.5	3	2.5	13.5	6	2	5	4.33	**58.5**
ALARMS	2.5	3	3	3	3	14.5	4	5	3	4.00	**58.0**
VIDEO SURVEILLANCE	2.5	2	4	2.5	2.5	13.5	1	3	2	2.00	**27**
EMERGENCY TELEPHONES	2	2	3	2.5	3	12.5	2	2	1	1.67	**20.8**

System's Condition & Capabilities Assessment Criteria

Age and Life Expectancy: How old is the system? What is the system's anticipated life expectancy?
1 = >8 years, 2 = 6-8 years, 3 = 3-5 years, 4 = 1-2 years, 5= 0 years

Support and Maintenance: How easy or difficult is the system to support, operate and maintain? Is the system currently supported? Is it current technology? Are parts and service still available? Is it reliable or prone to failure? Does it require special and hard-to-find skills to maintain? Does the manufacturer still support the system?
1 = replacement parts available .....5= no longer supported

Integration: Can the system be integrated so that it can operate with other security or IT systems? Can investments in existing network infrastructure be leveraged to implement or expand the system? Can the network be used to support resources to help support and maintain the system?
1 = fully integrated network application .....5 = stand alone

Redundancy & Fault Tolerance: Are there backup resources in case of system failure? Are there redundant features to prevent outages or system interruptions? Are there single points of failure within the system?
1 = fully redundant or backup system ......5 = no backup

Information: How effective is the system in providing, processing, transporting or displaying information from security devices or equipment? Is the information reliable and accurate? Is the information complete and does it provide enough information to allow Evergreen's staff, students and faculty to properly assess the situation and respond accordingly?
1 = complete and timely distribution ......5 = not reliable or accurate

Vulnerability Values

To rate the systems' vulnerability, threats were identified and categorized into three groupings for this assessment:

- Life and personal safety
- Loss of property
- Impacts to operations

A system's vulnerability to a specific threat was ranked in comparison to the other systems evaluated. The systems were ranked on a scale of one to eight. The evaluation took into consideration the importance of system's role in preventing, deterring, or limiting the consequences associated with the threat and the severity should the system fail to perform adequately. A high value indicates a system that provides a critical level of protection, and low value equates to little or no risk that could be associated with that system's performance.

From these ratings, a vulnerability multiplier was calculated as an average of the three categories' score. The multiplier value is applied to the system assessment score and the result provides an overall risk assessment score for that system. The risk assessment score is intended to provide Evergreen with a framework to aid in determining which systems are the most critical to the security and life safety objectives. The results of the assessment can be used as a means of focusing and prioritizing funding efforts, and capital projects requests.

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Fire Alarm
system assessment

112.0
SCORE

LIFE EXPECTANCY

MAINTENANCE

INTEGRATION

REDUNDANCY

INFORMATION

Existing Conditions

Evergreen's fire alarm system is configured as a proprietary supervising station per NFPA 72 (detailed on the following page) with all campus fire alarm signals reporting to Police Services Dispatch Center in Seminar 1 building. The fire alarm systems consist of conventional and addressable fire alarm control panels, summarized in Table 1, which are networked together and report to the Dispatch Center. The existing system topology is a networked system that utilizes both copper and optical fiber.

System field devices consist of a mix of smoke and heat detection, manual pull stations, duct smoke detection, as well as the fire sprinkler systems. Some buildings' fire alarm devices also monitor non-fire alarms like panic buttons at point-of-sale stations or system failure alarms in lab buildings.

Each building of the Evergreen's main campus that currently has a fire alarm panel also has existing telecommunications optical fiber cabling in the building telecommunications room. The existing facility telecommunications infrastructure has multi-mode optical fiber cabling available for fire alarm system use.

FACP LOCATION	FACP MFR	DEVICE REPORTING	NETWORK REPORTING	NOTIFICATION
Seminar I Lecture Hall Lab I	Autocall	Conventional/ Zone	Zone/Copper	Speaker
Lab II Longhouse Library Arts Annex Seminar II CRC	EST-3	Addressable	Zone/Copper	Speaker
College Activities Building Communications Laboratory Central Utility Plant	EST-3	Addressable	Addressable/ Fiber	Speaker
Children's Center	Quick Start	Addressable	Zone/Copper	Horn

Table 1

The campus is served by the McLane Black Lake fire department with the Headquarters Station 91 located less than two miles from the campus on Delphi Road Northwest. The station is staffed 24 hours a day, seven days a week. Evergreen is also served by station 92 on 36th which has a faster response time than station 91 to most of campus.

Noted Deficiencies, Risks & Recommendations

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
INFORMATION	Fire alarm panels provide inaccurate and incomplete information being communicated to the Dispatch Center. Fire alarm devices are not programmed correctly and report alarms in one area of the building when the device is located in a different area. Annunciator panels located on the exterior of buildings are not functioning (non-code compliant) or do not provide all of the information that is available from the fire alarm system.	Delay in proper response from the Fire Department	Update Annunciator Panels in buildings to display accurate information and/or add annunciators to locations accessed by the fire department.	Provide new addressable annunciators at entrances and/or fix the existing annunciators so they are working properly Test and retro-commission existing systems to verify accurate information is being relayed	
INTEGRATION	Utilizing new panels with conventional style relay monitor modules and older copper wiring between buildings, reporting to the NFPA proprietary supervising station on campus via zone outputs from the addressable panels. The existing copper network operates under a one-way communication set up. It does not allow the network to acknowledge, clear or silence alarms.	It has the possibility of a single point of failure, and in some cases monitoring deactivated fire alarm zones.	Upgrade existing EST-3 panels with network interface modules to connect to the fire alarm panels into the existing fire alarm optical fiber network Upgrade the campus fire alarm system connections to a redundant optical fiber cable loop.	Provide new network cards in existing fire alarm panels Extend existing campus optical fiber backbone cabling to all building fire alarm panels	Fire Alarm Upgrades $390,000
	Voice and mass notification systems, activated by the Dispatch Center, are not integrated.	Unable to support the system, and cannot clear or acknowledge signals from the panel			
	A portion of the optical fiber network is using a single fiber pair and not part of a token loop that reports back to the Police Services Dispatch Center.	If the fiber link is damaged or non functional, the dispatch center will not be able to monitor the fire alarm or receive status and alarm information	Repurpose existing and unused multi-mode fiber [see diagram] Relocate existing workstation to Central Utility Plant for maintenance		

Fire Alarm
system assessment
(continued)

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
MAINTENANCE	Three of the existing fire alarm panels are greater than 20 years old and replacement parts are no longer manufactured or commercially available. The monitoring workstation in the Dispatch Center can no longer receive software updates.	Unable to replace cards or parts manufactured for these systems. If the cards fail, the entire system will fail and no longer function.	Replace Existing Autocall Fire Alarm Panels in Seminar I, Lab I and the Lecture Halls building	Install new EST-3 addressable panels and associated devices Replace existing wiring with new wiring Connect the new fire alarm panels into the existing fire alarm optical fiber network	$500,000
	Alarms that are not fire alarm devices but are monitored by the fire alarm system.	See Alarms section for risk, recommendations, scope and costs			

It is also worth noting that operating a proprietary supervising station is governed by NFPA 72 requirements. Any future modifications should comply with these requirements:

Access to monitoring station shall be restricted
(Ref. NFPA 72 – 26.4.3)

Fire extinguishers shall be provided
(Ref. NFPA 72 – 26.4.3.3)

Emergency lighting shall be provided
(Ref. NFPA 72 – 26.4.3.4.3)

A recording device (i.e. printer) shall be provided in addition to audible and visual alerts
(Ref. NFPA 72 – 26.4.4.2.2)

At least two (2) operators shall be on duty at all times
(Ref. NFPA 72 – 26.4.5.1)

Indication of a fire alarm signal shall be promptly re-transmitted to the public fire service communications center
(Ref. NFPA 72 – 26.4.6.3)

Upon receipt of fire alarm signal, restore the system as soon as possible after disposition of cause of alarm signal
(Ref. NFPA 72 – 26.4.6.6)

Records of all signals shall be retained for at least one year
(Ref. NFPA 72 – 26.4.7)

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Police Dispatch
system assessment

104.0
SCORE


LIFE EXPECTANCY


MAINTENANCE


INTEGRATION


REDUNDANCY


INFORMATION

Existing Conditions

Evergreen operates a fully-functional police department with the same enforcement authority and training as any city or county police department in the state of Washington. Police Services provides police and emergency communication 24 hours, seven days per week with a staff of five communications officers, and eight police officers certified by the State of Washington and commissioned by The Evergreen State College Board of Trustees. The Dispatch Center, located in the Seminar I building, has direct access to state law enforcement computer databases, the Thurston County E911 Center (TComm), and all on-duty police, parking, and residential and dining services staff. Police Services dispatch center also has a walk-up customer service window and functions as the campus operator.

The campus life safety and security systems are monitored in the Police Services dispatch center. The dispatch center receives notifications and alarms through the Edwards FireworX® Fire Alarm system and the Millennium® access control system. These alarms include panic buttons, motion sensors, AV pilfer alarms, elevator and emergency telephones, video surveillance cameras, fire alarm and access control systems.

The Dispatch Center serves the entire campus and contains two operator stations. Each station includes two LCD displays with a 6 x 8 array of live video camera images. One display is fixed and the other is adjustable.

Each dispatch station also includes: one police and one console phone set; a dispatch PC, display and speakers; KVM switch to switch the display and keyboard between PC's; and radio console with microphone for police, maintenance and housing radio systems

The Edwards Fireworks graphical command station is located at the Dispatch station #1 and the Giant voice PC with push to talk interface is located at station #2. The Library panic button annunciator is mounted on the side of casework located behind the dispatch stations along with an Edwards EST fire alarm system annunciator panel. The Millennium Access Control system reports and alerts then appear on the Dispatch PC display.

If a panic button is pushed on campus, the speakers at the dispatch station provide an audible alert and a pop-up display appears on the screen identifying the button was pressed. The Dispatch operator can call the location using the phone to establish voice communication with the staff that pressed the button. A lockdown procedure can be initiated at the Dispatch center. Upon activating a lockdown, all exterior doors on the campus are locked.

The Emergency Operations Center (EOC) located in the lobby of the Lecture Hall building contains a mobile cart with base stations and battery backup for the Police Services and Maintenance radio systems. The base station can be connected to an antenna mounted to the Lecture hall roof to provide temporary radio service in the event of an emergency or if the Police Services Dispatch Center is not able to operate. The system provides adequate radio coverage to the upper campus but does not have enough power to reach all of the lower campus. The Police Services Dispatch telephone lines can be rerouted to the EOC so all calls from emergency telephones, elevators and other calls to Police Dispatch can be answered at the EOC.

Noted Deficiencies, Risks & Recommendations

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
INTEGRATION/ INFORMATION	The current system includes separate displays and consoles to monitor and control the separate life safety and security systems (video, access control, sensors, fire alarm, etc.), requiring operators to manually toggle between the separate systems.	The variety of systems, displays and complexity of the user interfaces can lead to human error and fatigue, resulting in missed alarms and slower response times.	Integrate monitoring and alerting systems in Police Services Dispatch Center	Implement a Physical Security Information Management (PSIM) system in Police Services Dispatch Center to integrate the separate security systems and present the information from these systems using a single comprehensive user interface	$375,000 + 20% of cost for annual maintenance contract ($75,000 base plus add-ons for each system: video surveillance, fire alarm, access control, intrusion detection and panic)
	Alarms are inconsistently reported and may be ignored	Emergencies or events may not be identified and ability to respond effectively may be impacted.			
	The access control system does not support reporting alarm location on map displays in Police Services Dispatch.				
REDUNDANCY	The Police Services Dispatch Center contains systems and equipment with single points of failure and backup facilities do not provide complete set of functions and services.	If the Dispatch Center goes down or is severely impaired, the ability to monitor electronic safety and security systems is impacted, as is the ability to properly respond.	Develop options and strategies for providing backup services or facilities to facilitate disaster recovery and business continuity, and reduce time required to restore dispatch center services and functionality.	Incorporate critical functions of Dispatch Center into space and infrastructure for planning and design of future Emergency Operations Center or Incident Command Center that can provide backup dispatch capabilities.	
				Implement critical applications using cloud-based systems or outsource services	Per month cost: $300 per server, 5 servers X $300 = $1,500/month
				Implement critical applications on private virtual server platform consisting of: Mid-size storage area network 2 physical hosts Core network switching	$80,000
LIFE EXPECTANCY	Space is limited in the current Police Services Dispatch Center	Less effective detection and response to emergencies, events and potential threats.	Plan for, program, and incorporate a new space for Police Services Dispatch Center in future building construction or renovation.	Identify a larger space that can support the current Police Services Dispatch Center supported programs, as well as the flexibility to adapt as technologies change and advance.	$400/ SF for physical space including: dispatch center, administrative offices, support spaces, dedicated electronics space for housing system head end equipment 1,960 GSF = $784,000

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Radio
system assessment

72.0
SCORE


LIFE EXPECTANCY


MAINTENANCE


INTEGRATION

REDUNDANCY


INFORMATION

Existing Conditions

Multiple radio systems are currently operating on the upper campus. Evergreen maintains the repeaters and FCC radio licenses for the systems they own and operate.

There are two separate UHF systems for maintenance staff radios which operate in the 400 MHz range and share an FCC license. The simplex system provides coverage above ground and the duplex system operates below ground. The maintenance system radio signals are transmitted using a central amplifier and leaky coax cabling in the tunnels. The systems perform acceptably in the tunnels, mechanical rooms and within the upper campus buildings except Seminar 2 and portions of the CRC building. The maintenance radios can be used to communicate with Police Services and request assistance. There is a third UHF radio system for parking enforcement which includes an antenna located on the clock tower that provides adequate coverage to the outdoor spaces.

The Police radios operate on a 150 MHz VHF full duplex system using an antenna mounted on the clock tower in Red Square. The service is adequate to outside areas but does not provide coverage to building interiors. A study was completed to identify options for improving coverage and plans are in place to implement an additional antenna and voting receivers.

Campus Police patrol cars are equipped with a Multi-use Radio System (MURS). The MURS system provides a Verizon data service for laptop computers which is integrated with the Thurston County Sheriff's Office IT systems.

Police Services radios also use channels on the Thurston County Sheriff's radio system to call for backup and coordinate multi-agency response efforts. However, the Thurston County Radio (TCOMM) system does not operate inside the buildings. The McLane Fire Department also uses the TCOMM system and has similar issues with radio reception inside of campus buildings.

The Police Service Dispatch Center includes two desktop radio consoles for making and monitoring calls on each of the campus channels. The console units include a keypad and LCD to display incoming calls, speakers and microphone.

Noted Deficiencies, Risks & Recommendations

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
INFORMATION	There are areas on the campus, including the interiors of some buildings, which do not have adequate coverage from the existing radio systems.	Limits the ability to report events or potential threats, communicate the appropriate action and respond accordingly.	Improve UHF, VHF radio to coverage to buildings with poor signal strength	Add repeater antenna and cabling	$15,000 per building per band
INFORMATION	Public safety radio systems, used by Campus Police, Thurston county sheriff, fire and other public safety organizations do not work consistently inside buildings.	Incomplete coverage may hamper efforts and effectiveness, and ability to respond to emergencies in timely fashion	Install Distributed Antenna Systems (DAS) systems in new buildings and retrofit existing buildings	System includes: exterior donor antenna bi-directional amplifier cabling interior omni-directional antenna	$80,000 - $100,000 per building
			Establish partnership with TCOMM to improve public safety radio systems	Fiber or microwave backhaul, repeater and licensing	$200,000
INTEGRATION	Existing campus UHF radio systems operate as independent systems	Creates a more complex system to operate and maintain	Consolidate UHF maintenance radios into single system	Large single repeater split between above and below ground systems, new antenna, cabling and licensing.	$50,000

the evergreen state college

Access Control
system assessment

60.7
SCORE


LIFE EXPECTANCY


MAINTENANCE


INTEGRATION


REDUNDANCY


INFORMATION

Existing Conditions

Evergreen currently employs the Millennium Access Control System to control access and monitor 400 exterior and interior doors on the campus. The system is intended to protect persons and property by preventing unauthorized access to secured spaces. The system includes door controllers, card readers, power supplies, cabling, database, and electronic door hardware. The system reports if doors are left open or forced open and also monitors and reports a variety of panic and other alarms. The Millennium system is capable of implementing an emergency lock down from the Police Services Dispatch Center which automatically locks the exterior doors of all the buildings on the upper campus. The system was first deployed in 2007 as a proof of concept but has become a more permanent solution over time.

The access control system also monitors and controls approximately 40 classroom doors, including some of the science classrooms. The science classrooms are configured with a toggle function which unlocks the door with the swipe of a card, and relocks it when the card is swiped again. The toggle function is implemented using hardware-based solution with relays.

Evergreen is interested in expanding access control to all classrooms and integrating access control with the student registration and class scheduling applications to automate the process of authorizing and granting student access to science labs, art facilities, practice rooms, and other instructional spaces. However, integrating access control with other campus applications is an expensive and complex project that Evergreen may wish to consider in the future if and when funds are available.

Noted Deficiencies, Risks & Recommendations

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
MAINTENANCE	The Millennium system is a proprietary system, requiring a third party vendor to maintain, modify or expand the system and its capabilities.	The limited functionality impairs the system's ability to identify actual threats or security breaches, and restricts the ability to expand and enhance the system's capabilities	Replace Millennium Access Control System	Provide an IP-based, network-enabled access control system capable of integrating access control, alarm monitoring, video surveillance and other monitoring capabilities. Replace door controllers and integrate with replacement solution Leverage investment in existing electronic door hardware, card reader, cabling and security devices, power supplies and network infrastructure.	$770,000 + $1,200 annual service contract
INFORMATION	Some of the existing door controller modules are not located in secure spaces and are more vulnerable to tampering and unauthorized access.				
INTEGRATION	The Millennium system is network enabled and can be access via the campus Ethernet network, however the serial door controllers are not network-based devices. This architecture limits the system's flexibility to be easily expanded and its ability to be integrated and operate with other systems.				
	Most classrooms are protected by traditional key locks.	Creates risk that doors may be intentionally or inadvertently left unlocked and increases the possibility of property loss.	Add access control to classroom doors	Electronic door hardware, door controllers, cabling, and programming.	$5,000/ door Approximately 100 classroom doors. 100 x $5,000 = $500,000 + 25,000 Integration costs
MAINTENANCE/ INFORMATION	The ADA push buttons are not well coordinated with the electronic doors. The ADA button is able to unlock a door and allow entry into the building when the door is in the locked state.	Unauthorized access and breach of security	Coordinate ADA push button with access control policy and system function	Review current door controller programming and reconfigure to operate correctly	$25,600 total assumes 32 doors x $800/ door
	The access control system cannot be programmed to allow only certain card holders the ability to unlock and leave unlocked the science lab doors. As a result, any card holder with access to the science labs can unlock the door and leave the door in an unlocked state indefinitely.	Increased potential for property loss	Limit swipe to unlock, swipe to lock feature to authorized users	Remove non-standard hardware and install secondary door controller and reader at 32 doors	$44,800 total assumes 32 doors x $1,400/ door

Access Control
system assessment
(continued)

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
	Access control server operates over network. In a power failure, the server cannot communicate with doors and features such as lock down cannot be implemented	Increases risk to personal safety	Install Uninterruptible Power Supplies for all network switches	Add 2KVA UPS with extended runtime options to 40 IDF rooms	$1,500 x 40 = $60,000
	Not all critical facilities or doors to key administrators and staff can be automatically locked in an emergency. The automatic lockdown may not be working properly at all exterior doors There are always a few doors that do not latch due to malfunction, air pressure that is too high in the building, closers that are not properly maintained and even debris in the threshold.	Increases risk to personal safety, property loss and interruption to operations	Verify all doors operate as intended and add auto locking to doors not currently equipped with that function. At a minimum this should include all critical facilities, exterior doors, key staff and administrators' offices	Identify all doors that need to be locked during an emergency. Complete a comprehensive audit of the door and test to verify operation. Add electronic hardware and lockdown capability to doors where required.	Inventory and assess doors $20,000 Additional door hardware and access control = $5,000 per door

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Emergency Notifications
system assessment

58.5 SCORE


LIFE EXPECTANCY


MAINTENANCE


INTEGRATION

REDUNDANCY


INFORMATION

Existing Conditions

In accordance with the 2008 CLERY Act, Evergreen uses a variety of methods and technologies to generate and distribute notification of delays, closures or other emergencies throughout the campus. Messages are announced on outdoor public address (PA) speakers in the upper campus and lower campus areas. Students and faculty can sign up to receive weather and emergency text messages and email alerts using the free e2Campus service. Information is also distributed on local TV and radio stations, digital signage displays, the college website, and on an information hotline.

The upper campus outdoor emergency notification system includes nine mass notification speakers mounted on top of the blue emergency phones and five speakers mounted on the Lecture Hall roof. A separate "Giant Voice" outdoor public address speaker system provides coverage for the lower campus outdoor spaces. The upper campus outdoor speaker system head-end is located in Communications Room 112 in the Seminar 1 building. The head-end consists of wall mounted panels containing amplifiers, relays and power supplies. The system is backed up by a UPS and the building emergency power generator providing a total of 24 hours of operation. Announcements from the outdoor emergency notifications system are made from the Police Services Dispatch Center. A single message can be announced simultaneously over both the upper and lower campus' outdoor PA systems.

Evergreen is evaluating a network-based software product from Alertus Technologies that can provide a common interface to integrate the various notification systems and extend notification to other network devices such as personal computers. The Alertus software can be run on a virtual server platform and is accessed using a free web-based client interface. The system can provide in-building notification using a wall-mounted network beacon device that includes a strobe for visual notification, sounder for audible notification and an LED display for text messages. The Alertus system can use pre-scripted text messages and supports custom text messaging and live announcements. The beacons can be connected to the campus network using standard network cabling for data and power services. The Alertus system also supports text-to-speech modules which can provide an interface to fire alarm and other public address systems so that the voice notification can be synchronized and consistent.

Noted Deficiencies, Risks & Recommendations

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
INTEGRATION	Current emergency notification system consists of several separate notifications systems each operating independently and requiring separate messages and control.	There is a potential for miscommunication and confusion as a result of inconsistent, incomplete and/ or inaccurate information relayed through the messages.	Implement Alertus Unified Notification system	Configure and expand the Alertus system to include existing infrastructure and applications including: e2campus and desktop computers	$5,000 operational costs to implement and configure Alertus software application + $50 per end point to update computers and test configuration
INFORMATION	Existing mass notification systems do not provide complete coverage to interior spaces	Increases possibility that announcements and information are not received or directions are not understood completely.	Add Alertus Text-To-Speech Modules	Add one each text-to-speech module at interface to fire alarm system and outdoor PA system	Text to speech module $5,000 each $5,000 x 2 = $10,000 plus $2,000 integration = $12,000
			Add Alertus Beacons	Add Alertus Emergency Notification beacons and associated network infrastructure	Beacons at $1,500 each Coverage Options Basic: 20 beacons. $30,000 Comprehensive: 45 beacons $67,500
	Emergency notification systems do not fully address needs of the hearing impaired	Persons with hearing disabilities may not recognize emergencies or receive all the necessary information	Implement flat panel displays in classrooms to provide visual notification and emergency response information	Flat panel displays, mount, and network encoders in 125 classrooms, and associated cabling	$1500/each classroom 125 X $1500 = $187,500
	Classroom AV systems are not automatically muted during fire alarms or other emergency notifications	Alarms and announcements may not be heard or occupants may receive incomplete information	Configure fire alarm system to mute classroom AV systems during alarms or emergency announcements	Deploy contact closure to all classroom AV systems using a addressable loop devices. Program existing AV control panel to mute amplifier during emergency announcements	Contact closure, cabling and programming $600/classroom $600 X 125 classrooms = $75,000

Alarms
system assessment

58.0 SCORE

LIFE EXPECTANCY

MAINTENANCE

INTEGRATION

REDUNDANCY

INFORMATION

Existing Conditions

The set of alarms points currently monitored by the electronic security systems includes:

- Panic buttons
- Pilfer alarms
- Motion detectors
- Central Utility Plant (CUP) boiler and Lab freezers
- Millennium tamper switches
- Fire Knox boxes
- Door contacts

With the exception of the CUP boiler and Lab freezers, the alarm points are monitored at the Police Services Dispatch Center using a variety of systems and displays including the Millennium access control, GE NetworX security and Edwards fire alarm systems. The CUP boilers and the Lab freezer alarms are activated by contact closures and are monitored locally by the CUP and Lab staff.

Panic/duress buttons are currently installed in point-of-sale locations, and administrative and counseling offices in the CAB, Library and Seminar 1 buildings. The panic buttons in the counseling offices in the Seminar 1 building report through a custom in-house system. The library panic buttons and the CAB motion detectors operate on a GE NetworX intrusion detection system and annunciate through a separate panel in the Police Service Dispatch Center. All of the other panic buttons, report through relays on the fire alarm system.

The motion detectors, pilfer alarms, tamper, and door contacts report through the Millennium system.

Motion detectors are dual technology Passive Infrared (PIR) and microwave sensors and trigger alarms when warm moving bodies are identified in secured spaces. They are located in the CAB and Library buildings, book store, food services, musical instrument Check-out, and other spaces with high value property.

The pilfer alarms are intended to protect AV equipment and high cost equipment from theft and are triggered when equipment is disconnected or moved. The door contacts are intended to send an alarm when locked doors are forced opened. The cabinets housing automated external defibrillator (AED) in CAB building are monitored and report to Police Services. The intent is to alert Police Services when the cabinet containing the AED equipment is opened, identifying a potential life safety event. The rest of the AED cabinets are local alarmed with a sounder.

Noted Deficiencies, Risks & Recommendations

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
MAINTENANCE	The panic buttons operating through fire alarm panels use a custom system of non-UL system relays.	Increases difficulty of support and troubleshooting and may lead to system failure or operational issues. Limits ability to expand system to include additional panic buttons and impacts ability to alert Police Dispatch of threats to persons and property.	Migrate panic alarms and other devices from fire alarm system and existing GE NetworX panel to an enterprise class alarm monitoring system	Replace existing GE security panel and install new monitoring modules in existing Millennium or new access control system. Program and configure system to report to existing Police Services Dispatch interface Install new cabling from panic buttons and motion detectors in CAB, library, to new monitoring platform Provide new monitoring modules and integration for 100 video projectors	Materials $48,000 Labor for programming and testing $53,000 = $101,000
MAINTENANCE	The panic button alarms generated through the fire alarm system require the alarms to be cleared by the fire alarm system before new alarms can be generated.	If the alarms are not cleared, pressing the panic buttons again will not generate an alarm on the system, leading to missed alarms.			
MAINTENANCE	The Library panic buttons annunciate on a separate GE NetworX panel in the Dispatch Center	Increases complexity of interface at Police Services Dispatch and increases probability of missed alarms and/ or a delayed response.			
MAINTENANCE	The various alarms are not integrated and report through three separate systems (fire, Millenium, and GE NetworX).	Emergencies or events may not be properly identified and ability to respond effectively may be impaired.			
MAINTENANCE	The GE NetworX security system is designed for residences and smaller scale applications and is not well suited for the enterprise wide requirements of a college campus. The system cannot be expanded or enhanced.	Prevents enhancements and expansion of the system to address new and evolving security needs.			
INTEGRATION	The information presented on the GE NetworX panel is cryptic and the panel is difficult and confusing to use.	Potential for error in interpreting information and resulting in an inadequate or delayed response.			
INFORMATION	The Edwards FireworX display at Police Services Dispatch identifies that a panic button has been pressed. In order to determine the location, Police need access the fire alarm annunciator panel and the annunciator panel may be out of date or inaccurate.	Increases the time required to respond to an event.			

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	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
INFORMATION *(continued)*	Only the AED equipment in the CAB is monitored by Police Services.	Life safety event may not be identified and proper response and response time may be negatively impacted.	Monitor all AED equipment at Police Services	Add contact switch at AED cabinets, input board, cabling, and programming	$2,000 input board. + $500 for switch and cabling + $500 programming = $3,000 for each AED cabinet
	Alarms and alerts are reported and annunciated at Police Services Dispatch. However, so many are received uncategorized and not prioritized responders are not able to quickly and easily discern the appropriate response.	A poorly organized alarm interface can cause confusion and lead to missed or ignored alerts.			
	Some alarms are considered to be a nuisance and may have been disabled or ignored. The tamper switches on the Millennium panels and magnetic position switches at the doors do not report consistently and have been considered a nuisance at times. Many of these alarms have largely been disabled or are ignored.	Events or potential threats may not be reported leading to inadequate responses. As a result, the probability to prevent or deter threats to property, life-safety and uninterrupted campus operations is diminished. Disabled or ignored alarms pose potential risk to personal injury and property loss if intruders are able to enter secured spaces undetected. If tampering of system is not detected, the system could be impaired or disabled by unauthorized persons.	Simplify alarm reporting to focus on most important assets	Audit existing alarm system messages for accuracy and consistency. Review existing points and assign priority. Categorize alarms so alarms associated with life safety or responsible for protecting critical facilities are reported as higher priority and have more visibility. Lower priority alarms can be documented, but do not require immediate action.	$33,800 total Based upon 500 alarm points, review and confirm existing points 20 hours x $65/hour = $1,300 Classify, categorize and prioritize alarms 250 hours x $65/hour =$16, 250 Testing $16,250
	Request-to-exit (REX) detectors are installed on most doors; however, the system is programmed to report door openings as alarms even when the door is used to exit during normal business hours and non-emergencies, resulting in numerous alarms that are considered to be a nuisance.	Disabled or ignored alarms pose potential risk to personal injury and property loss if intruders are able to enter secured spaces undetected. If tampering of system is not detected, the system could be impaired or disabled by unauthorized persons.	Resolve issues with false alarms from tampering and magnetic door contacts Audit existing doors Replace REX as needed and update system programming	Scope assumes replacing 100 REX detectors and programming	$44,000 total $180/ REX x 100 = $18,000 +400 hours x $65/hour = $26,000

Video Surveillance
system assessment

24.8 SCORE


LIFE EXPECTANCY


MAINTENANCE


INTEGRATION


REDUNDANCY


INFORMATION

Existing Conditions

Evergreen's video surveillance system consists of cameras, special cabling, and video recording and monitoring equipment. The system is used primarily to aid loss prevention efforts through visual observation and by providing recordings for investigation and forensic review. By the presence of cameras, the system can also serve as a deterrent to theft. The video surveillance system currently includes approximately 51 analog and 5 IP-network enabled megapixel security video cameras on the campus. Due to campus culture, Evergreen has been reluctant to deploy a large number of cameras on the campus. As a result, the cameras are primarily limited to locations with point-of-sale (POS) activity such as the book store and cashiers.

The cameras are controlled and video is recorded using American Dynamics hybrid Digital Video Recorders (DVR) that can accommodate both the older analog and newer IP-network cameras. The current system includes a backup DVR in the case one of the DVR's fails. Evergreen uses ExacqVision Video Management System (VMS) software to monitor, control and configure cameras, and archive and access recorded video. Video images are recorded and stored for 30 days for forensics investigation purposes. The cameras can be monitored on a matrix display on a station in the Police Services Dispatch Center. The Police Services Dispatch station can select any camera from the matrix display and enlarge the view for greater detail. Video from the ExacQVision VMS can also be accessed over the network with free client software for Macs, PC's and mobile devices.

A project is currently in place to migrate the ExacqVision VMS from the DVR appliances to a virtual server-based Network Video Recorder (NVR) platform. There are also plans to replace the older analog cameras with IP cameras and reuse the existing coax video cabling with coax to twisted-pair converters at the camera and NVR.

Noted Deficiencies, Risks & Recommendations

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
MAINTENANCE	DVRs are restricted to a fixed quantity of cameras and fixed amount of storage.	Limits ability and increases cost to add cameras and expand the storage capacity of the system.	Migrate VMS from existing DVR appliances to virtual server-based platform	Currently in-progress	
INTEGRATION	Cameras are not integrated with panic buttons at POS locations and require manual steps to view the camera associated with a particular button.	Increases opportunity for operator error and impacts operator's ability to quickly assess the situation and determine the appropriate response.	Integrate panic button and CCTV system so that when a panic button is pushed, the video images from the camera nearest that location will automatically and instantaneously appear on the Police Services Dispatch monitor.	Add alarm input boards to alarm monitoring system Program VMS triggers and integration	$9,525 total $2,200/ input board x 3 bldgs = $6,600 + $95/ panic button for license and integration x 15 buttons = $1,425 + $100/ button, cabling and connection x 15 = $1,500
INTEGRATION/ INFORMATION	The current video coverage is limited and does not cover all the critical facilities and tunnels.	Leaves critical facilities vulnerable to the risks of personal safety, loss of property and disruptions to operations.	Add video surveillance cameras to critical facilities currently without coverage	Add Cameras to: Service Yard between Seminar 1 and Library Fire Alarm and Mass Notification headend and equipment rooms in Seminar 1 Machine room PBX room KAOS radio studio Entrances to tunnels	$1,500 x 20 = $30,000
	Many of the existing cameras are analog low resolution or black and white cameras. Analog cameras cannot be integrated onto the existing campus IP-network or operate with other systems.	Limits visibility into areas and compromises identification and forensics efforts	Upgrade existing analog cameras to color IP-network cameras	Replace (50) analog cameras with IP-network cameras. Use existing coax cabling with Ethernet over coax adaptor at each end and Ethernet switches.	$80,000 total $1,500 each includes fixed IP camera and Ethernet over coax adaptor x 50 = $75,000 + $5,000 Ethernet switches
	Video cameras are not installed at emergency telephones.	Limits Police Services Dispatch operator's ability to quickly and properly assess situation, and determine appropriate response in timely manner.	Add video surveillance cameras to emergency telephones and integrate emergency phones with cameras	Install outdoor cameras at 12 upper campus emergency telephone locations. Scope includes camera and twisted-pair adaptors Configure VMS to automatically switch Police Services Dispatch monitor to display camera mounted on stanchion	$120,000 $30,000 per parking lot location x 3 =90,000 $2,000 per other locations 9 x $2,000 = $18,000 $1,000/ camera for integration x 12 = $12,000

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Telephony
system assessment

20.8 SCORE


LIFE EXPECTANCY


MAINTENANCE


INTEGRATION


REDUNDANCY


INFORMATION

Existing Conditions

The existing campus telephone system, or Private Branch Exchange (PBX), is a Nortel CS1000 located in the PBX room 0447 of the Library Building. The system provides analog and digital telephony services to telephone sets and equipment throughout the campus. The system includes a bank of batteries to power the PBX in case of a power outage. As of this date, the system is expected to have a five year life span.

Should the PBX system go down, ten emergency phones around campus provide direct service to CenturyLink. Additionally, the Emergency Operations Center (EOC) in the rotunda of the Lecture Halls also has backup emergency phone service from CenturyLink. If all phone systems are down, the EOC also has police radio and ham radio capability to connect with outside emergency responders.

The campus currently has a total of 18 blue emergency phones, 12 are located in the upper campus. These emergency phone locations consist of a Gaitronics pillar with built-in blue strobe lights, a Talk-a-Phone telephone device, and speakers for emergency notifications. The phones are connected to the campus phone system using standard copper cables.

Calls from the emergency phone stations, elevators and 911 calls are directed to the Police Services dispatch. The calls appear on a separate console phone which displays the phone location. The emergency phones are most commonly used for non-emergency applications, such as requests for jump starts, unlocking cars for owners, and requests for police escorts after dark.

Noted Deficiencies, Risks & Recommendations

	DEFICIENCIES	RISK	RECOMMENDATION	SCOPE	COST OPINION
INFORMATION	There are three emergency telephone locations to cover parking lots B and C.	The limited number of emergency telephones restricts their visibility and results in a greater distances to reach the nearest emergency telephone.	Add a minimum of two emergency telephones in parking lots	Install trenching, conduit, telecommunications and power cabling. Install a new stanchion and devices.	$35,000 per location 2 X $35,000 = $70,000
				Alternative: Install solar powered wireless devices	$20,000 x 2 = $40,000 includes reoccurring costs for cellular or radio service
MAINTENANCE/ INTEGRATION	The existing PBX is nearing end of life and Evergreen is planning to migrate to a Voice over IP (VoIP) system operating over the campus Ethernet network. However many of the rooms where the Ethernet equipment is located do not have backup power systems.	In the event of a power outage, the VoIP phone sets will not operate.	Complete review of existing telecommunication equipment power and generator loads to determine if generators have capacity to accommodate additional telecommunications equipment	Complete an emergency power generator study	$30,000
			Install uninterruptible power supplies (UPS) in telecommunications rooms to provide backup power for limited durations	Add 2KVA UPS with extended runtime options to 40 IDF rooms	$1,500 x 40 = $60,000

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Physical Security
system assessment

NOT SCORED

Existing Conditions

Physical security in the campus context comprises security measures that are designed to deny access to a building, facility, or stored information to unauthorized personnel, and the design of structures to resist potentially hostile acts.

A physical threat assessment of Evergreen may be divided in to three broad areas as follows: overall access to the campus, approach and potential threats to individual buildings, and threats to essential facilities or locations within buildings. Many of the existing security systems that comprise Evergreen's responses are included in the body of this study. A full assessment of physical security site surveys, risk assessments, ranking of risks, costs, and response procedures is outside the scope of this study.

Campus perimeter

Restricting access to the campus through physical security means must be balanced with the required open-nature of a college campus. Some of the methods to restrict access without infringing on the operations and daily workflow of the campus may include:

- Warning signs and window stickers
- Fences
- Vehicle barriers
- Vehicle height restrictors
- Restricted access points
- Security lighting

Individual buildings

For the protection of individual buildings against outside threats, especially those associated with vehicle-borne explosive devices, the most cost-effective solution for mitigating blast effects is to ensure the explosion occurs as far away from the building as possible. To increase this distance, the following can be used:

- Fixed bollards or retractable bollards
- Engineered planters
- Fences
- Use of berms, high curbs, and trees to prevent vehicles from departing roadways

Whenever possible, commercial, service, and delivery vehicles should have a designated entry point to the site, preferably away from high-risk buildings. Active perimeter entrances should be designated so that security personnel can maintain full control without creating unnecessary delays.

An example of an area on Evergreen's campus with high vulnerability to vehicle-borne explosive devices is the vehicular access area on the south side of the library that is above the basement and below the third floor.

Individual spaces within buildings

Individual locations in buildings that house important security or communications equipment or operations, such as the PBX and SER in the Library or the Campus Dispatch Center, may be protected by access control and surveillance systems, as well as by the appropriate door hardware. In addition, exterior and interior envelopes of individual spaces may be hardened with glazing blast film, bullet-resistant construction, and other physical protective measures.

Because of the nature of college education, an open campus is a requirement for the promotion of learning. Vulnerability to targeted shootings involving active shooters, snipers, and terrorists can be reduced to some extent by access control measures. Key approaches to preventing a targeted shooting attack are to deny access to the shooter and, if this fails, to ensure the shooter does not have unrestricted access to the entire building.

Preventing these adversaries from entering the building and roaming throughout the building is critically important. The most impactful way to mitigate targeted shootings is the have a detailed response plan in place before a shooting occurs. Regular training with other local law enforcement agencies that may also respond to an incident can limit the amount of confusion and miscommunication during an attack. Roof or tunnel access to buildings should be prevented by having any doors or hatches controlled through the campus-wide access control system. Cameras can also be placed to provide police with surveillance coverage of door and hatch access, as well as surveillance of the roofs.Specifically, there is increased vulnerability to an active shooter by allowing unrestricted roof access to the public where Lab I and Lab II connect.

To prevent unauthorized access to buildings, doors and windows should have security mechanisms in place. Windows may have working locks and can have break detectors that can alert police that a break-in may be occurring. Doors should have access control mechanisms and should be able to go in to a lock-down mode when an incident occurs. The college may wish to consider increasing inspection and maintenance of doors, latches, and closers to assure doors close automatically. This will improve performance if a lock-down command is need to safeguard students, faculty, and staff.

A full physical security study is required to assess the TESC's specific risks, and to prioritize them appropriately, as well as to estimate costs for implementation.

The following methods can be used to limit the access a shooter may have:

- Intrusion detection
- Access control
- Immediate video assessment
- Effective response capabilities and procedures

IT Infrastructure
system assessment

NOT SCORED

Existing Conditions

Although the Information Technology (IT) infrastructure was not included in the scope of the study, it is integral to the operation and performance of all of the electronic security systems on campus. It is expected that the current direction of the technology is to converge more systems onto the network to leverage the investment in the infrastructure and take advantage of integration, interoperability and scalability options of network-based solutions. As more security and life-safety systems are converged onto the network the bandwidth, reliability and resiliency of the IT infrastructure becomes even more important.

Currently the IT infrastructure on the campus includes a data center located in the Machine Room 0206 in the Library. The data center houses the campus servers, storage, Ethernet switching equipment, and the software and applications to connect users to campus resources and the Internet. There is redundant equipment in the data center to prevent system outages should a piece of equipment fail. The Machine room is equipped with high capacity battery backup Uninterruptible Power Supplies (UPS) and the building generator can provide emergency power to the data center. The buildings on campus are connected via high bandwidth single-mode optical fiber cabling which has the capacity to meet the current needs of the campus IT systems.

The scope of this study did not include the evaluation of the IT infrastructure on the campus, but considering its importance in supporting the current and future life-safety and security systems, it is recommended that Evergreen conduct a more complete and thorough review of the IT infrastructure and associated power systems on campus to determine their current capabilities and vulnerabilities.

Referenced documentation

Emergency Notification Map

Existing Fiber Map

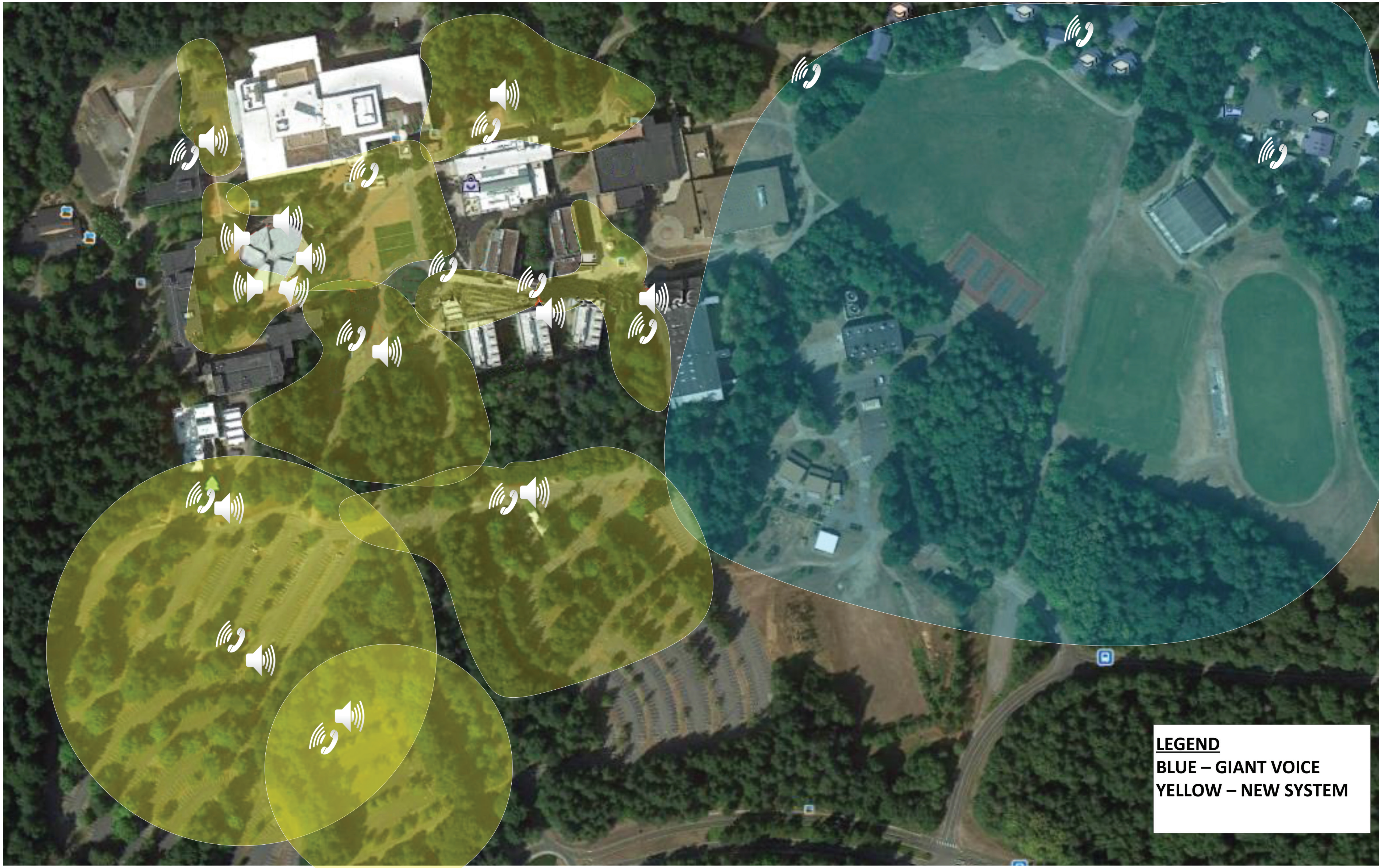
Alertus Diagram

Alarm Matrix

Fire Alarm Diagrams

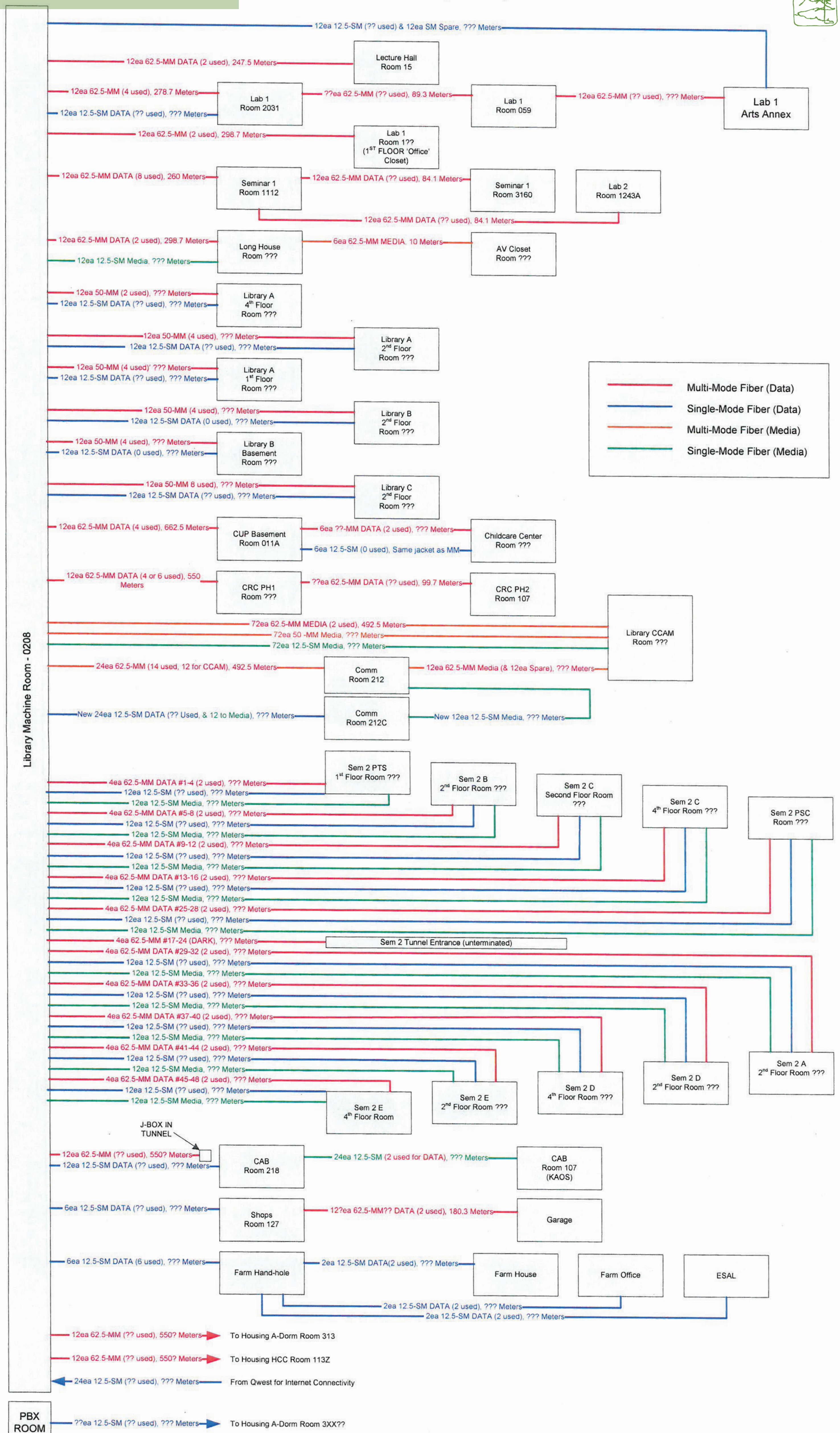
- **Existing System Topology**
- **Existing Telecommunication Optical Fiber Cabling Diagram**

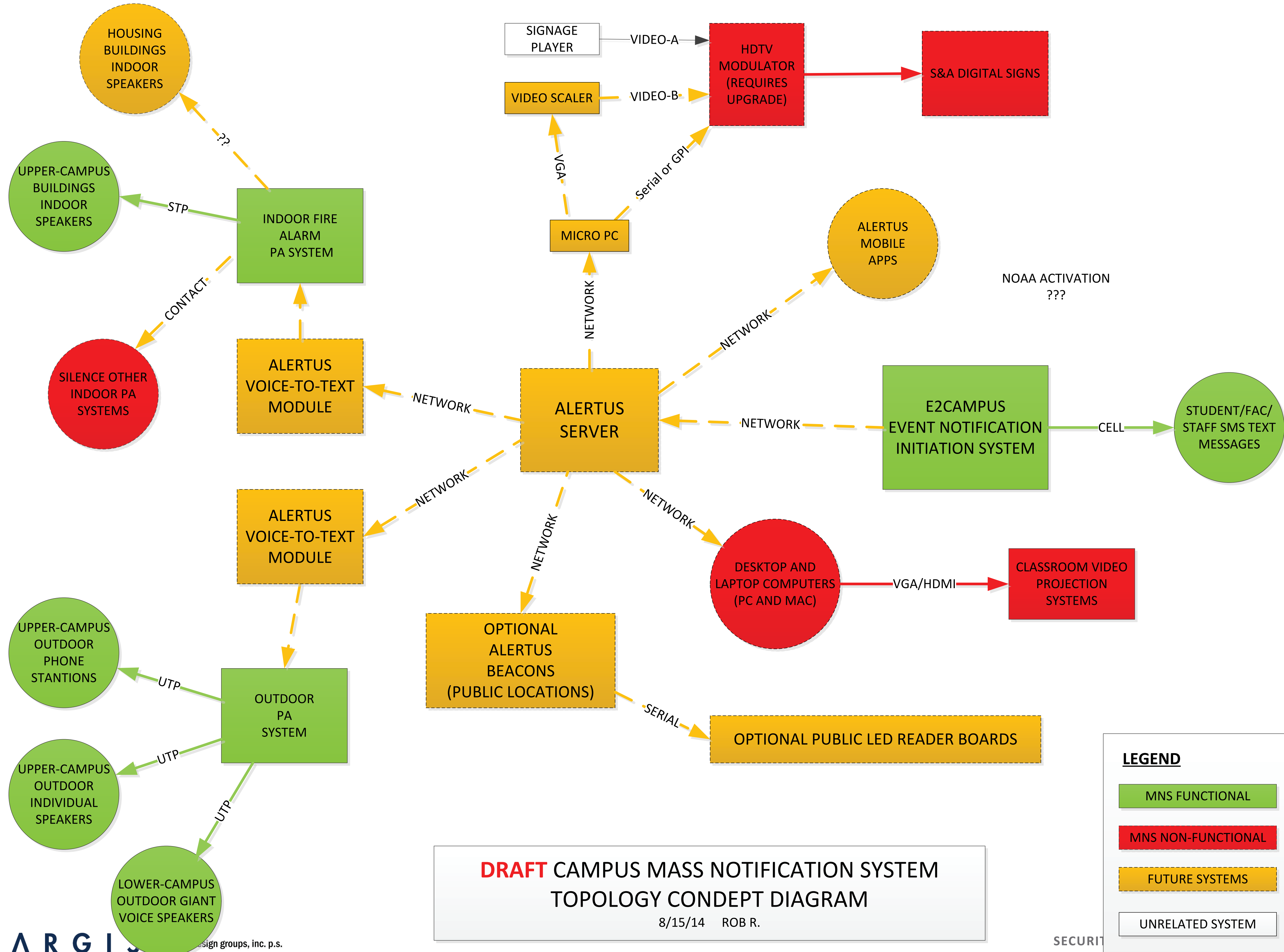
Cost Details


LEGEND
BLUE – GIANT VOICE
YELLOW – NEW SYSTEM

TESC Upper Campus Fiber Optic Cable

Revised: 02/24/12 (Rob/Richard)





HOUSING BUILDINGS INDOOR SPEAKERS
??
UPPER-CAMPUS BUILDINGS INDOOR SPEAKERS
STP
INDOOR FIRE ALARM PA SYSTEM
CONTACT
SILENCE OTHER INDOOR PA SYSTEMS
ALERTUS VOICE-TO-TEXT MODULE
NETWORK
SIGNAGE PLAYER
VIDEO-A
HDTV MODULATOR (REQUIRES UPGRADE)
S&A DIGITAL SIGNS
VIDEO SCALER
VIDEO-B
VGA
Serial or GPI
MICRO PC
NETWORK
ALERTUS MOBILE APPS
NOAA ACTIVATION ???
NETWORK
ALERTUS SERVER
NETWORK
E2CAMPUS EVENT NOTIFICATION INITIATION SYSTEM
CELL
STUDENT/FAC/ STAFF SMS TEXT MESSAGES
NETWORK
ALERTUS VOICE-TO-TEXT MODULE
NETWORK
NETWORK
DESKTOP AND LAPTOP COMPUTERS (PC AND MAC)
VGA/HDMI
CLASSROOM VIDEO PROJECTION SYSTEMS
UPPER-CAMPUS OUTDOOR PHONE STANTIONS
UTP
OUTDOOR PA SYSTEM
OPTIONAL ALERTUS BEACONS (PUBLIC LOCATIONS)
SERIAL
OPTIONAL PUBLIC LED READER BOARDS
UPPER-CAMPUS OUTDOOR INDIVIDUAL SPEAKERS
UTP
UTP
LOWER-CAMPUS OUTDOOR GIANT VOICE SPEAKERS
DRAFT CAMPUS MASS NOTIFICATION SYSTEM
TOPOLOGY CONDEPT DIAGRAM
8/15/14 ROB R.
LEGEND
MNS FUNCTIONAL
MNS NON-FUNCTIONAL
FUTURE SYSTEMS
UNRELATED SYSTEM

DRAFT: Campus Alarms List			Revised:9/9/13 - Rob R.															
		CAB Panic Buttons	Library A Panic Buttons	Sem1 Panic Buttons	Motion Alarms	CAB Motion Alarms	AV Pilfer Alarms	911 call from Campus	CUP Boiler	Lab Freezers	Elevator Phones	Emergency Phones	General Telephones	Video Surveillance	Fire Alarms	Millenium Tamper	Fire Knox Boxes	Forced Door
ALARM EVENT	Type of Event	Personal threat, inadvertant activation	Personal threat, inadvertant activation	Personal threat, inadvertant activation	Warm, moving body in secured spact	Warm, moving body in secured spact	AV equipment disconnectedor stolen	Person reporting life/safety emergency	Failure to heat water	Heat rise above preset threshold	Person requesting assistance, etc.	Person requesting assistance, etc.	You name it...	Person or object moving in camera view	Heat, smoke or fire event; inadvertant activation	Door opened or wiring problem	Door opened	Forced Door
	Event Detection	Button activation	Button activation	Button activation	Motion detect	Motion detect	Lost connection	Phone call to Co. 911	Contact closure	Contact closure	Button activation	Button activation	Call to TESC Dispatch	Motion detect	Pull station, fire detection device, water flow sensor, etc.	Contact closure	Contact closure?	Millenium door sensor
ALARM MONITORING REQUIREMENTS	Who should monitor?	Police Dispatch	Police Dispatch	Police Dispatch	Police Dispatch	Police Dispatch	Police Dispatch	Police Dispatch	CUP Staff	Lab Staff	Police Dispatch	Police Dispatch	Police Dispatch	Police Dispatch, situation commander	Police Dispatch	Police Dispatch (for high risk areas only)	Police Dispatch	Police Dispatch
	Who is back-up monitor?	None	None	None	None	None	None	Co. 911 Center	Students or CUP staff will call Police when they figure it out	CUP get messages, Police would be good backup if text message fails	None	None	None	None	Station 91 (via local-made tone alert)	None	None	??
	Should alarm condition persist until acknowledged?	Yes	Yes	Yes	Yes	Yes	Yes	Ring until answered	No	No	Ring until answered	Ring until answered	Ring until answered	Not needed currently	Yes	Yes - at least for high-risk areas	Yes	??
	Where should event be monitored?	Dispatch Office	Dispatch Office	Dispatch Office	Dispatch Office	Dispatch Office	Dispatch Office	Dispatch Office	Computers, smart phones	Computers, smart phones	Dispatch Office	Dispatch Office	Dispatch Office	Dispatch Office	Dispatch Office	Police Dispatch (for high risk areas only)	Dispatch Office	Dispatch Office
	What info should be included in event message?	Type of event, Building, room #	Type of event, Building, room #	Type of event, Building, room #	Type of event, Building, room #, notification list	Type of event, Building, room #, notification list	Type of event, Building, room #, notification list	Type of event, Building, room #	Type of event, Building, room #	Type of event, Building, room #	Location of emergency phone	Location of emergency phone	Location of emergency phone	Camera general location on-screen	Type of event, Building, room #	Type of event, Building, room #, notification plan?	Location, type of event	Location, type of event
ALARM RESPONSE NEEDS	What response is needed?	Officer to location	Officer to location	Officer to location	Officer to location	Officer to location	Officer to location	First Responder and Officer to location	CUP Staff to site?	Lab Staff to site?	Determined by nature of call	Determined by nature of call	Determined by nature of call	Determined by nature of event	Police SOP	???	??	Officer to location?
	What is the back-up response plan?	None?	None?	None?	None?	None?	None?	None?	None?	Police Dispatch to contact CUP staff?	None?	None?	None?	None?	Building occupants call 911?	None?	None?	None?
	How quickly is a response needed?	Immediate	Immediate	Immediate	ASAP	ASAP	ASAP	Immediate	ASAP	ASAP	Determined by nature of call	Determined by nature of call	Determined by nature of call	Determined by nature of event	Immediate	ASAP - at least for high risk areas	???	???
	Where is response action detailed?	Call and verify emergency while enroute	Police Dispatch SOP	Police Dispatch SOP	Millenium pop-up message	Millenium pop-up message	Millenium pop-up message	Police Dispatch SOP	CUP SOP	LAB SOP	Police Dispatch SOP	Police Dispatch SOP	Police Dispatch SOP	Police Dispatch SOP	Police Dispatch SOP	???	???	???
	What is the risk of delayed response?	High - life/safety	High - life/safety	High - life/safety	Medium - property loss	Medium - property loss	Medium - Property loss	High - life/safety	Medium - loss of heat and hot water to students	Medium - Property loss	Determined by nature of call	Determined by nature of call	Determined by nature of call	???	High - life/safety	Medium - Property loss	???	???
Y	What system is used to convey/display alarm	Text on EST-3 printer, control panel and Fireworx display	GE Networx alarm panel display	Facilities-made system tied to EST-3	Millenium - pop-up message on dispatch computer	GE Networx alarm panel display	Millenium - pop-up message on dispatch computer	Pop-up message on dispatch computer	CUP alarm system - email and text message	Circon System - email and text message	Nortel digital phone - caller ID	Nortel digital phone - caller ID	Nortel digital phone - caller ID	Computer video displays	Text on EST-3 printer, control panel and Fireworx display	Millenium - pop-up message on dispatch computer	EST-3 System? Mike D. to confirm	Millenium Access Control PC software

ALARM TRANSPORT TECHNOLOG	What are the known issues with this system?	Some alarms don't report on all 3 devices	temporary solution Not extensible	Custom-made system, does not provide exact location	Millenium alarms may not be transmitted occassionally	temporary solution Not extensible	Millenium alarms may not be transmitted occassionally	System won't work if network or dispatch computer is down	Network outages would prevent communiction	Network outages would prevent communiction	Caller ID gives location?	Rare emergency phone failures	Caller ID gives location?	Intermittent video server re-boots	Not all building connected to EST-3 fiber network	Message frequently ignored by dispatch, many open doors?	Not sure if these are working or not?	Millenium alarms may not be transmitted occassionally
	Risk of system outages?	Very Low	Medium	Low	Medium	Medium	Medium	Low?	Medium	???	Very Low	Low	Very Low	Low	Very Low	??	??	??
	What is the impact of system outages?	High - life/safety	High - life/safety	High - life/safety	Medium - property loss	High - life/safety	Medium - property loss	High - life/safety	Medium - loss of heat and hot water to students	Medium - property loss	High - life/safety	High - life/safety	High - life/safety	Medium - property loss	High - life/safety	??	??	??
	Who's the Campus Expert on this System?	Mike Scheppke, Convergent	TSS	Sam Pooley	TSS	TSS	TSS and Mike Kinley	TSS	Cole Industries	Holiday Parks, Mike Drennons team	TSS	TSS	TSS	TSS	Mike Scheppke, Richard Johnson	Jake Peetz, Mike Kinley (Rob R)	Mike Scheppke, Convergent	??
	Other questions that need to be answered							Is this system performance reliable enough?								What are the high risk areas? Should tamper alarms be disabled for lower risk areas?	Do these alarms actually work?	

SHEET NOTES:

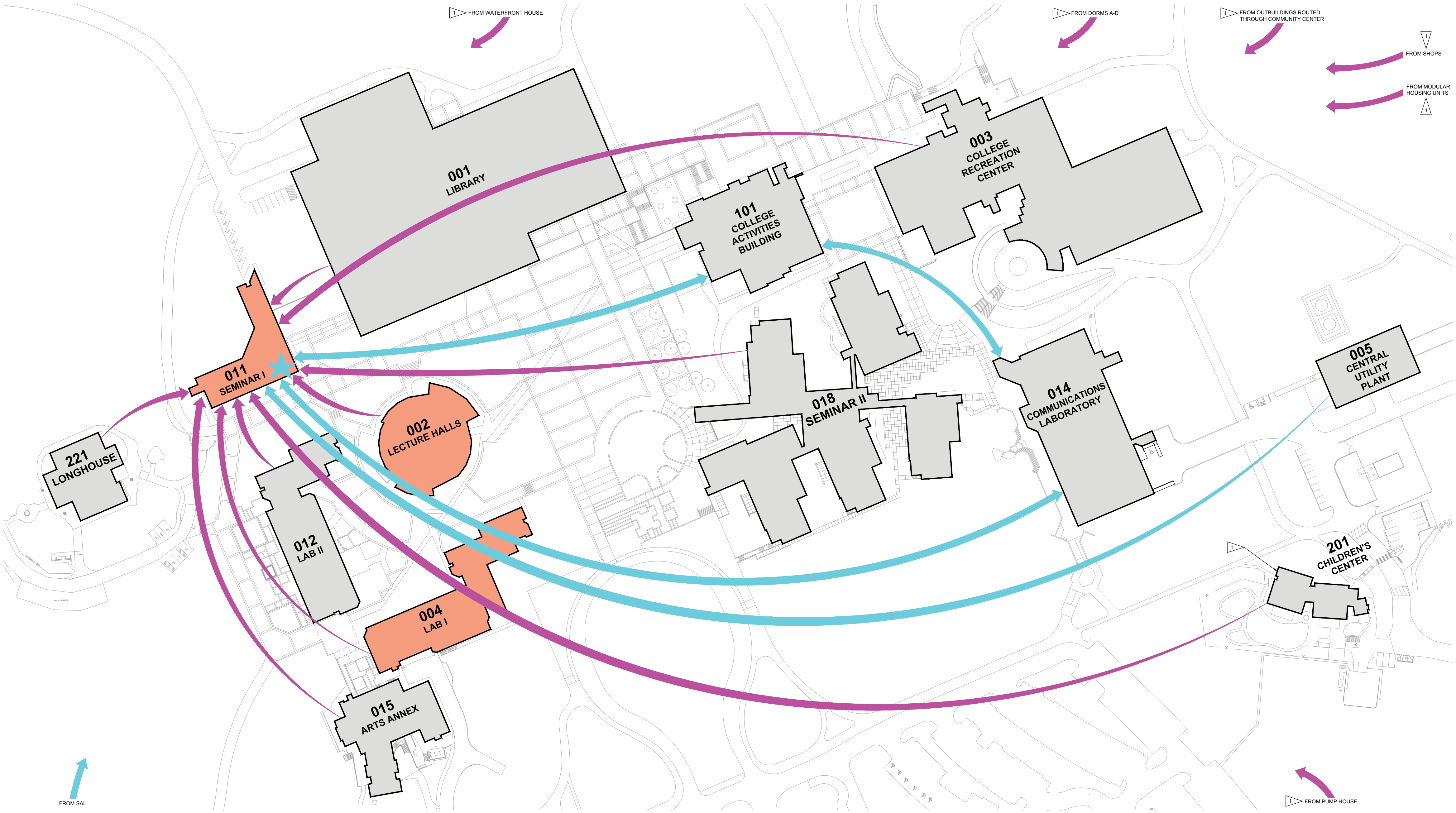
1. ALL BUILDINGS HAVE VOICE NOTIFICATION EXCEPT THOSE NOTED.

FLAG NOTES:

1 FACILITY HAS NO VOICE NOTIFICATION.

LEGEND:

- EXISTING OPTICAL FIBER NETWORK
- FIRE ALARM PANEL REPORTING ZONED INFORMATION TO MONITORING STATION
- CAMPUS HEAD-END EQUIPMENT AND TESC PROPRIETARY MONITORING STATION (POLICE DISPATCH)
- BUILDING WITH ADDRESSABLE DEVICES
- BUILDING WITH CONVENTIONAL DEVICES (NON-ADDRESSABLE)



MAIN CAMPUS SITE PLAN - EXISTING FIRE ALARM TOPOLOGY
SCALE: 1" = 60'-0"

HARGIS

THE EVERGREEN STATE COLLEGE
2700 Evergreen Parkway NW
Olympia, WA 98505

REV.	RELEASE	DATE
	PLANNING STUDY	10/02/14

PROJECT NO.	
HARGIS PROJECT NO.	14083
DRAWN BY	DY
CHECKED BY	DS
APPROVED BY	

SHEET TITLE
MAIN CAMPUS SITE PLAN - EXISTING FIRE ALARM TOPOLOGY

SHEET NUMBER
E1a

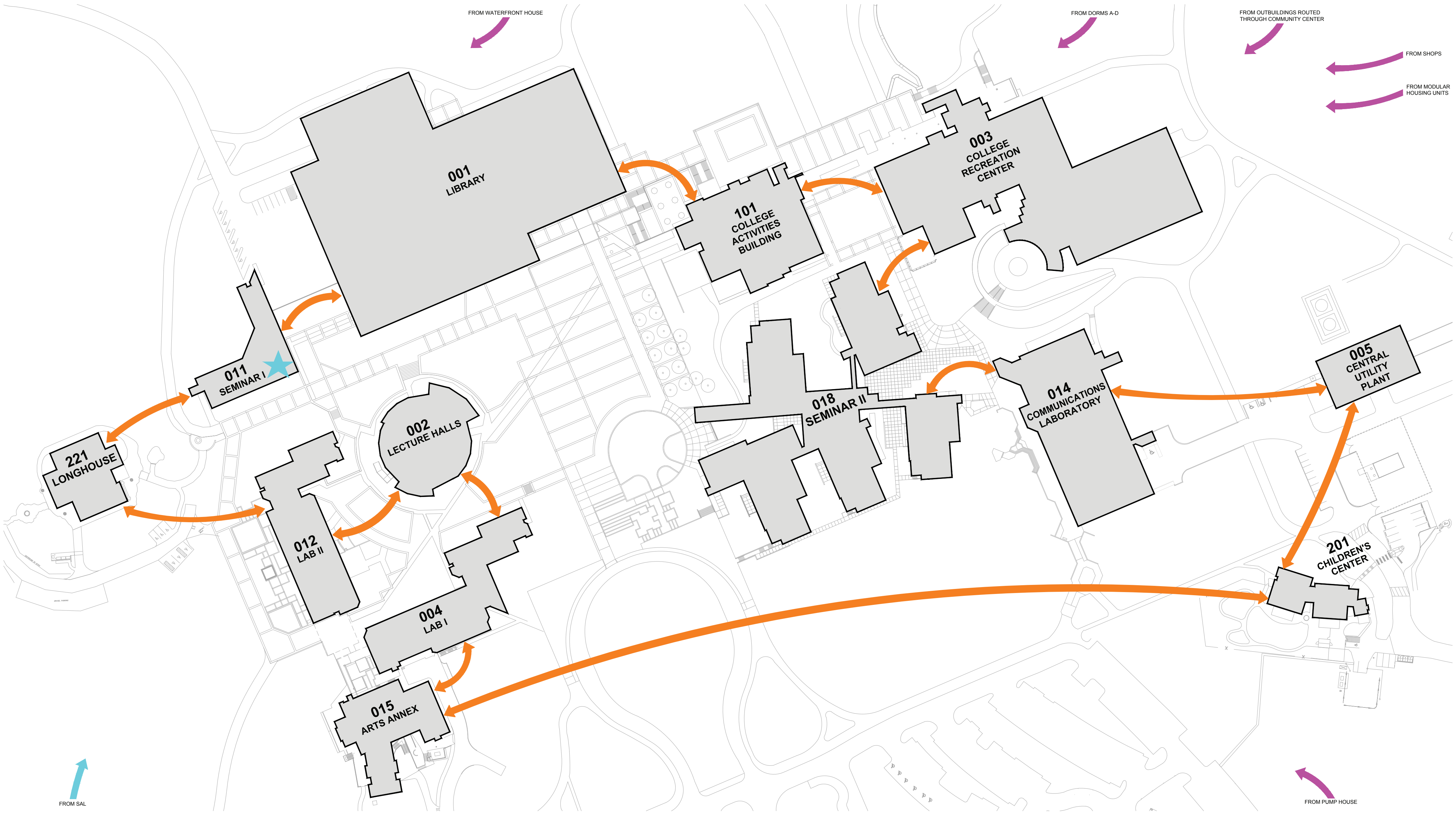
Fire Alarm
Existing Telecommunication
Optical Fiber Cabling Diagram

SHEET NOTES:

1. OPTICAL FIBER NETWORK ARROWS INDICATE NEW FIRE ALARM OPTICAL FIBER LOOP FOR THE CAMPUS BUT DOES NOT INDICATE THE EXACT CONNECTIONS BETWEEN BUILDINGS.

LEGEND:

- NEW OPTICAL FIBER NETWORK
- EXISTING OPTICAL FIBER NETWORK
- EXISTING FIRE ALARM PANEL REPORTING ZONED INFORMATION TO MONITORING STATION
- CAMPUS HEAD-END EQUIPMENT AND TESC PROPRIETARY MONITORING STATION (POLICE DISPATCH)
- BUILDING WITH NEW ADDRESSABLE DEVICES



MAIN CAMPUS SITE PLAN - PROPOSED FIRE ALARM TOPOLOGY
SCALE: 1" = 60'-0"

HARGIS

THE EVERGREEN STATE COLLEGE
2700 Evergreen Parkway NW
Olympia, WA 98505

REV.	RELEASE	DATE
	PLANNING STUDY	10/02/14

PROJECT NO.
HARGIS PROJECT NO. 14083
DRAWN BY DY
CHECKED BY DS/ES
APPROVED BY
SHEET TITLE MAIN CAMPUS SITE PLAN - PROPOSED FIRE ALARM TOPOLOGY
SHEET NUMBER E1b

HARGIS | KMB design groups, inc. p.s. architecture, education facilities group, justice facilities group, security design group

COST OPINION

Job Name **The Evergreen State College**	Basis for Opinion [ ] Schematic Design	Prepared By Paul Robaidek	Job Number 14083
Description **Security Cost Summary**	[ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**	Checked by Patrick Shannon	Date **1/12/2015**

DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
ACCESS CONTROL RECOMMENDATIONS								
REPLACE MILLENNIUM ACCESS CONTROL SYSTEM								$769,845
ACCESS CONTROL AT CLASSROOM DOORS								524,500
ADA PUSH BUTTONS								$25,600
SCIENCE LAB DOORS								$44,800
UNINTERRUPTIBLE POWER SUPPLIES								$60,000
ELECTRONIC DOOR INVENTORY AND ACCESS CONTROL								$20,000
							TOTAL - ACCESS CONTROL	**$1,364,745**
ALARMS RECOMMENDATIONS								
REPLACE EXISTING GE PANEL								$101,000
AED MONITORS (PER AED CABINET)								$3,000
AUDIT AND CATEGORIZE ALARMS								$33,800
REPLACE AND REPROGRAM REX DETECTORS								$44,000
							TOTAL - ALARMS	**$178,800**
VIDEO SURVEILLANCE RECOMMENDATIONS								
INTEGRATE CAMERAS AT PANIC BUTTONS								$9,525
CAMERAS AT CRITICAL FACILITIES								$30,440
UPGRADE ANALOG CAMERAS								$80,000
CAMERAS AT EMERGENCY TELEPHONES								$119,850
							TOTAL - VIDEO SURVEILLANCE	**$239,815**
TELEPHONY RECOMMENDATIONS								
EMERGENCY TELEPHONES								$71,370
EMERGENCY POWER AND GENERATOR STUDY								$30,000
UNINTERRUPTIBLE POWER SUPPLIES								$60,000
							TOTAL - TELEPHONY (WIRED TO PARKING LOTS)	**$161,370**
MASS NOTIFICATION RECOMMENDATIONS								
ALERTUS NOTIFICATION SYSTEM (BASIC SCOPE)								$10,000
ALERTUS NOTIFICATION SYSTEM (COMPREHENSIVE SCOPE)								$55,000
ALERTUS TEXT-TO-SPEECH MODULES								$12,000
ALERTUS BEACONS (Basic Coverage)								$30,000
ALERTUS BEACONS Comprehensive Coverage)								$67,500
FLAT PANEL DISPLAYS IN CLASSROOMS								$186,875
MUTING OF CLASSROOM AV SYSTEMS								$74,063
							TOTAL - MASS NOTIFICATION (BASIC)	**$312,938**
							TOTAL - MASS NOTIFICATION (COMPREHENSIVE)	**$395,438**

								COST OPINION	
Job Name **The Evergreen State College**	Basis for Opinion [ ] Schematic Design		Prepared By	Paul Robaidek				Job Number	14083
Description **Security Cost Summary**	[ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**		Checked by	Patrick Shannon				Date	**1/12/2015**
	QUANTITY		MATERIAL COST		LABOR COST			ENGINEERING OPINION	
DESCRIPTION	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL		UNIT COST	TOTAL

RADIO SYSTEM RECOMMENDATIONS	
IMPROVE UHF AND VHF COVERAGE	$15,000
DISTRIBUTED ANTENNA SYSTEMS	$80,220
PARTNERSHIP WITH TCOMM	$200,000
INTEGRATE EXISTING UHF SYSTEMS	$50,000
	$295,220
POLICE SERVICES DISPATCH	
PHYSICAL SECURITY INFORMATION MANAGEMENT SYSTEM	$375,000
CLOUD-BASED SERVICES	$1,500
PRIVATE VIRTUAL SERVER PLATFORM	$80,000
NEW POLICE SERVICES DISPATCH CENTER	$784,000
TOTAL - POLICE SERVICES DISPATCH (USING CLOUD-BASED SERVICES)	**$1,160,500**
TOTAL - POLICE SERVICES DISPATCH (PRIVATE VIRTUAL SERVER)	**$1,239,000**

Exclusions:

1. Sales tax
2. Project Soft Costs
3. Escalation
4. Contingency

								COST OPINION	
Job Name **The Evergreen State College**	Basis for Opinion [ ] Schematic Design			Prepared By **Paul Robaidek**				Job Number **14083**	
Description **Access Control Cost Opinion**	[ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**			Checked by **Patrick Shannon**		Date		**1/12/2015**	
	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION		
DESCRIPTION	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	

DESCRIPTION	NUMBER	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL	LABOR UNIT COST	LABOR TOTAL	ENGINEERING UNIT COST	ENGINEERING TOTAL
REPLACE MILLENNIUM ACCESS CONTROL SYSTEM								
General Provisions	1	LS	1,850.00	1,850.00	875.00	875.00	2,725.00	2,725
Enterprise Controller	2	EA	32,200.00	64,400.00	3,750.00	7,500.00	35,950.00	71,900
Network Door Controller	100	EA	5,318.00	531,800.00	300.00	30,000.00	5,618.00	561,800
Alarm Input Module	112	EA	550.00	61,600.00	65.00	7,280.00	615.00	68,880
Alarm and Monitoring Integration	1	EA	300.00	300.00	1,785.00	1,785.00	2,085.00	2,085
Emergency Lock Down Integration	1	EA	150.00	150.00	2,475.00	2,475.00	2,625.00	2,625
Pathways and Cabling	1.00	LS	3250.00	3,250	2500.00	2,500	5750.00	$5,750
Terminations	1	LS	1,500.00	1,500.00	2,580.00	2,580.00	4,080	4,080
Programming and Integration	1	LS			50,000.00	50,000.00	50,000.00	50,000
Total Replace Access Control				664,850.00		104,995.00		**769,845**
ACCESS CONTROL AT CLASSROOM DOORS								
Door Hardware	100	EA	550.00	55,000.00	925.00	92,500.00	1,475	147,500
Door Controller	100	EA	2,200.00	220,000.00	550.00	55,000.00	2,750.00	275,000
Card Reader	100	EA	400.00	40,000.00	150.00	15,000.00	550.00	55,000
Cabling	100	EA	125.00	12,500.00	95.00	9,500.00	220.00	22,000
Application Integratiion	1	LS			25,000.00	25,000.00	25,000.00	25,000
Total Classroom Doors				327,500.00		197,000.00		**524,500**
ADA PUSH BUTTONS								
Review current programming, and reconfigure	32	EA			800.00	25,600.00	800	25,600
Total ADA Push Buttons						25,600.00		**25,600**
SCIENCE LAB DOORS								
Door Controller	32	EA	600.00	19,200.00			600	19,200
Card Reader	32	EA	400.00	12,800.00			400	12,800
Labor	32	EA			400.00	12,800.00	400	12,800
		0						
Total Science Lab Doors				32,000.00		12,800.00		**44,800**

COST OPINION

Job Name	Basis for Opinion	Prepared By	Job Number
The Evergreen State College	[ ] Schematic Design	**Paul Robaidek**	**14083**
Description	[ ] Design Development		
Access Control Cost Opinion	[ ] Construction Documents	Checked by / Date	
	[X] Conceptual Planning	**Patrick Shannon**	**1/12/2015**

	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION	
DESCRIPTION	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
UNINTERRUPTIBLE POWER SUPPLIES								
2KVA UPS with extended run-time battteries	40	EA	1,500.00	60,000.00			1,500	60,000
Total Uniteruptible Power Supplies				60,000.00				**60,000**
ELECTRONIC DOOR INVENTORY AND ACCESS CONTROL								
Inventory and assess existing electronic doors	1	LS	20,000.00	20,000.00			20,000	20,000
Electronic Door hardware and access control	1	EA	3,000.00	3,000.00	2,000.00	2,000.00	5,000	5,000
		0						
Total Electronic Door Inventory and Access Control				23,000.00		2,000.00		**25,000**

									COST OPINION
Job Name **The Evergreen State College**	Basis for Opinion			Prepared By **Paul Robaidek**			Job Number **14083**		
Description **Alarms**	[ ] Schematic Design [ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**			Checked by **Patrick Shannon**		Date	**1/12/2015**		
	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION		
DESCRIPTION	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	
REPLACE EXISTING GE PANEL									
Control Panel	1	EA	15,000.00	15,000.00			15,000.00	15,000	
Cabling	1	LS	8,000.00	8,000.00			8,000.00	8,000	
Monitoring modules	1	LS	25,000.00	25,000.00			25,000.00	25,000	
Installation, programming, and configuration	1	LS			53,000.00	53,000.00	53,000.00	53,000	
Total Replace Existing GE Panel				48,000		53,000		**$101,000**	
AED Monitors									
Input Board	1	EA	1,500.00	1,500.00	500.00	500.00	2,000.00	2,000	
Contact Switch and Cabling	1	EA	350.00	350.00	150.00	150.00	500.00	500	
Programming	1	EA			500.00	500.00	500.00	500	
Total AED Monitors (per AED cabinet)				1,850		1,150		**$3,000**	
AUDIT AND CATEGORIZE ALARMS									
Review and confirm existing points	20	HR			65.00	1,300.00	65.00	1,300	
Classify, categorize, and prioritize alerts and alarms	250	HR			65.00	16,250.00	65.00	16,250	
Testing	1	LS			16,250.00	16,250.00	16,250.00	16,250	
Total Audit and Categorize Alarms						33,800		**$33,800**	
REPLACE AND REPROGRAM REX DETECTORS									
Replace REX detectors	100	EA	115.00	11,500.00	65.00	6,500.00	180.00	18,000	
Classify, categorize, and prioritize alerts and alarms	400	HR			65.00	26,000.00	65.00	26,000	
Total Replace and Reprogram REX Detectors				11,500		32,500		**$44,000**	

								COST OPINION	
Job Name **The Evergreen State College**	Basis for Opinion [ ] Schematic Design			Prepared By **Paul Robaidek**				Job Number **14083**	
Description **Video Surveillance Cost Opinion**	[ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**			Checked by Date **Patrick Shannon**				**1/12/2015**	
	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION		
DESCRIPTION	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	

DESCRIPTION	NUMBER	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL	LABOR UNIT COST	LABOR TOTAL	ENGINEERING UNIT COST	ENGINEERING TOTAL
INTEGRATE CAMERAS AT PANIC BUTTONS								
Input Boards	3	EA	2,200.00	6,600.00			2,200.00	6,600
License and VMS Integration	15	EA	50.00	750.00	45.00	675.00	95.00	1,425
Cabling and connections	15	EA	45.00	675.00	55.00	825.00	100.00	1,500
Total Integrate Cameras at Panic Buttons								**$9,525**
CAMERAS AT CRITICAL FACILITIES								
Service Yard	1	EA	3,500.00	3,500.00	350.00	350.00	3,850.00	3,850
Fire Alarm Headend	1	EA	750.00	750.00	250.00	250.00	1,000.00	1,000
Mass Notification Headend	1	EA	750.00	750.00	250.00	250.00	1,000.00	1,000
Machine Room	1	EA	750.00	750.00	250.00	250.00	1,000.00	1,000
PBX Room	1	EA	750.00	750.00	250.00	250.00	1,000.00	1,000
KAOS	1	EA	750.00	750.00	250.00	250.00	1,000.00	1,000
Tunnel Entrances	13	EA	750.00	9,750.00	250.00	3,250.00	1,000.00	13,000
Conduit	1,500	LF	.95	1,425.00	1.61	2,415.00	2.56	3,840
Cabling	2,500	EA	1.05	2,625.00	.85	2,125.00	1.90	4,750
Total Cameras at Critial Facilities								**$30,440**
UPGRADE ANALOG CAMERAS								
Camera and license	50	EA	865.00	43,250.00	340.00	17,000.00	1,205.00	60,250
Ethernet over Coax adapter	50	EA	200.00	10,000.00	95.00	4,750.00	295.00	14,750
Ehthernet Switches	1	LS	5,000.00	5,000.00			5,000.00	5,000
Total upgrade Analog Cameras				58,250		21,750		**$80,000**

								COST OPINION	
Job Name **The Evergreen State College**		Basis for Opinion [ ] Schematic Design			Prepared By **Paul Robaidek**			Job Number **14083**	
Description **Video Surveillance Cost Opinion**		[ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**			Checked by Date **Patrick Shannon**			**1/12/2015**	
DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION		
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	
CAMERAS AT EMERGENCY TELEPHONES									
Stanchion Cameras									
Camera	3	EA	1,250.00	3,750.00	525.00	1,575.00	1,775.00	5,325	
Trenching	1,500	EA			50.00	75,000.00	50.00	75,000	
Conduit	1,500	LF	.95	1,425.00	1.90	2,850.00	2.85	4,275	
Cabling	2,500	EA	1.25	3,125.00	.85	2,125.00	2.10	5,250	
Building Mounted Camera									
Camera	9	EA	900.00	8,100.00	400.00	3,600.00	1,300.00	11,700	
Pathway	1	LS	2,000.00	2,000.00	1,575.00	1,575.00	3,575.00	3,575	
Cabling	2,500	LF	.45	1,125.00	.64	1,600.00	1.09	2,725	
Programming and Licenses	12	EA			1,000.00	12,000.00	1,000.00	12,000	
Total Cameras at Emegency Telephones				19,525		100,325		**$119,850**	

			COST OPINION
Job Name **The Evergreen State College**	Basis for Opinion [ ] Schematic Design	Prepared By **Paul Robaidek**	Job Number **14083**
Description **Telephony Cost Opinion**	[ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**	Checked by Date **Patrick Shannon**	**1/12/2015**

DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
EMERGENCY TELEPHONES								
Stanchion with Light	2	EA	4,500.00	9,000.00	850.00	1,700.00	5,350.00	10,700
Weatherproof Phone	2	EA	650.00	1,300.00	425.00	850.00	1,075.00	2,150
Trenching	1,000	EA			50.00	50,000.00	50.00	50,000
Conduit	2,000	LF	.95	1,900.00	1.61	3,220.00	2.56	5,120
Cabling	1,500	EA	.25	375.00	.45	675.00	.70	1,050
Power Cabling	500	EA	.25	125.00	.45	225.00	.70	350
Speakers	2	EA	750.00	1,500.00	250.00	500.00	1,000.00	2,000
Total Emergency Telephones (Wired)								**$71,370**
EMERGENCY POWER AND GENERATOR STUDY								
Emergency Power and Generator Study	1	LS			30,000.00	30,000.00	30,000.00	30,000
Total Emergency Power and Generator Study								**$30,000**
UNINTERRUPTIBLE POWER SUPPLIES								
2KVA UPS with extended run-time	40	EA	1,500.00	60,000.00			1,500.00	60,000
Total Uninterruptible power supplies								**$60,000**

the evergreen state college

			COST OPINION
Job Name **The Evergreen State College**	Basis for Opinion [ ] Schematic Design [ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**	Prepared By **Paul Robaidek**	Job Number **14083**
Description **Emergency Notification Cost Opinion**		Checked by **Patrick Shannon**	Date **1/12/2015**

	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION	
DESCRIPTION	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
ALERTUS NOTIFICATION SYSTEM (BASIC SCOPE)								
Server configuration and programming	1	LS			5,000.00	5,000.00	5,000.00	5,000
Endpoint connection and configuration	10	EA			500.00	5,000.00	500.00	5,000
Total Altertus Notification System (Minimum Scope)								**10,000**
ALERTUS NOTIFICATION SYSTEM (COMPREHENSIVE SCOPE)								
Server configuration and programming	1	LS			5,000.00	5,000.00	5,000.00	5,000
Endpoint connection and configuration	100	EA			500.00	50,000.00	500.00	50,000
Total Altertus Notification System (Comprehensive Scope)								**55,000**
ALERTUS TEXT-TO-SPEECH MODULES								
Text-to-Speech module	2	EA	5,000.00	10,000.00			5,000.00	10,000
Integration	2.00	EA	0.00	0	1000.00	2,000	1000.00	$2,000
Total Text-to-Speech Modules								**12,000**
ALERTUS BEACONS (Basic Coverage)								
Beacon	20.00	EA	800.00	16,000	0.00	0	800.00	$16,000
Ethernet switch port	20	EA	125.00	2,500.00			125	2,500
Cabling, pathway, and connectivity	20	EA	275.00	5,500.00	300.00	6,000.00	575.00	11,500
Total Altertus Beacon Basic Coverage								**30,000**
ALERTUS BEACONS Comprehensive Coverage)								
Beacon	45	EA	800.00	36,000.00			800	36,000
Ethernet switch port	45	EA	125.00	5,625.00			125	5,625
Cabling, pathway, and connectivity	45	EA	275.00	12,375.00	300.00	13,500.00	575	25,875
Total Altertus Beacon Comprehensive Coverage								**67,500**

								COST OPINION	
Job Name **The Evergreen State College**	Basis for Opinion [ ] Schematic Design		Prepared By **Paul Robaidek**				Job Number **14083**		
Description **Emergency Notification Cost Opinion**	[ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**		Checked by Date **Patrick Shannon**				**1/12/2015**		
	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION		
DESCRIPTION	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	

DESCRIPTION	NUMBER	UNIT	MATERIAL UNIT COST	MATERIAL TOTAL	LABOR UNIT COST	LABOR TOTAL	ENGINEERING UNIT COST	ENGINEERING TOTAL
FLAT PANEL DISPLAYS IN CLASSROOMS								
42" Display	125	EA	560.00	70,000.00	55.00	6,875.00	615	76,875
Wall Mount	125	EA	150.00	18,750.00	65.00	8,125.00	215	26,875
Video Encoder	125	EA	150.00	18,750.00	65.00	8,125.00	215	26,875
Cabling	125	EA	300.00	37,500.00	150.00	18,750.00	450	56,250
							1,495	
Total Flat Panel Displays in Classrooms								**186,875**
MUTING OF CLASSROOM AV SYSTEMS								
Contact Closure	125	EA	50.00	6,250.00	50.00	6,250.00	100	12,500
Programming	125	EA			67.50	8,437.50	68	8,438
Cabling	125	EA	275.00	34,375.00	150.00	18,750.00	425	53,125
							593	
Total Muting of Classroom AV Systems								**74,063**

			COST OPINION
Job Name **The Evergreen State College**	Basis for Opinion [ ] Schematic Design	Prepared By **Paul Robaidek**	Job Number **14083**
Description **Radio Systems Cost Opinion**	[ ] Design Development [ ] Construction Documents **[X] Conceptual Planning**	Checked by Date **Patrick Shannon**	**1/12/2015**

DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
IMPROVE UHF AND VHF COVERAGE								
Repeater antenna, and cabling	1	EA	10,000.00	10,000.00	5,000.00	5,000.00	15,000.00	15,000
Total UHF and VHF Coverage								**$15,000**
DISTRIBUTED ANTENNA SYSTEMS								
Bi-directional Amplifier	1	EA	25,000.00	25,000.00	9,750.00	9,750.00	34,750.00	34,750
Donor Antenna	1	EA	4,250.00	4,250.00	1,250.00	1,250.00	5,500.00	5,500
Omni Directional Anntenna	12	EA	175.00	2,100.00	85.00	1,020.00	260.00	3,120
Cabling	4000	LF	2.75	11,000.00	2.15	8,600.00	4.90	19,600
Taps, terminations, and accessories	1	LS	4,500.00	4,500.00	2,250.00	2,250.00	6,750.00	6,750
Engineering	1	LS			10,500.00	10,500.00	10,500.00	10,500
Total Distributed Antenna System								**$80,220**
PARTNERSHIP WITH TCOMM								
Fiber/Microwave backhaul, repeater, and licensing	1	LS	115,000.00	115,000.00	85,000.00	85,000.00	200,000.00	200,000
Total Partnership with TCOMM								**$200,000**

COST OPINION

Job Name	Basis for Opinion	Prepared By	Job Number
The Evergreen State College	[ ] Schematic Design	**Paul Robaidek**	**14083**
Description	[ ] Design Development		
Police Dispatch Cost Opinion	[ ] Construction Documents	Checked by / Date	
	[X] Conceptual Planning	**Patrick Shannon**	**1/12/2015**

	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING OPINION	
DESCRIPTION	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
PHYSICAL SECURITY INFORMATION MANAGEMENT SYSTEM								
Software configuration and programming	1	LS	50,000.00	50,000.00	25,000.00	25,000.00	75,000.00	75,000
Add-ons and integration	1	LS	200,000.00	200,000.00	100,000.00	100,000.00	300,000.00	300,000
Total PSIM								**$375,000**
CLOUD-BASED SERVICES								
Monthly per server cost	5	EA			300.00	1,500.00	300.00	1,500
Total Cloud-based services								**$1,500**
PRIVATE VIRTUAL SERVER PLATFORM								
Mid-size Storage Area Network	1	EA	25,000.00	25,000.00	11,500.00	11,500.00	36,500.00	36,500
Physical Host and licensing	2	EA	10,750.00	21,500.00	5,500.00	11,000.00	16,250.00	32,500
Core Network Switching	1	LS	8,500.00	8,500.00	2,500.00	2,500.00	11,000.00	11,000
Total Virtual Server Platform								**$80,000**
NEW POLICE SERVICES DISPATCH CENTER								
Physical space including:	400	SF	1,960.00	784,000.00			1,960.00	784,000
Dispatch Center								
Administrative Offices								
Support Spaces								
Dedicated Electronics space for headend equipment								
Total New Police Dispatch Center								**$784,000**

Appendix I - Capital Improvement Recommendations for the Medium Voltage Systems

Capital Improvement Recommendations

for the

Medium Voltage Systems

at

The Evergreen State College

by

Richard J. Davis, P.E.

February 2016

RICHARD J. DAVIS
STATE OF WASHINGTON
21422
REGISTERED
PROFESSIONAL ENGINEER

Feb 3, 2016

Introduction

This report is prepared at the request of Jeanne Rynne, Director of Facilities Services at The Evergreen State College. It is prompted by the need for critical improvements of the medium voltage (12,470 volt) system to increase reliability. The goal of this report is increasing awareness of equipment deficiencies related to both age and obsolescence so that systemic improvements can be planned, funded and executed.

Unplanned electrical power failures are always inconvenient. Those that are caused by lack of routine maintenance and the failure of equipment with known deficiencies prior to an outage are antithetical to the mission of Facilities Services. Ancillary, but important benefits of planning and funding improvements include increased safety for workers by reducing the probability and frequency of arcing type failures, and controlling and reducing future expenditures. Equipment failures can cause connected and adjacent equipment to fail through heat and overload damage, require expedited manufacturing and shipping of replacement equipment at premium prices, and often necessitate high labor costs for expedited work. Meeting temporary power needs using generators is also costly. Harder to calculate are the costs associated with interruption of the main mission of the college, the education of students.

The premise for funding improvements is reducing the frequency and duration of power outages. This can be accomplished by eliminating known deficiencies in the distribution system. There is a direct correlation between greater investment and improved reliability, although some risk of system failure always exists.

It is increasingly apparent to electrical engineers and electricians familiar with the college that the medium voltage equipment is critically deficient, despite several small upgrade projects that have been completed in the past decade. The chief deficiencies will require substantial capital investment for new switchgear, replacement of obsolete and dangerous junction boxes with load break elbows, and new cables to replace the remaining original cables.

Computing and Communications also realizes that known failure risks for the campus medium voltage system are a threat to the reliability of their systems. For example, we learned recently a 30 minute power outage can cause two full days of work for a crew to re-establish critical access to data bases and programs for the campus community.

Executive Summary

The Evergreen medium voltage system needs improvement for several reasons:

- Much of it is old, dating back to the original construction of the college, about 45 years ago.
- Regulations and standards evolved regarding safety, including the development of arc flash standards since the initial construction of the campus, and related technological improvements developed quickly in recent years. The college medium voltage switches were not designed to the present standard, causing compliance with those standards to be costly and challenging.

Fundamental causes for capital deficiencies are age, obsolescence, upgrades not keeping pace with requirements, and now, safety concerns associated with some needed maintenance and operational work. Key maintenance could not be done in some areas because interrupting power to the entire campus for the entire duration of the maintenance work was not acceptable. There has been an intersection of problems, including initial and early design changes in the early seventies that decreased medium voltage system redundancy; infrastructure improvements that were too few and were funded later than ideal; substantial improvements in technology and safety that developed in the almost half century since the initial planning and design of the college's MV systems; and a general lack of routine maintenance.

Below is a list of key capital requirements, a brief description of the item, a preliminary and pre-planning estimate of the cost of each, and a summary of the rationale for each recommendation.

1. New Main Switchgear
   a. This term refers to the equipment that provides the college-owned switching and over-current protection for the ten medium voltage feeders (sets of cables for each circuit) that are owned and operated by the college. The main switchgear is housed in the metal structure south of the Central Utility Plant.
   b. Estimated Cost: **$1.2 million**
   c. Existing switchgear is in poor condition. Compartment heaters have failed, leading to condensation within enclosures. The college cannot completely shut-off power on either side of the switchgear to fully service the heaters. It is too dangerous to prepare the roof for painting and to check it for leaks because we cannot shut off power below. The switchgear is not technologically advanced enough to provide arc flash protection. The means to raise and lower breakers includes mercury switches and is not operating correctly. We are no longer confident that the breakers will open due to their condition. <u>A major failure of the switchgear can cause a complete closing of the college for many days.</u>

2. New Cables for the F4 and F5 Feeders
   a. These designators comprise four feeders, F4-1, F4-2, F5-1, and F5-2. Each main academic building can be fed by either the dash 1 or the dash 2 feeder. The feeders are spliced at various locations with obsolete junction boxes known to fail catastrophically. The vendor, Gulf and Western, has published a letter noting their obsolescence and recommending that all of them should be replaced with new technology.
   b. Estimated Cost: **$1.4 million**
   c. The cable recommended for replacement are polyethylene (PE) insulated. The life of the cables in a wet environment is 20 to 50 years. These circuits are in a substantially dry environment, and the college has experienced no failures to date. However, several factors indicate replacement is needed soon. Indicators for replacement are:
      i. The cables are approaching their expected useful life.
      ii. The spare cable available is immediately adjacent to the cable in service, and a failure of one may destroy the other.
      iii. Once a failure occurs, the college will likely experience other failures in relatively quick succession. The rate of failure will likely exceed the rate at which replacements can be funded.
      iv. There is a high likelihood that the college will need to stop operations for at least a day or two whenever a failure in these feeders occurs. A serious failure or an injury related failure could close the college for much longer.
      v. We recently learned that the condition of the connections in the old Gulf and Western junction boxes is worse than expected. Some connectors that should have been set with a torque wrench were finger tight. A failure of any of these boxes can lead to outages, and because there is no known method to repair them to prevent all modes of failure, a failure can lead to complete cable and splice replacement for the affected circuit.

3. New Medium Voltage Switches in Buildings
   a. Most main buildings have two dry, snap action MV switches, one for each feeder. The Library building has two sets. These are original equipment, and some are beginning to fail mechanically.
   b. **Estimated Cost: $850,000**
   c. The chief justifications for change are failures, as has occurred in the Communications Building; technological obsolescence due to lack of arc flash risk mitigation in the design of this equipment; and lack of routine maintenance, which has allowed oxidized electrical contact surfaces to be in use. Of the three

major costs listed here, this one could be delayed by performing maintenance. The main switchgear upgrade will allow the MV switching in the buildings to be done when circuits are open, an appropriate work-around for arc flash mitigation.

4. Replace Housing Community Center and Parking Lot "B" Transformers
   a. The HCC transformer is a wye-delta transformer, the final link preventing the college from setting ground fault protection on this circuit, the only college circuit without this protection. Ground fault protection will generally allow the circuit to open more quickly in the event of a fault, improving safety.
   b. The Parking Lot "B" transformer is a live-front device. It is dangerous for workers, vandals who open the cabinet, and can cause major outages in the event rodents enter the enclosure.
   c. **Estimated cost for both replacements: $100,000**

Total Cost of Improvements Needed: **$3,550,000**

General Background on Medium Voltage Systems

Medium voltage (MV) has more than one definition. The IEEE (Institute of Electrical and Electronics Engineers) defines medium voltage as greater than 1000 volts and less than 100,000 volts. NEMA (National Electrical Manufacturer's Association) classifies medium voltage cables as having ratings between 600 volts and 69,000 volts. The Evergreen MV system, at approximately 12,470 volts, or 12.47 kV, meets both definitions.

There are several reasons that college and university electrical distribution systems often use medium voltage on campuses. The primary and driving reason is that higher voltages allow the delivery of energy with lower current flow. Less current flow correlates directly with smaller wire and smaller bus bars in electrical equipment, reducing the expense for equipment. There is also a utility cost savings. Most serving utilities, including Evergreen's, offer lower rates in exchange for the customer paying the capital costs for transformers that change medium voltage to the voltages commonly found within buildings, such as Evergreen's 480/277 and 208/120 volt systems.

Unique Characteristics of MV Energy and Safe Practices

Medium voltage power systems have many surprising characteristics compared to the lower voltages with which we are somewhat accustomed in our residences. These differences include those based on physics, work practices, and extend to the training of personnel who work on them. Some are expressed in bullet form, below:

- Licensed journey level electricians are not trained in medium voltage systems. Most electrical trades persons interested in the field of medium voltage work become linemen or get other specialized training after becoming electricians. Electrical engineers familiar with building design may know very little about medium voltage systems. Again, they participate in additional studies to learn the field.

- Having workers get close to live conductors is very dangerous, because an arc will establish. Stopping the arc requires moving further away than the distance between the person and the conductor when the arc began, but the victim is incapacitated and cannot escape.

- Right-handed persons perform switching functions with their left hands and vice-versa. Switching requires standing not on the hinged side of the cabinet, and not in front of the door. Because the switches are large and spring loaded, it is physically difficult to actually perform the switching, especially with one's weaker, non-favored arm. Safe switching practices lower the risk of harm from arc flash explosions, and may mitigate

harm by assuring that a favored limb is not lost in the event of mishap. Further mitigating harm is the use of flash protection personal protective equipment, which is increasingly in use for switching operations based on updates to NFPA 70E, the industry standard for arc flash protection.

- All work is done with the cables and equipment de-energized. Workers use "hot sticks," insulated tools, to attach ground clamps to the equipment and cables before working on them. This discharges any capacitive energy to ground, making the disconnected equipment safe to work on.

- Injuries from medium voltage shocks are generally severe burns and shock that are often fatal. The risk of harm is high. At Evergreen, all work is discussed in advance among the workers and managers to prevent injuries and reduce the risk of error and the incidence of harm. Everyone has the right and duty to state errors and omissions in the safety protocols. We meet again before re-energizing circuits to make sure everything is safe, including all covers being in place, with all personnel agreeing on the readiness of the system to handle energy.

Description of Evergreen's Medium Voltage System

A single Puget Sound Energy overhead circuit is split into two feeds at the last pole, one owned by the college. This pole is on the load side of the meter, the traditional and actual demarcation between customer and utility property. The feeds supply energy to each side of the main switchgear at 12,470 volts. The entire campus can be fed from either side of the switchgear, allowing the side not energized to be serviced. There are six active circuit breakers on each side of the switchgear. Those circuits supply the loads listed below (not listed in any particular order).

- Main Breakers (one on each side of the switchgear)
- Housing (all plus the Covered Recreation Pavilion)
- Lab II, Seminar II and Communications Building
- Lab I (includes Annex), Lecture Hall, Seminar I (includes Longhouse), Library, CRC, and CAB
- Parking Lots B and C, Pump Station and Child Care Center*
- Central Utility Plant

*One breaker on each side of the switchgear can supply energy to this single feeder through an A-B style switch, with the common terminals serving the load. The switch location is in the tunnel below the main switchgear. There are two identical switches, this one, and an abandoned one next to it that failed after approximately 12 years of service due to corrosion on the bus bars.

Most, if not all, of the cables installed at the college during the initial construction were polyethylene (PE) insulated. These cables usually fail from tiny fissures as they age. The fissures can fill with water, resulting in what is called "treeing" due to the appearance of branching that resembles tree growth when viewed with a microscope. Treeing leads to shorting and catastrophic failure in roughly 20 years, much shorter than the anticipated cable life. EPR cable is preferred for direct buried applications because it is less vulnerable to water intrusion and consequential failure.

Fortunately, the majority of the college's cables are in the tunnels. These are on trays that have asbestos board liners to support the cables. The cables are generally warm and dry, allowing them to last longer than those in underground service that are buried.

Direct buried cables fed the Child Care Center, Lots B and C, and the Pump Station. They were replaced in 2014, and the new cable was installed in conduit. A spare, empty conduit was installed adjacent to the conduit in service to expedite replacement in the future and to reduce down-time following a failure. The only other direct buried cable runs from the switch behind the CRC to Mod Housing, and serves Modular Housing. It was installed as a replacement in the early nineties, and has no spare conduit. Housing feeders leave the tunnel just south of the CRC and run in conduit to the residence halls.

All major buildings have MV switches, usually two key-interlocked dry style snap-action switches suitable for hot switching. There is one switch for each feeder. Switching the building's load from one cable to the other requires opening the switch supplying the building and closing the other, assuming both feeders are energized. We had been switching the buildings' dry switches with all power off to decrease the risk of arcing. This reduces risk of injury for the workers doing the switching. The main switchgear breakers could handle hot switching more safely than those in the buildings. However, due to the poor condition of the main switchgear, we switched the dry contact building switches under load recently. To my knowledge, this was the first time this was done in the history of the college, and the first time since April 1994.

Important MV Improvements at Evergreen's Olympia Campus

- Repeated failures of the direct-buried cable serving Modular Residence Halls caused cable replacement from near the CRC to the transformer at Modular Housing in 1993. My best information is that the new cable was installed like the old one, with no conduit. Also, no spare conduit was added that would allow for expedited replacement while minimizing outage duration. The soccer field will need to be trenched again. To my knowledge, this is the only remaining direct-buried MV cable owned by the college.

- Portions of the Phase II Residence Hall MV cable (in conduit) failed during a project in 2012. That portion of cable, installed with the second phase of the apartment style units, was replaced.

- Replaced direct-buried cable that serves the Child Care Center, the Pump Station, and parking lot lighting for Parking Lots B & C. This was an original, direct buried cable that was past its expected life. Failure could cause interruptions anywhere along the path of the cable, including the Evergreen Parkway and McCann Plaza. Also, repair following failure would have been time consuming, potentially taking several weeks. This would be unacceptable for the power source that feeds the college's water pump station and the fire pumps. The new feeder is in conduit and is adjacent to a spare, empty conduit to make future replacement quicker and easier than otherwise.

- Two switchgear circuit breakers were replaced with refurbished breakers in 2015. The project also included some breaker control system repairs.

- Four of seven transformers serving Phase II of campus housing did not have neutral connections. Replacement of those transformers was completed in 2015. Unfortunately, the HCC transformer needs replacement for a similar reason.

- Re-established feeder redundancy in 2010 for college residence halls up to the switch behind (northeast corner) of the CRC for Phase II (apartment style) and Phase III (Mod Housing), and for the entire run for Phase I (A, B, C, and D).

- Reconfigured the circuits in 2002 to allow routine maintenance on each side of the switchgear while the other side serves all college loads, thus increasing the ability to perform needed maintenance. This work will be complete as soon as the college resolves a concern with disconnecting the Puget Sound Energy service from each side of the switchgear. The work is scheduled for the summer of 2016. We will install a pad-mounted switch in the main switch yard that can disconnect one or both feeds. The design work is underway now.

Summary of Maintenance History

The college opened in 1971, forty five years ago. Much of the Olympia campus MV system is original. Indeed, there are MV switches for which no record exists of routine maintenance. No routine maintenance (cleaning by wiping internal parts and vacuuming) has occurred on MV switches in buildings for over two decades.

The main switchgear has been serviced and tested periodically by outside contractors, although the maintenance intervals are sporadic and have been too infrequent based on the number and severity of the problems discovered by Eaton Corporation working as a subcontractor for Taurus Industries, Inc. in 2014. These problems include several breakers that would not open upon fault detection because of lack of lubrication - the grease had become solid. Two breakers failed high potential testing. Both were replaced at a cost of approximately $20,000 each. One of the two failed breakers worked fine at 20,000 volts and will be kept as a spare. Also, many manual and fault tripping circuits had failed, and mechanical systems to raise and lower the breakers are not operating correctly, requiring staff to lift and lower the breakers manually using a poorly designed crank and worm gear system. Unfortunately, the worm drives are not lubricated, making this work extremely difficult. Indicator lights and labelling are not functioning and are in disarray.

In 2001, the college commissioned Cross Engineers, Inc. to study the MV system. The work was accomplished by Theodore "Ted" Cross, P.E. He stated, "The cable (in the tunnels) may last 40, 50 or 60 years, and it may fail tomorrow." He recommended that the college not replace it because upon failure staff can switch to the redundant feeder. He later stated that, "Only those loads without a redundant feeder connection are at risk for an extended blackout from a feeder fault."

The circuits without second feeders and their status are as follows:

> ***Feeder to Mods*** – Direct buried cable from behind CRC Building to Mod Laundry Building, serving the Mods. It was replaced in 1993 with another single direct buried feeder. The estimated remaining life is 10 to 20 years.
>
> ***Feeders to Housing*** – The initial redundant design was defeated with the addition of the Mods, which were fed with one of Housing's dual feeders, and Phase II which was fed by the other. Redundancy was re-established with the addition of a new switch behind the CRC in 2010. During the following biennium, in 2012, the main feeders to Residence A were changed. These are in conduit. The 2012 project also removed a switch from service for the Mod feeder that failed due to lack of regular maintenance. The MV branch circuits to Phase II and the Mods have no redundancy. Establishing redundancy for Phase II is more difficult because each of the pad-mounted transformers is a connection point. However, in 2014 we added a second, spare conduit for approximately half of Phase II.
>
> Thinking of Phase II as having seven pad mounted transformers plus the HCC transformer as loads for the MV system allows the following table to be useful for understanding the status of this portion of the campus MV system.

Transformer (1 is closest to line-side)	Cable Connection Status for Transformers 5 thru 7, not including HCC transformer	Transformer Characteristics	Action
1	Connection to transformers 5 through 6 is similar to a daisy chain. Failure of one transformer requires leaving all of Phase II without power pending replacement or temporary modifications.	No neutral terminal on primary side of original transformers. Connection did not permit setting ground-fault detection for all of housing	Remedied by a project completed in 2014. Transformers are connected in a parallel configuration. New transformers, new conduit with a spare conduit are installed.
2			
3			
4			
5		Neutral terminals exist.	New cable pulled in in 2012, using old conduits
6			
7			

List does not include the HCC Transformer.

Table 1 – MV Status Summary for Phase II Residence Halls

The cable replacement in 2012 was caused by a cable failure that occurred during switching of the circuit. Existing conduit was used to pull the new cables, thus not correcting some of the inherent problems created by the original design.

Child Care Center, Parking Lots B and C, and the Pump Station – The MV cable serving the Child Care Center, Parking Lots "B" and "C," and the Pump Station, until 2014, was an original, direct-buried polyethylene insulated cable that was beyond both its economic and useful life. It had never failed. The cable was replaced using horizontal boring technology in 2014. Once the bore holes were completed, two conduits were pulled through. One of these is available for future use in the event of cable failure. The other conduit contains the new, replacement cable. The old direct-buried cable was cut and abandoned in place.

Conclusion

This report includes recommendations for necessary improvements to establish reasonable performance of the medium voltage system at The Evergreen State College in terms of both reliability and safety.

Earlier drafts of this report included repairing the main switchgear. Since then, the condition of the switchgear has continued to deteriorate due to the existence of moisture, the costs to protect the gear from weather and repair it are increasing, and we continue to learn of better designs that render the existing switchgear obsolete. Also, arc flash prevention is of increasing importance in improving safety. Speed of operation and arc flash prevention will be greatly enhanced with new gear.

The same drafts recommended not replacing the cables and junction boxes in the tunnels, circuits F-4 and F-5. The cables should be replaced and the junction boxes should be removed, predominantly for two reasons:

1. The cables are much older and more vulnerable to failure now than when Ted Cross wrote his report fifteen years ago.
2. The condition of the Gulf and Western junction boxes is worse than we thought at that time.

New splices should be load break style elbows of reputable manufacture (3M or Elastimold).

Appendix A

Important Historical Changes - Chronological

1971 Connection of Mods to one of the redundant feeds for campus residences. This was likely done because the Mods were thought to be temporary. The Mods remain in service today, 45 years after the college opened. This method of connection impaired the redundant feeder design for Residence Halls A through D because only one feeder could supply all of the residences once the Mods were connected in this fashion.

1987-89 The apartment style residences were constructed in two phases. Both are now referred to as "Phase II of Housing." Primary electrical service is through a single feeder that supplies energy to several small pad-mounted transformers, similar to a residential single-family housing development. The feeder is connected at the upstream end to one of the two residential housing feeders, the one not serving the Mods. Thus, a failure of either of the "redundant feeders" would require use of the second feeder to supply Residence Halls A, B, C and D, but interrupting the electrical feed to either Phase II or the Mods. The redundancy contemplated by the original design team existed only for Residence Halls A, B, C and D, not for all residences from the time the college opened until 2010.

1993 The Mod feeder cable was replaced after several failures of the original cable. This circuit feeds the Mods, the Covered Recreation Pavilion, and a walkway lighting circuit along Driftwood Road.

2000 The main campus tie bar at the west end of the main switchgear, and on the opposite end of the switchgear from the single PSE feed, failed on December 24, 2000. This failure was an opportunity to end the single feed to the switchgear that impaired the ability of Facilities Services to completely shut off power to each side of the switchgear at different times. This led to the changes noted in the bulleted items immediately below, the steps taken to make the switchgear fully serviceable without interrupting electrical service to the campus for the first time in the history of the college.

2001 An MV study was commissioned by Facilities Services and completed by Cross Engineers, entitled "Electrical Systems Evaluation."

2002 Puget Sound Energy split their feed, supplying each side of the switchgear with MV feeds, as apparently intended by the first designers of the college. The tie bar at the west end of the switchgear was no longer needed and was disconnected.
The dual feeders for residences were spliced together, completely defeating redundancy as intended originally. This remained so until 2010. Two switches were installed in the basement

below the switchgear. One permitted feeding the Pump Station, Child Care Center and Parking Lots B & C feeder from either side of the main switchgear. The other did the same for the residence halls.

2010 A new switch for the housing circuit was installed behind the CRC, and the housing switch installed below the main switchgear in the basement ten years earlier was abandoned, establishing dual feed for all residences from the main switch gear to the new switch. Redundancy for MV feeds was established for Residence Halls A, B, C and D for the first time since the installation of the Mods in 1971.

2012 New feeder cables were installed for the residence halls because the old cables were not changed in 2010 when the switch was added. The MV switch for Mod Housing near the main soccer field, installed in 1993, was removed from service. Note that the Housing Phase II system remains a single feeder distribution on the load side of the switch near the CRC, as do the Mods.

2014 New cable was installed for Parking Lots B and C, the Pump Station, and the Child Care Center. The new cable was installed in new conduit, and a spare conduit was installed that will be available for installing a replacement feeder in the future. This work left the Mods as the only load on campus served with direct-buried MV cable.

Appendix B

Repair Recommendations (rev. February 2016)						
No.	Work Type	Description	Potential for In-House Work?	Repetition	Cost	Estimated Annual Cost
1R	Repair	Communications Building: Right hand switch door interlock has failed	Yes	One time, asap. Mike Drennon has needed parts.	$7,000	
2R	Repair	Repair failed switch in tunnel below the main switchgear.	Yes	None	$5,000	
Cost Summary - Estimated Repair Cost					**$12,000**	

Table 1 - Repairs

Appendix C

Maintenance Recommendations (rev. February 2016)						
No.	Work Type	Description	Potential for In-House Work?	Repetition	Cost	Estimated Annual Cost
1M	Maintenance	Fill potheads at G&W connectors that are leaking (source: Cross)	No	Perform asap. Repetition schedule judged based on how much fluid is added.	$5000 for first, then $1000 for subsequent work.	$2,000
2M	Maintenance	Update one-line diagram with detailed annotations of work and changes. (source: Cross)	Yes	At each major repair or system change.	Drafting section.	$2,000
3M	Maintenance	Clean and lubricate MV switches in buildings. (source: Cross)	Yes, with training and equipment	asap and every 5 years thereafter.	$30,000 the first time (equipment and training) and $20,000 thereafter with overtime	$5,000
4M	Maintenance	Hire Eaton or equal to maintain the switchgear to verify lubrication of breakers. One concern is that the oil added in 2014 to the grease may not maintain lubricity.	No	Complete testing starting asap and every 5 years thereafter.	$10,000	$2,000
5M	Maintenance	Clean MV vaults of debris, mud and excess water	Yes	asap and each two years thereafter.	$5,000	$2,500

6M	Maintenance	Test existing G&W connection boxes in tunnel using infrared sensor	Yes	At least annually, twice per year is better because of age and risk.	$1,000	$2,000
7M	Maintenance	Clean and check torque on existing G&W dry connectors.	Yes	Subsequent service based on IR testing each 5 years.	$5,000	
8M	Maintenance	Test trip function of each MV breaker between contracted work noted in item 3M.	Yes	Annually, except years divisible by five.	$1,600	$400
9M	Maintenance	Clean load brake compartments in pad mounted transformers, including RAD.	Yes	Annually	$2,000	$2,000
10M	Maintenance	Repair Water Leaks in Tunnel	No	One each year, minimum	$15,000	$15,000
Cost Summary - Estimated Annual Maintenance Cost						**$32,900**

Table 2 - Maintenance

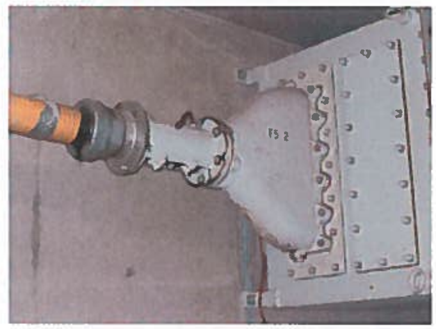
Note: Many maintenance and repair tasks end or change if recommended capital improvements are funded.

Appendix D - Photographs

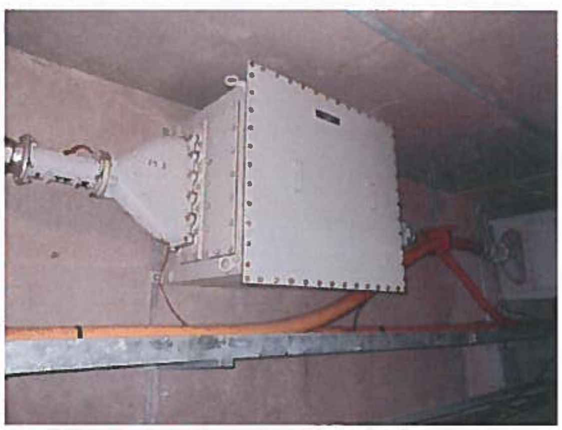
Lab II MV Switches

Lab II Key Interlock Allows Only One Switch to be Closed at a Time

Material That Leaked from Pothead

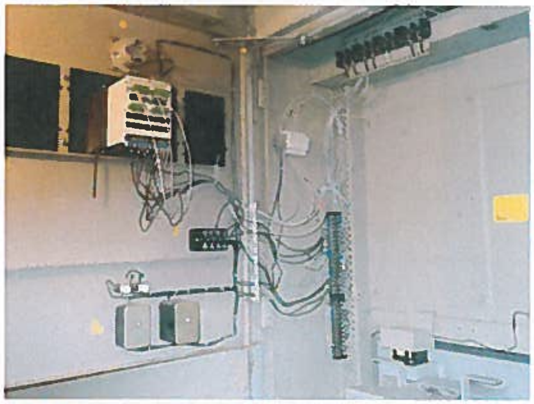


MV Cable Enters Junction at Pothead



Junction Box – Obsolete

Switches Added in 2002. One on Right Failed and is Out-of-Service



Meter Portion of Breaker Cabinet

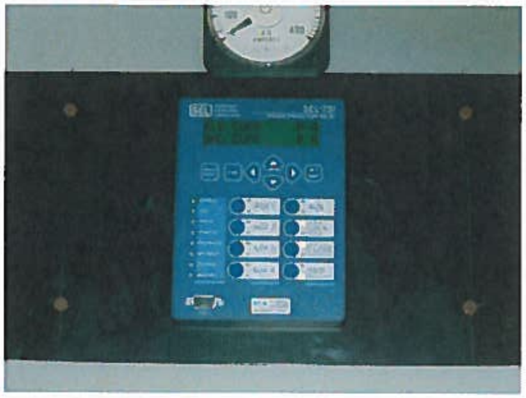
Breaker from Back Perspective

Damage from Year 2000 Failure

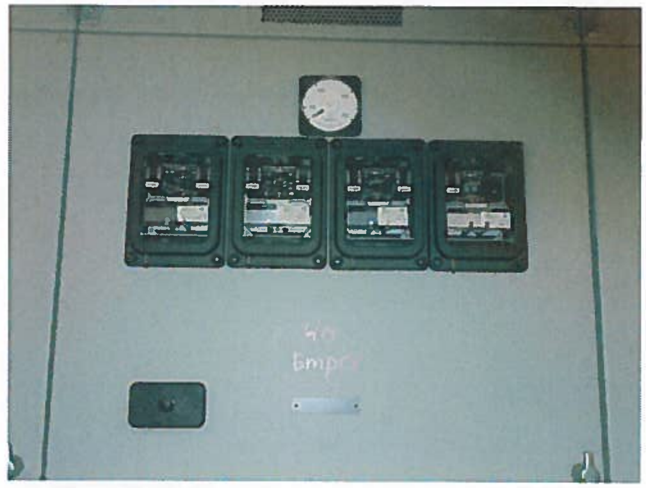
Switchgear from the Outside

Switch Installed Between CRC and Phase I
Load End of Dual Feeder System for Phase II and Mods

A Typical Pad Mounted Transformer
serving Phase II of Housing



New Style Meter



Old Style Meters

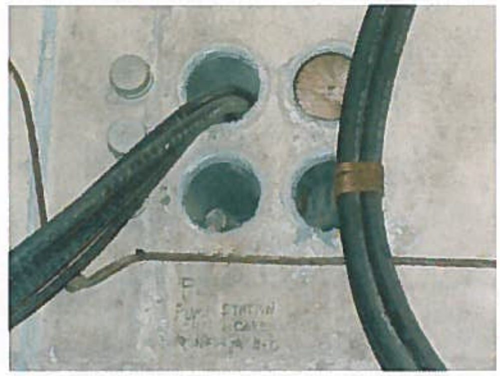
Empty Breaker Cabinet

Upper Portion of Breaker Space

Right Side of Breaker Compartment

Breaker in Place

Key Interlock for Basement Switch



New Cable to Pump Station, Child Care and Lots B and C.

Failed Parts from Abandoned Switch

Last Pole Prior to TESC Substation

Westinghouse Breaker – Needs Repair

Last Two Poles Prior to Substation

Appendix J - Stakeholders Telecommunications Findings and Review

Stakeholders Telecommunications Findings & Review

December 1, 2014

COMgroup inc

the evergreen state college

Project Tasks and Methodology

- Collect and review technical information for the current environment
- Review data network & infrastructure readiness
- Conduct needs assessments and educational sessions with departments
- Develop requirements and specifications
- Provide a survey of systems and vendors in colleges of a similar size
- Assist in budget development
- Deliver an implementation strategy

Computing & Communications Goals and Strategies

- **GOAL** - Develop a robust technical environment that provides a diverse community of students, staff, and faculty with mobile access to important College resources
  - ***Strategies***:
    - Implement a secure wireless portal that supports access to College resources including providing guest accounts
    - Develop and implement a unified mobile support strategy
    - Design and develop integrated, mobile-friendly single-point access to the most important college technologies
    - Explore opportunities to develop unified voice, video conferencing, email and text messaging services
- **GOAL** – Improve our outreach to underserved students via appropriate technology and infrastructure
- **GOAL** – Enhance and improve internal communications

Data Infrastructure

- Current network architecture works well for the campus
- Need to focus on improving infrastructure for Wi-Fi and Internet bandwidth
- Necessity for time sensitive networks are driven by VoIP, wireless network and desire for mass emergency notification system
- There is a lack of power to the data closets and power supplies for data switches
- Virtualization and 24/7 computing are driving the need for a more agile and reliable network infrastructure
- Asses financial impact to remediate the network

Voice System

- Legacy Nortel technology
  - Digital versus VoIP
- Well past manufacturer's supported versions
- Vendor support services are only best effort
- Some required and desired features are unavailable like audio conferencing and collaboration tools
- Limited business continuity or disaster recovery capability

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Common Themes

- The Evergreen State College is going through growing pains and catching up with today's academic and computing environment
- A personal connection with callers is preferred by most departments and handling the majority of calls in person is optimal
- Lack of standardization for telephone sets, desktops/ laptops and email platform across the campus
- Frequent commercial power failures interrupt service
- Most users did not know how to conference or use other basic features

Common Themes

- A parallel project underway will broadcast alerts to students, faculty, staff and parents
- A high volume of incoming calls into department numbers are transferred to other departments or to the campus operator
- Current cell phone coverage is poor outside of campus buildings and is limited inside most buildings
- Due to the nature of their work, some staff use personal cell phones to conduct College business (Facilities, Recruiting, Coaches)

Findings – Telephony

- Interest in mobility choices:
  - Calls redirected to cell phones or other numbers, controlled by individual user
  - "Simultaneous ring" to other numbers or cell phone numbers
  - <u>Outbound calls from cell phones</u> shows the College extension for caller-ID, *not* personal cell numbers
  - <u>Incoming calls</u> default to the College voice mail system, *not* the personal cell number
  - Remote access to allow work from home
  - Wireless headsets allow the ability to answer calls when away from the desk
  - Soft phones for use when traveling or when off campus.

Findings – Telephony

- Need to improve internal communications
  - Ability to determine if others are on a phone call, in a meeting or unavailable (Presence)
  - Integration of the calendar function into Presence
  - Ability to chat (Instant Message or IM) with others on campus
  - Easy use of conference features

Findings – Telephony

- Need to improve external communications
  - Some departments would use an Auto Attendant for their main number to reduce the quantity of individually handled calls, however designs should be simple, resulting in improved customer service
  - Opportunities for utilizing basic Call Center functionality for queuing, messages while on hold, reporting capabilities, especially during peak busy times
  - Ability to automate outbound calling for fundraising, recruiting and development programs
  - Future ability to integrate with Admissions CRM package, Hobson's Radius

Findings – Telephony

- Need ease-of-use tools
  - Caller ID on incoming calls, both number and name (when provided)
  - Audio conference bridges for collaboration with other schools or professional groups
  - Collaboration tools for hosting webinars or training
  - Desktop sharing imbedded into communications tool
  - Personal call history log
    - Calls placed, calls received, and calls missed
    - Ability to "click to dial" from a log entry
- Want to send or receive Faxes in email
  - 70 Fax machines in use

Findings – Voicemail

- Many users dislike the current user interface; they don't know how to use the features, what number to call in to retrieve messages etc.
- Ease of use is main requirement:
  - Easy to manage from email account
  - Ability to prioritize returning calls based on caller ID information
  - Easy to forward messages or transfer callers direct to voicemail
  - Some systems allow users to apply multiple greetings based on their status, i.e. out of the office, in a meeting, busy etc.
- 40% of faculty use Mac's
  - About 20-30% of Mac users use Outlook
  - Mac Mail is used by all others
  - May impact availability of universal tool for unified messaging

Findings – Voicemail

- Some departments/users have more than one voice mail box they monitor for mail; retrieving messages is cumbersome since each voicemail box does not have a message light

- Some faculty have individual numbers or mailboxes; most don’t have office hours and deal with students via email

- There is confusion between students, campus operators and departments regarding call handling and transfers from voice mail boxes that result in calls being handled several times before they reach the correct destination

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Findings – other requests

- Tools for outbound calling campaigns
  - Create content & manage call campaigns without involving IT

    Interested areas are Admissions, Advancement, Graduate programs & KAOS radio stations for fund raising and recruiting
  - Emergency messaging (classes cancelled due to weather)
  - Appointment reminders from Health Services
- IVR
  - Expand and redesign a menu for Registration
  - Areas interested in new menus, Financial Aid & Deans office
- Long Distance Billing
  - Charges for long distance are a sore spot with some departments
  - Feel they are penalized because they contact students or conduct campus business and pay a premium to conduct business
  - Most departments don't understand it is a funding mechanism

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Findings – Emergency Operations

- Multiple departments on campus are stakeholders in planning and executing emergency operations plan
- EOC center is currently designed with (10) POTS lines and (10) analog extensions off the PBX
- There are multiple options available for notifications: email, E2 subscription program, Alertus
- Campus operators are interested in recording emergency calls
- E911 calls are delivered with specific extension and room number which requires a manual process to keep current

Industry Trends

- PC Call Control (application software)
- Soft-Phone
- Unified Messaging
- Collaboration tools
- Mobility Options
  - "Twin" or simultaneous reach with cell phones
  - Smart-phone apps
- Instant Messaging with Presence / Status

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Telecom Manufacturers

Likely to provide proposals:

- Avaya (now own Nortel)
- Cisco
- NEC
- Microsoft
- Mitel (now own Aastra / Ericsson)
- ShoreTel
- Unify (formerly Siemens)

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Choices Affecting Total Costs

- Hardware Costs
  - Telephone set choices
  - Headsets
  - Gateways for local trunks
- Software Costs
- Unified Messaging
- Call center agents
- Business continuity functions (some)
- Professional Services
- Computer / Telephony Integrations (IVR)

Questions

And Answers!

Appendix K - Voice Communications Strategic Planning

The Evergreen State College

Voice Communications Strategic Planning

December 2014

Produced by:

COMgroup inc

TABLE OF CONTENTS

Executive Summary

COMgroup, an independent consulting firm, was hired to assist The Evergreen State College (TESC) with the development of a project plan, evaluation and budget for the replacement of the telecommunications systems.

This report includes technical specifications for a future RFP (Request for Proposal), a plan to address voice communications requirements, a conceptual solution design and budgetary cost estimates to assist the College with the procurement of the appropriate technology to modernize the telecommunications systems.

The following tasks were completed and used to produce recommendations for this voice communications strategic plan:

- Collected and reviewed statistical information provided by the College project team on the current systems and services
- Reviewed the impact of technology projects that are either underway or planned
- Interviewed representatives from internal departments and Computing and Communications to elicit requirements, business needs, and future plans
- Presented the interview findings to the project team and stakeholders
- Identified communications infrastructure and data network issues that will impact the project
- Reviewed the College's current telephony providers and also the industry leaders of unified communications systems as potential replacements for the current system
- Analyzed the industry technology developments and developed a conceptual recommendation

Background

The Evergreen State College (TESC) telephone system is at end of life and does not provide the benefits of the newer telephony architecture, which leverage data networking principles.

The existing vendor support contract is limited to "best efforts" and because the manufacturing support has ended, parts and software fixes are not guaranteed. This means that support for core software problems (patches) is unavailable and the diagnostic and troubleshooting skills of the manufacturer are no longer available. The lack of access to engineering support and software patches increases the risk of problems that affect daily operations or could potentially cause a system-wide communications interruption. The current systems cannot be upgraded; the technology changes are too different to make the Nortel product line (now owned by Avaya) upgrade feasible.

The College must ensure that the new / replacement system integrates with other communications and networking systems, and lays the foundation to meet the College's needs for the foreseeable future.

Telecommunications Industry Technology Trends

Over the past 15 years, the industry has evolved from digital telephony (based on dedicated point to point circuits using time division multiplexing, or TDM) to Voice over Internet Protocol (VoIP) telephony, using data packet transmission and standard Ethernet-based protocols for real-time communications (voice and video). This evolution created significant turmoil in the industry, leading to new products and vendors, with some of the traditional suppliers unable to make the transition. Since the College has not made incremental upgrades to the system during this transitory period, the current Private Branch Exchange (PBX) or phone system, is not considered current technology. Furthermore, the PBX in place is now old enough that it is getting difficult to obtain parts and the manufacturer will no longer provide software support. The industry has completed the transition to VoIP thus, it is now prudent and necessary that the College move forward as well.

IP telephony development has produced many benefits, including new features, improved business continuity capabilities, and better integrations with computer systems. Some of the other enhancements include using IP-based techniques to provision the trunk circuits and connections to other peripheral systems like an IVR (Interactive Voice Response).

VoIP is an underlying element of all new telecommunications system research and development. But VoIP is more than just the dominant technology trend – it adds value, features, and services. All new product development for every manufacturer attempts to leverage the IP standard for new (cost effective) features not available on the older systems such as data systems integration, text messaging, video, mobility, collaboration, etc. VoIP also provides the capability for a "virtual enterprise". Voice services and applications can be extended to remote locations over a Local Area Network, (LAN) or Wide Area Network (WAN) providing services to mobile and teleworkers. Business Continuity can be more than the traditional Disaster Recovery scenario that requires IT to implement a stand-by back-up plan. Instead, the systems are designed and programmed to anticipate various component and services failures. This allows the College to immediately react and adapt to changing conditions that may be market driven, system caused, or disaster related.

Because the systems today are far less hardware dependent, core applications can be duplicated and distributed across a WAN. The key components can be installed at a geographically diverse location, avoiding the need to purchase and maintain separate voice systems for each location.

The telecommunications carriers have responded to the technology changes in a similar fashion. They, too, are converting their network backbones and their

primary services to IP-based offerings. The other carrier service that benefits from this conversion is the delivery of dial-tone using IP instead of analog or digital transmission. Often referred to as SIP (Session Initiation Protocol) trunks, it is the natural match for a VoIP system because there is no media conversion needed and the service is easily scalable and offers new features. SIP trunks reduce local telephone line costs, reduce equipment costs (eliminating TDM gateways) and provide dramatically improved flexibility and business continuity. New features such as video calls, intelligent routing, and dynamic service levels are possible, although not offered by all carriers. SIP trunks are the future of carrier services just as VoIP has changed the PBX market.

Although the initial driver is to remove the risk of failure, a well-designed new system will enhance daily operations, improve business continuity, and add functionality that will provide collaboration abilities and other efficiencies to many departments across the campus.

Implementing a new integrated system allows TESC to design the system with better redundancy and takes advantage of planned changes for distributed servers for all core services. The result is a robust architecture that can survive various internal and external events that continues supporting full telecommunications operations and provides improved cost-effective options for disaster recovery operations.

One key item to note; the change to VoIP does not impact the continuing need for the delivery of analog services for many functions including elevator phones, FAX machines, lobby courtesy sets and for the “ePhones” or emergency phones located at the blue pillars around campus. New systems can continue to support traditional telephony through the use of analog gateways that extend analog services where needed.

Data Network Assessment

A VoIP-based PBX system requires a sound data network design and proper settings to handle the needs of real-time voice communications traffic. To ensure there are no hidden issues with the current configuration or deployment, one of the project tasks included a full review and a software-based test using real-time protocol packets

NetAlly Testing

The NetAlly tool consists of probes and a test center. The probes simulate IP phones by sending controlled phone calls between a pair of probes and report the voice qualities to the test center. The number of simultaneous calls can be controlled by the test center. For the G.711 codec, each call uses about 82kpbs of bandwidth.

The test traffic traverses the College’s internal network. The test agent software communicates with the Test Center (at COMgroup) only for test controls and

reporting. Performance metrics include network end to end packet losses, network jitter, and delay.

Four probes were deployed to the College:

- One agent at the datacenter to simulate the voice server
- One agent at the Library where the connecting switch has seen heaviest traffic historically
- One agent at Housing where the Uplink is only 100Mbps
- One agent at the Tacoma campus where the connection is provided by 100Mbps QMOE link

Readiness tests between the four agents were run on November 12th, 2014. The simultaneous calls per test case were increased from 1 through 10 between agents. One of the goals of these tests is to look for variants based on call volumes.

Certification test between fours agents were run on November 12th where 20, 60 and 100 simultaneous calls between Tacoma, Housing, the Library and the server room were placed every two minutes for 24 hours. One of the goals of these test is to look for variants based on time.

Summary of observations:

- Jitter and Delay are well within acceptable limits
- There were end to end packet losses
- Packet losses drove the voice quality down

Test results are in Attachment A.

The data network is centralized which works well for the campus. The College has standardized on HP switches for the data network hardware. The HP-5400 switches provide 1Gbps ports and are Power over Ethernet (POE) capable. As of last count, there are (12) non-POE data switches at the Olympia campus.

Wiring includes various fiber runs with separate data and media paths. The existing fiber cables are using the older OM1 standard (62.5 micron MM fiber) that can only support 100mbps over long distance, hence the bandwidth limitation to the Housing facilities.

Spare pairs from buildings on campus to the core are available however there is no redundant path.

Data wiring to workstations is Cat5e or better in most areas. Best practices require that any Cat 5 wired locations are upgraded to Cat 5e prior to a VoIP deployment. There is a mixed number of ports, anything between 1 and 4, at workstations and not all stations have two data ports. Where only one data port exists, this would limit the deployment to a converted model only.

The wireless network is an Aruba 802.11n infrastructure. Wireless is currently public facing only and is currently being testing for internal use that is anticipated to be ready prior to the VoIP project.

Existing Voice System Assessment

The main phone system is located at the Olympia campus and has two ISDN PRI T1's that carry 2-way inbound and outbound traffic.   A remote PBX shelf is located in Tacoma connected by a T1 with tie lines back to Olympia. The Tacoma site also has an ISDN PRI T1 for 2-way inbound and outbound calls to Tacoma.   Long distance calls from Tacoma are routed through Olympia. The system is configured for approximately 1,575 phones, almost evenly split between analog lines and digital (multi-line sets).

The College has an unusually high number of analog sets used for a variety of applications; elevator lines, FAX machines, classrooms, emergency phones and courtesy phones in Housing. Phone sets are subject to vandalism and frequently replaced.

The current PBX system manufactured by Nortel was installed prior to 1992 and last upgraded in March of 2009. The CallPilot voice mail system was installed in 2005. Both systems are at end of life and do not provide the benefits of newer telephony architecture, which leverage data networking principles.

Gap Analysis

Data Network

The upgraded HP data network devices are capable of supporting a VoIP deployment. However several critical items need to be addressed prior to the VoIP implementation:

- Configure end to end QoS to eliminate packet loss in the network by giving higher priority to VoIP over other network traffic
- Cat 5 cables - Best practices require that any Cat 5 wired locations are upgraded to Cat 5e or Cat 6 prior to a VoIP deployment
- Insufficient Power supply to support full POE load at Edge switches and no UPS in the IDF's

Options to address power issues for data switches include:

1. Add power supplies for HP 5412zl and HP 5406zl switches to support added power requirement by the phone sets and WAP
2. Use external power injectors to support the phone sets and WAP
3. Use solutions such as Phybridge to utilizing the existing phone wiring and provide power via the Phybridge unit

Uninterrupted Power Supplies (UPS) should be adequately sized for the PoE switches in the telecommunications closets to provide protection for power surges, brownouts or brief interruptions. Options include:

1. Install enough UPS power per IDF to support gracefully shutdown, brownouts or gap before backup generator starts. Additional circuits to the IDF may be required depending on the power draw
2. Provide centralized backup power to Phybridge or other analog gateway units that can be centrally located in the current PBX room

TESC IT staff are knowledgeable about the power issues with some work already in progress. See Attachment B for estimated IP Phone wattage requirements.

The other data network improvement recommendations have limited impact on the immediate VoIP project, but are more strategic in nature. These are:

- Continue to utilize hub and spoke, layer 2 architecture. Care must be taken to size the subnet to minimize broadcast traffic, level of cascaded uplinks and the number of Virtual LANs (VLANs)
- There is currently no redundant network core nor redundant uplink. While this does not prevent a VoIP deployment, there is an increased risk for a single point of failure with the current architecture compared to a fully redundant architecture

Several steps that will result in a more robust network are:

1. Planning for a redundant network core. Consider building a second server room and fiber termination location at future site (a Lecture Hall and Tacoma were mentioned as possible locations.) A 400 square foot room can accommodate 10 racks comfortably. A risk analysis should be conducted for any potential site prior to implementation.
2. The current 100Mb link could be an issue if the link is close to the saturation point. Wireless explosion and increased demand for bandwidth will soon make these 100Mb uplinks inadequate. TESC should plan for10G uplinks from campus buildings to network core sites. These can be implemented over time, on an as needed basis.

Wireless is the fastest growth section of the edge network. The growth is especially focused in the 5GHz channels that is driven by the newer mobile devices (smartphones, tablets and laptops) that offer 802.11ac radios and the upcoming 802.11ac (2) or 802.11ax standards. The future standards offers 7-10 Gbps throughput that further the requirement of the 10G campus fiber backbone. Although the College just finished the deployment of the Aruba wireless network, it is not too late to start planning the next wireless upgrade.

Voice Network

As operating today, the installed products do not meet the current and future needs of the organization. The average user's needs are not overly complicated, but improvement can be obtained in two basic areas. One is an improvement in system-wide capabilities as listed below, which can affect the customer service capability of the College and increase productivity of the staff.

- Establish a redundant design with geographic separation of the core processing components (utilizing planned network upgrades to the Tacoma campus)
- Improve conferencing capabilities, adding meet-me bridge options to the current ad-hoc capabilities; this will enhance both internal and external communications, especially when in crisis management mode
- System capture of the Caller-ID with name display on all inbound calls, which can be used with system automation (IVR call processing where appropriate) and passed on to the users for all standard phone calls
- Individual (per extension) control over the outbound Caller-ID information sent by the College on all calls. The default options include the ability to send the specific caller's direct number, a department main number, an informational number, or no number at all
- Upgraded voice mail systems, with the option to add unified messaging (voice mails managed in the email system)
- Mobility features such as integrated call flow to smart phones to reach critical staff, remote access tools (for field workers such as Police Services or Facilities,), and the ability to easily redirect calls and services to different locations
- Integrated CTI (Computer Telephony Integration) solutions for applications like Hobson's Radius and RuffaloCODY
- Integration with campus emergency alerting system, Alertus

The other category of improvement is the individual user interfaces, with an emphasis on ease of use. This includes new telephone sets where they are still needed, PC-based software that interacts with / controls the phone system, and alternative devices such as mobile phones or computer-based phones when a physical telephone set is not required. To gain the full benefits, all physical telephone sets need to have good (larger) displays for things like Caller-ID and context-sensitive soft keys, which make it much easier to use the system's features. Other key features desired by the users that are typically included as standard features include:

- A "soft-phone" capability that can be used to give the user's PC control over the calls, including mouse controls for features such as answer, transfer, "click to dial" (from a contact list), etc.

- The ability to redirect calls to cell phones or other numbers; avoiding the need to give out personal cell numbers. Most systems also support a simultaneous ring feature (bridging the desk and cell phone). This feature also allows calls to a campus number, answered on a cell phone, to default to the user's campus voice mail box and not the voice mailbox for their personal cell phone
- Ability to receive voice mail messages on a smart phone or via email without having to dial into the system to retrieve the message
- Easy texting from a desktop device to a smart phone for communications with field staff
- Collaboration tools for desktop sharing or for hosting webinars and training
- Sending and receiving Faxes in email

<u>Mobility</u>

With increasing mobility of the work force, it is also prudent to seek the same capabilities for those not at a desk but instead using remote tools or mobile devices. A frequently raised concern and consequent requirement for mobile staff such as Police Services, Facilities and Conference Services, was the increased use and desire for streamlined tools to manage communications between staff or the public. Many employees use their personal mobile devices because it is the tool that helps them communicate with others and helps provide the personal touch that is part of the culture.

<u>Bring Your Own Device (BYOD)</u>

Departments are challenged to comply with the current policies that do not adequately address the issues and requirements faced by front line workers on a daily basis. This includes policies around the use of personal devices for work and:

- Appropriate use
- Message retention (text conversations and email)
- Discoverability
- Archiving

<u>Phones</u>

The telephone sets themselves remain an expensive part of a new system and cost about the same with VoIP units as the old digital phones. As before, there is some variance as well – a standard set may cost as much as $100 to $300 less than a large set with extra buttons (but not necessarily with any extra features). With VoIP, a price difference is often seen with sets that need to support gigabit Ethernet connections (when the computer is plugged into the telephone); it can add $50 or more to the cost of the telephone set.

Call Center

Call center features include the ability to queue callers when call volume is heavy and can target queue hold messages to specific callers. Queue volumes can be managed manually and dynamically by supervisors. Calls can be routed based on a schedule and time of day or on the number called. A call center offers informational and self-service options and can be paired with an IVR. Reports track the number of calls in and dialed out, the average length of time a call is waiting to be answered plus more extensive detailed call data.

During interviews with department representatives, the College's philosophy of providing a personal touch to callers was a frequent theme. There are however several groups, Computing and Communications Help Desk, Admissions and Financial Aid, that would benefit from basic Call Center functionality. These features would allow departments to continue providing personalized service with additional tools to improve their ability to handle a high volume of calls more efficiently, thus providing improved customer services.

IVR

Inbound and outbound calls can be placed through IVR's providing everything from simple menu options for incoming callers to automating manual tasks like sending out appointment reminders. Help with collections, automated surveys, as well as the ability to craft seasonal, emergency messaging (the school is closed due to snow) are some of the primary benefits of an IVR.

IVR's can also integrate with backend databases that provide data integration (CTI or Computer Telephony Integration) with the use of new proposed platforms like Hobson's Radius for Admissions.

Students placing outbound calls for Advancement make several hundred calls per day on lines that are connected to old outdated auto dialers that are no longer manufactured. IVR's can automate those functions and integrate with systems like RuffaloCODY. The KAOS radio station also places outbound calls during fund raising events that could be automated through the use of an IVR.

Analog

One area that has not been incorporated into new VoIP systems is the integration of analog lines used for applications like modems, elevator phones, FAX machines, lobby courtesy sets and for "ePhones" or emergency phones located at the blue pillars around campus.

Approximately 50% of the phones on campus are configured as analog lines and their reliability is a valid reasons to leave these services in place as is. In areas like Housing, these phone sets are subject to vandalism and the cost to replace these older analog sets is much lower than VoIP sets.

System Support (IT and Communications)

One of the more significant improvements needed is the ability to manage, administer, and update systems. New tools allow technical staff to be more responsive, remotely support all locations, save time, and reduce outside support costs. All of the better systems include these enhancements as part of their design (no extra cost), but during an evaluation some differences in operation can be observed. This is especially critical when troubleshooting call quality issues and ensuring stable networking for real-time (voice and video) traffic. An important tool that can make a difference is one oriented to real-time monitoring, diagnostics, and performance reporting.

The College will need to consider merging support efforts after implementing a converged VoIP-based Unified Communications system. The tasks for telephony systems traditionally handled primarily by telecom staff will need to be augmented by new tasks supported by the IT network team. Due to the converged nature of VoIP telephony and the integration with parallel technologies such as PCs and backend computing resource, most organizations find it is difficult to continue to justify dedicated resources for core telephony support tasks.

Core Technical Elements of a Future RFP

Required System Features

- A VoIP Unified Communications system capable of supporting 2,000 total end points including 750 analog integrations
- Support for existing PRI T1's or SIP trunks
- Caller ID
- Softphones
- PC call control
- E911 solution
- CDR (Call Detail Reporting)
- Call Center with & reports
- IVR with CTI integration
- UC features to include:
    - Unified messaging
    - Presence & Instant Messaging
    - Single number reach / Find-me Follow-me
    - Audio Conferencing
    - Integration with calendar functions
    - Mobility
    - Collaboration tools for desktop sharing
    - Video
- Integration with Alertus
- Call history logs
- FAX integration with email

Optional

- Call recording system for E911 dispatch

Trends with Public-Sector Funded Projects

As can be expected, the public sector has purchased systems from the manufacturers at rates consistent with general market share percentages. Thus, every supplier can provide references for higher education installations, although the market leaders will naturally have more. The two most common influencers are cost and risk; public sector agencies often have funding challenges and tend to be conservative with their choices.

Although the market share of hosted communications solutions is increasing, most higher-ed institutions have continued to install premises-based systems. This is due primarily to the availability and control during emergency situations and the life cycle cost advantages. This first issue reflects that the situations when a public sector is most dependent upon the communications systems are also when there is a greater risk that the communications link to the hosted solution is unavailable, or the supplier's remote support personnel are not able to respond fast enough to real-time emergencies.

At the same time, many have (by necessity) explored various options to mitigate the impact on cash flow. Hosted solutions cost more over time, and so will variations such as fully managed services offerings. This is because the underlying costs for the vendor are similar to those the College would have, but the vendor will need to make a markup to cover their costs plus create a profit margin. Various business-case analysis results have shown that hosted and fully managed service offerings tend to cost 25 to 40 percent more for installations covering 1,500 or more users. But even when the cost differences are less (as they are with smaller agencies), hosted and/or managed service options are rarely chosen unless the organization has outsourced all IT operations.

A more common approach to mitigate the capital costs of a premises-based system are leasing options, especially when the manufacturers offer subsidized rates or zero cost financing as a purchase incentive. This is usually a decision made by the financing staff, balancing the cost of various funding options with the impacts.

Vendor Options

The following list details the highlights of the top suppliers with complete / integrated solutions in the marketplace, listed alphabetically.

Avaya

- Leading market position (along with Cisco) in IP-PBX space
- Owned by two private equity firms, but carrying large debt load

- High quality PBX product line (now Communication Manager)
- Redesigned core architecture and product line undergoing changes
- Strong Contact Center product portfolio, although reporting tool is not considered top of the line anymore; claims to have the top market share
- Voice mail / unified messaging product, Avaya Modular Messaging, developed from the Octel heritage it purchased years ago
- Carry a leading IVR product, the Avaya Enterprise Portal, although high cost
- Tend to be one of the most expensive options, including ongoing costs
- Many channel partners to choose from

<u>Cisco</u>

- Largest market share in IP-PBX, but significant revenues from other products
- Publicly-owned firm with huge market capitalization
- Complex; many options; requires greater level of administration to implement
- Design overlays best on an all-Cisco data network, can then leverage Cisco proprietary code such as Cisco Discovery Protocol (CDP)
- Two contact center offerings – the smaller (<400 agents) is easier to use and better designed offering, although not as comprehensive; routing is on a separate server from call processing
- Unified messaging provided by Cisco Unity
- Native IP based IVR (separate server) integrated tightly with IP-PBX
- Many channel partners to choose from
- Professional services costs from Cisco VARs tend to be high

<u>Microsoft</u>

- Much is proprietary software, including version of SIP used and preferred codec
- Server intensive solution
- Third-party hardware required for gateways, phones, call center, etc.
- Push “soft-phones” - Limited IP Set Options
- Exchange is a quality unified messaging product
- Lack some features found in legacy telephony systems
- Some of the distributors are new to voice communications (big learning curve)
- Office 365 / Lync Online version does not support telephony

<u>Mitel</u>

- Good PBX features, telephone set, and soft-phone client options
- Leader in merging product into VMWare platform
- Purchased two third-party suppliers to internalize call center solution, including the advanced routing, call reporting, and call recording functions

- Multiple voice mail / unified messaging options, including an integrated product or a willingness to leverage Microsoft Exchange as the UM system
- IVR via add-on module to contact center server or third-party products
- Programming is layered and not as integrated as some products
- Traditional target clients were small & medium business; system capacity for key product is considered 5,000 ports
- Deal with Aastra brings large system capability into portfolio (but with a different product) and provides European market share
- Several channel partners, although most are not very large companies

<u>NEC</u>

- Large and financially stable
- Split product line and undefined roadmap for merging unlike products
- Some issues with performance of IP based soft-switch product line; traditional VoIP system more reliable with recent UC announcements
- Traditional product line scales to very large sizes
- Generally viewed as a half step behind in Contact Center applications, but improving
- Usually paired with AVST for voice mail / unified messaging and IVR
- Several channel partners, although many also sell other products as well
- Sometimes good pricing / big discounts

<u>ShoreTel</u>

- Initial target clients were small & medium business
- No debt and gaining market share, but with underperforming stock
- Distributed appliance approach is unique design
- Easiest system on market to program and maintain
- Voice mail / unified messaging product is good performer with tight integration with Microsoft Exchange / Outlook
- Good internal IVR solution and also partners with others
- Good unified communications features
- Many channel partners, but mostly smaller firms
- New product offering for contact centers

<u>Unify (formerly Siemens)</u>

- Strong established product portfolio, but smaller market share
- Contact center capabilities are well developed and highly rated
- IVR built into contact center product
- Excellent unified messaging product than incorporates SMS (text) as well as the standard voice, email, and fax mix
- Recently rebranded and split off from Siemens
- Limited support options; often sell direct (instead of using a channel partner)
- Traditionally a higher cost option

There are some products on the market that specialize in partial solutions, such as Aspect or Genesys in the call center and IVR space, or AVST for voice mail and IVR systems. However, using a client-driven “best of breed” approach to creating a solution is not only more expensive, it adds considerably to the level of complexity and vendor coordination. Sometimes a very large organization with unusually complex business requirements can justify the “silo” approach, but for mid-size organizations it is better if the proposing vendor pulls in the best mix of systems and services for a packaged solution.

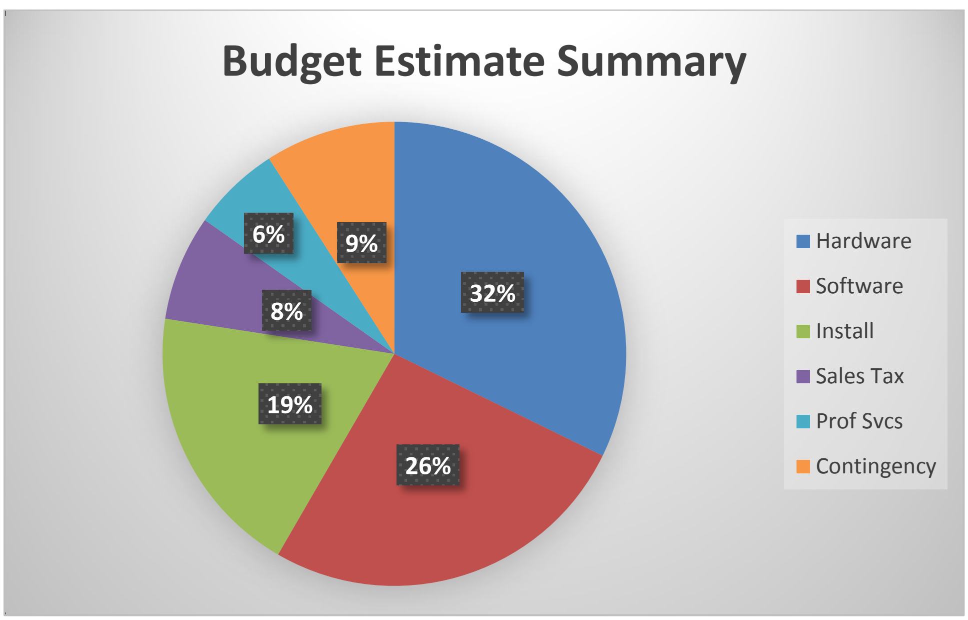
Another “hot concept” in the industry is hosted/cloud telephony solutions, often labeled as Communications as a Service (CaaS); it is not a good fit for the College. It places a high reliance on the telephone company network connections to the hosted vendor’s site, does not have the on-the-fly flexibility of a dedicated premises system (for disaster recovery purposes), and almost always costs more over an extended life-cycle cost analysis.

Survey of Systems of Local Colleges

College/University	PBX	Selling Vendor	Install date or Reinvestment	Servicing Vendor
University of Washington	Avaya Aura	Unknown	ongoing	self supporting
Highline CC	Avaya Aura	Cerium	2012	CNR
Seattle CC	Avaya Aura	Cerium	2010	Cerium
University of Puget Sound	Cisco	Unknown	2012	3rd party, Cisco, self supporting
Eastern Washington University	Cisco	CenturyLink	2005	CenturyLink
Northwest University	Mitel	Unknown	2012	Tritec
Bellevue College	Mitel	Mitel	2010	self suppporting & Mitel
Western Washington University	Nortel	Microsoft	See note 1	self supporting & MSFT
Central Washington	Nortel CS1000	CenturyLink	See note 2	CenturyLink
South Puget Sound CC	ShoreTel	Black Box	2013	Black Box
Tacoma CC	ShoreTel	Unknown	2010	self supporting
Note 1: Beginning migration to Microsoft Lync				
Note 2: Ongoing migration to VOIP as they add or change; haven't changed out their core systems.				

Budget Estimate Summary

Category	
Telephony (Core, Sets, Headsets)	$610,783
Analog Gateways	$191,216
Voice Mail	$86,525
Call Center (ACD)	$55,140
Interactive Voice Response (IVR)	$60,115
SubTotals	**$1,003,779**
Sales Tax	$95,359
TOTAL	**$1,099,138**
Sys Admin Training	$12,000
External Resources	$67,500
Estimated Project Cost	**$1,178,638**
Contingency (10%)	$117,864
TOTAL Project Cost Estimate	**$1,296,502**
Annual Maintenance	$86,980



Unified Communications Cost Breakdown

Category	Hardware	Software	Professional Services
Telephony (Core, Sets, Headsets)	$280,061	$184,700	$146,022
Analog Gateways	$112,000	$44,160	$35,056
Voice Mail	$5,500	$59,000	$22,025
Call Center (ACD)	$5,500	$30,900	$18,740
Interactive Voice Response (IVR)	$14,900	$20,000	$25,215
Sub-Totals	**$417,961**	**$338,760**	**$247,058**

Implementation Strategy

The following implementation suggestions are based on a combination of best practices and risk management. The events itemized below form the basis of the installation project plan.

1. Install Power over Ethernet in switches as necessary to support VoIP phones, implementing virtual networks (VLANs) and turn up Quality of Service (QoS) as required, adding UPS and power supplies where they are necessary. Ensure there is the correct amount of power in IDF's to support the hardware.
2. Assess and/or test the updated data network to ensure it is ready to support VoIP telephony.
3. Perform other preparation tasks for related systems, such as active directory updates, Exchange, and VMware, and backend database systems (such as RuffaloCODY).
4. Begin training the internal IT department subject matter experts on system administration and support tasks. This may include general knowledge courses such as data networking and VoIP, but must include product specific training for the selected systems.
5. Assign a knowledgeable contact person for each department and train them on the new system features and functionality. Then provide the contact people with survey forms to enable the collection of user database programming details. Meet with each contact person to review the data collected and to ensure proper design for each user and department number, matching the business processes.
6. If using SIP trunks for dial-tone, install the services in advance as a parallel connection. If using ISDN-PRI circuits for dial-tone, install one new circuit to the new system. This allows complete testing and the ability to migrate in phases, if needed. At cutover, the remaining ISDN-PRI

circuits can be migrated to the new system, or disconnected as the SIP trunk capacity is expanded.

7. If a secondary core location is going to be established, install telephone company circuits at that site and test. Also, test failover capabilities between the two cores.
8. Define level of detail to be provided (or continued as is) for E911 address location identification, arrange for PSALI database updates.
9. Establish a small pilot group for thorough system testing and verification of plans and processes. Do not use primarily public-facing departments for the pilot. Test all features, call handling, call center scripts (call flow), announcements, reporting, call recording, reports, system administration tools, etc.
10. Train all users on the new system (which must be up and running) prior to placing them on the new system. This includes supervisor training for those using call center features. Training should be emphasized (with upper management support) to ensure that problems are minimized – historically, 80% of the help desk requests on the first day of service come from those that did not go to training.
11. Install the new system in parallel with the old. This is more easily accomplished with IP telephones sets, where additional/unused wire to the desktop is not required (because the IP sets can use the same data drop as the computer). It allows the installation team more time to verify every endpoint and reduce the number of "first day of service" problems.
12. Where desktop space is at such a premium that installing the phone in advance is impractical, the installation team can place all affected sets after-hours on the night before the cut over.
13. During installation of sets, test inbound and outbound calling, call forwarding, group call handling, voice messages, and E911 routing (per zone, not every phone).
14. Cutovers are best scheduled during the early evening of a day in the middle of the week. It is difficult to get adequate telephone company support for weekend cutovers if anything goes wrong. Often, the installing vendor can adjust the technicians work shifts to avoid overtime pay (which impacts the total project cost). User training can be conducted on the days immediately before the cut night, which minimizes the memory loss if trained the week before the "go-live" day. Also, Monday mornings are often a very busy time for many departments and the distractions of a new phones system can be more disruptive.
15. Define in advance what will constitute a "change order" and what are normal (no charge) adjustments for users / departments immediately after cutover. Define process for reporting and documenting change and repair requests.

16. Any vendor selected will be required to provide adequate resources for "first day of support" requirements and advance training. This includes on-site staff available for one-on-one follow-up training where necessary.
17. Verify vendor documentation of the system implementation and perform full acceptance testing on the total solution, prior to making final payment.

Implementation Roadmap

The key is to keep the strategic vision and eventual complete deployment plan in mind during the tactical planning and initial execution phases. However, in most cases there is a clear sequence required to accomplish the individualized goals of each element.

Phase 1

The first Phase addresses the core telecommunications elements, covering the centralized services that are the foundation for all other components. The following should be installed as a coordinated initial installation:

- Core Telephony Servers and Gateways
- Business Continuity for Telecommunications (basic design element)
- Voice Mail / Unified Messaging
- Call Center core technology
- Conference Bridge, if applicable (audio only initially)
- Interactive Voice Response (IVR) core – (full implementation for all apps to be phased)
- Server and / or services to provide address location identification (for E911)
- System administrative tools for changes, diagnostics, and reporting
- Call Detail Recording
- Initial SIP trunk services (optional design element)

Although this appears to be a long list, many of the items are natural components of a properly designed core. It will take more time and effort to install these items if not activated as part of the initial phase.

Phase 2

The second Phase is activation of the pilot test groups, allowing them to operate. The pilot groups should include IT as well as some non-customer facing users that will provide a test bed for key features and functionality important to the College.

Phase 3

This covers replacement telephony for all users, and therefore can be phased-in based on planning efforts for the campus. After the core is working and connected to the old system, users can be migrated from the old to the new systems in logical groups. A phased roll-out provides the opportunity for organized user training and the ability to address any implementation issues.

- Replace all desktop telephones
- Remove all old PBX components
- Converge Voice & Data Networking
- Finish conversion to SIP Trunks (replacing Telco ISDN PRI circuits) or re-home the current ISDN circuits to the new equipment

Phase 4

This phase covers solution components that are provided as enhancements to the core IP-based telecommunications system, but require a fair amount of vendor and College resources to implement correctly. The College should move to address these items (after initial system is accepted) based upon a review of the benefits and confirmation with the affected departments.

- Provide self-service functions where it is logical
- Implement pre-calling / out-calling tasks to IVR
- Implement screen-pop services if/where beneficial
- Explore using IVR with Alertus application
- Add additional SIP Trunk capacity as needed

Proposed Milestones

January 2015 to June 2015 6 months

- ✓ Complete network development, including power and all infrastructure work
- ✓ Decision for redundant core location
- ✓ Obtain technical specifications for integration with RuffaloCODY and Hobson’s Radius plus any other applications
- ✓ Draft RFP

July 2015 to November 2015 5 months

- ✓ Issue RFP and obtain proposals
- ✓ Evaluate proposals and select vendor(s)
- ✓ Negotiate contract

December 2015 to February 2016 3 months

- ✓ Install core systems and initial database
- ✓ Activate test/pilot group

March 2016 to June 2015 4 months

- ✓ Roll out and replace system in all other buildings
- ✓ Final system acceptance and documentation verification
- ✓ Decommission and surplus the old equipment

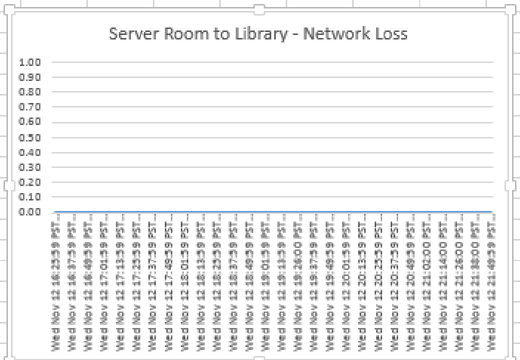
Dial Plan

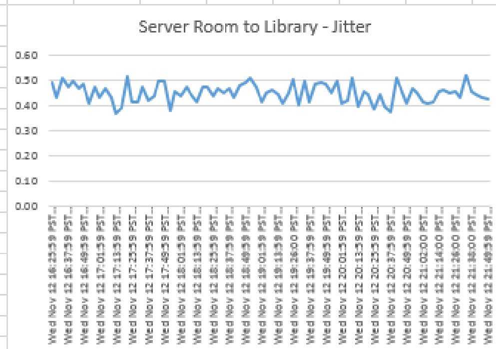
There is no need to change dial plans; the current one is sufficient and will work with the new system. The college is currently using approximately 1,575 numbers out of 3,000 Direct Inward Dial (DID) phone numbers. There are currently over 1,400 spare numbers available for future growth. The number range can be moved or ported to the new VoIP provider if SIP trunking is installed or if a new vendor is selected to provide new PRI ISDN circuits.

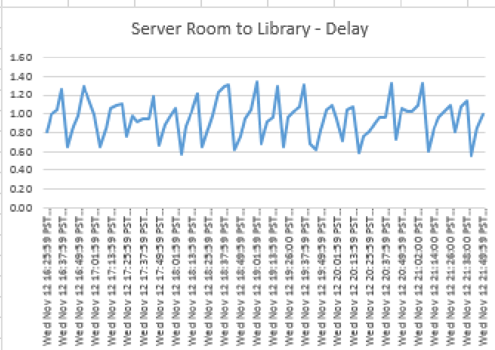
A decision for consideration is whether or not to retain the practice of dialing 9 for an outside line. New systems will “normalize” the digits dialed making this practice obsolete. It can be retained if there is concern about changing dialing patterns for users, however it is no longer necessary.

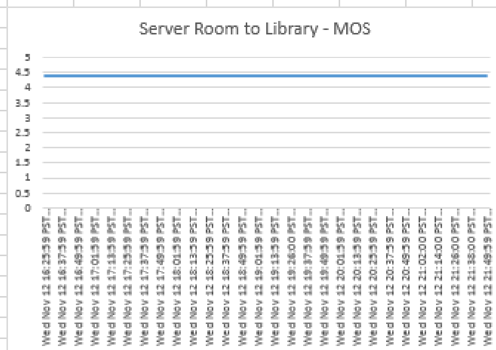
Attachment A – Real Time Communications Tests

NetAlly Test Results – From Server Room to Library

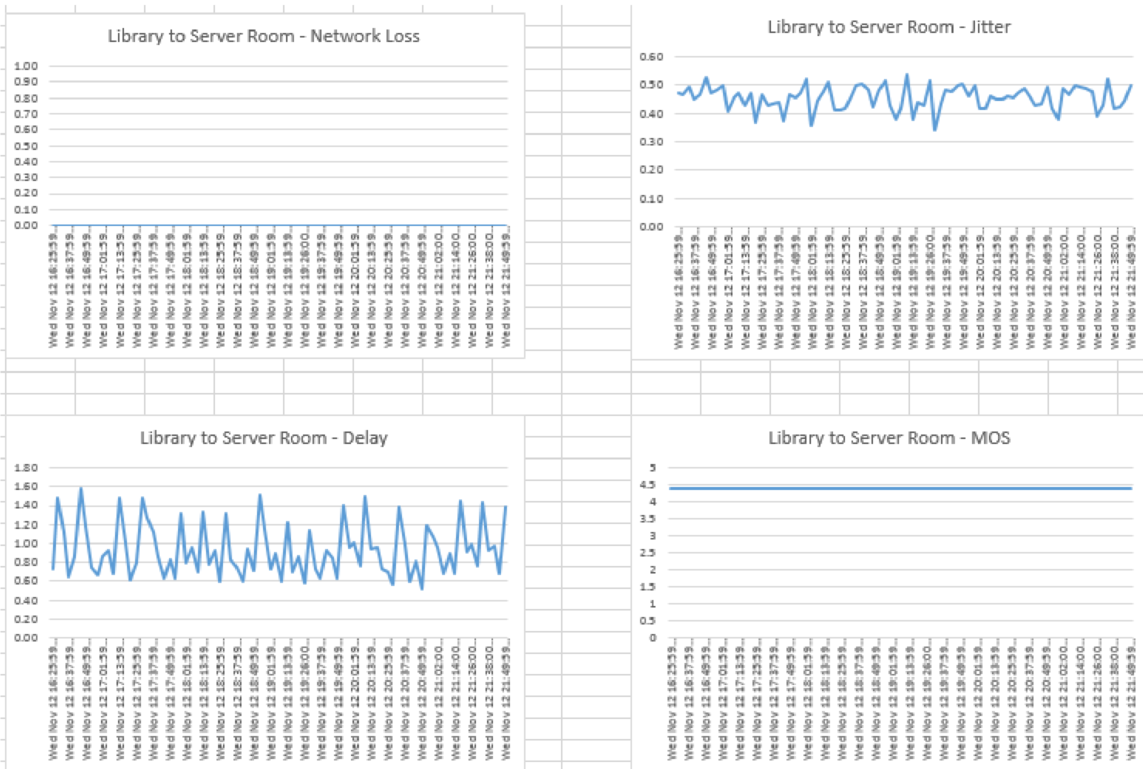




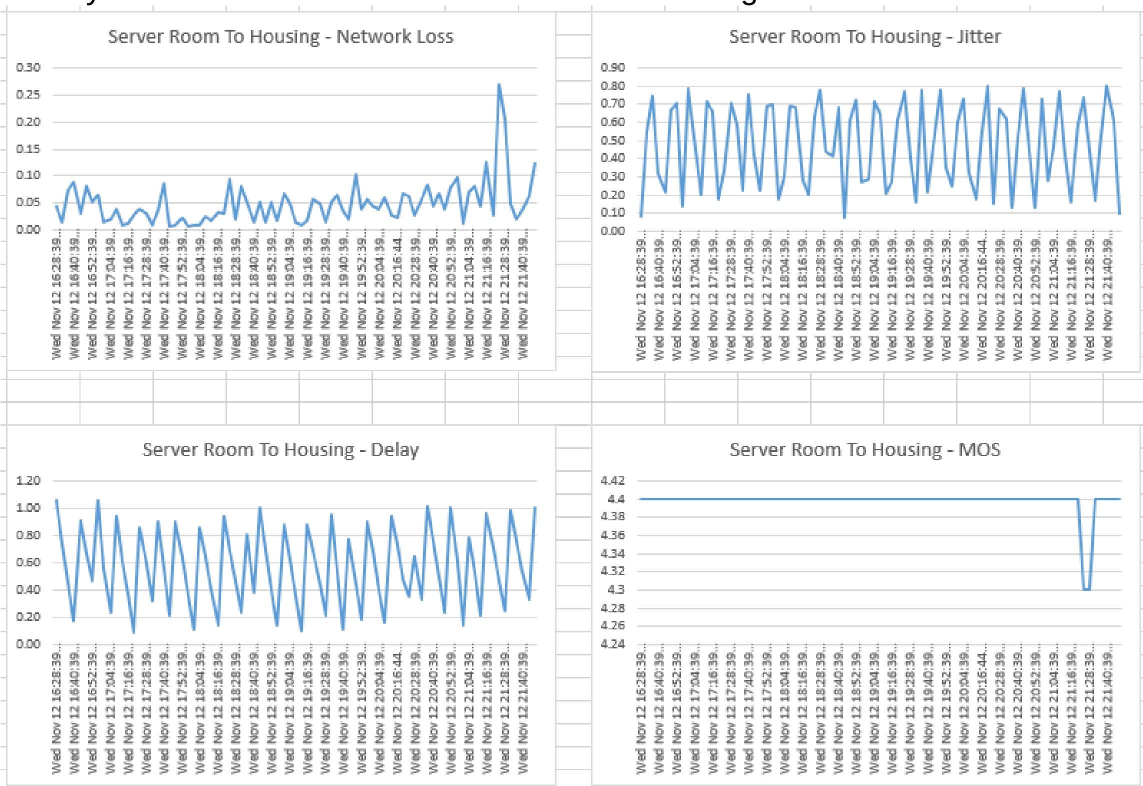




NetAlly Test Results – From Library to Server Room



NetAlly Test Results – From Server Room to Housing



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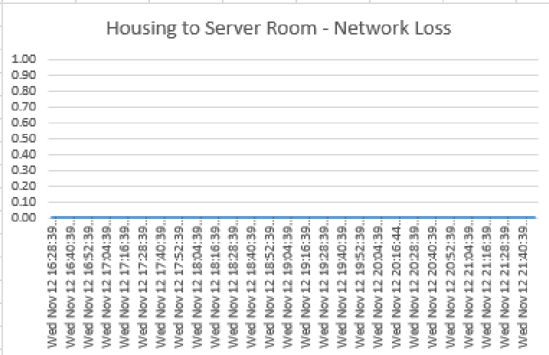
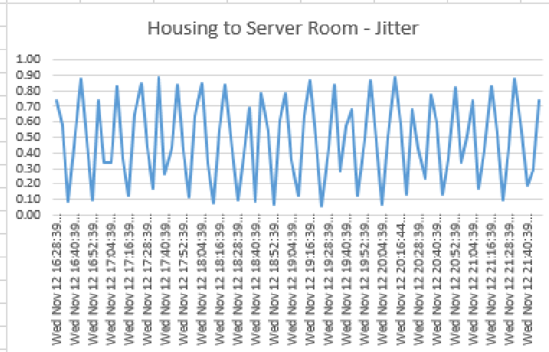
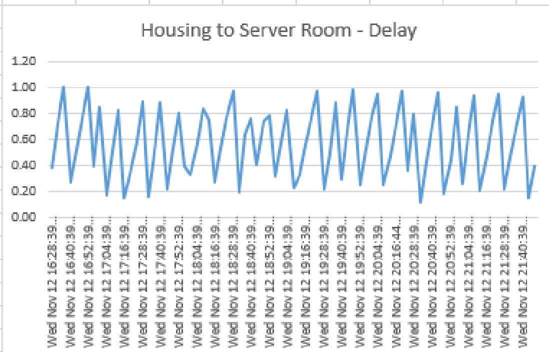
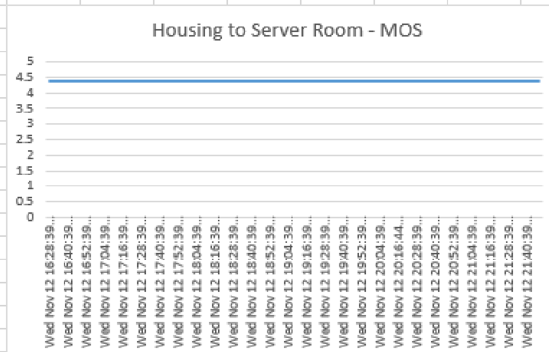
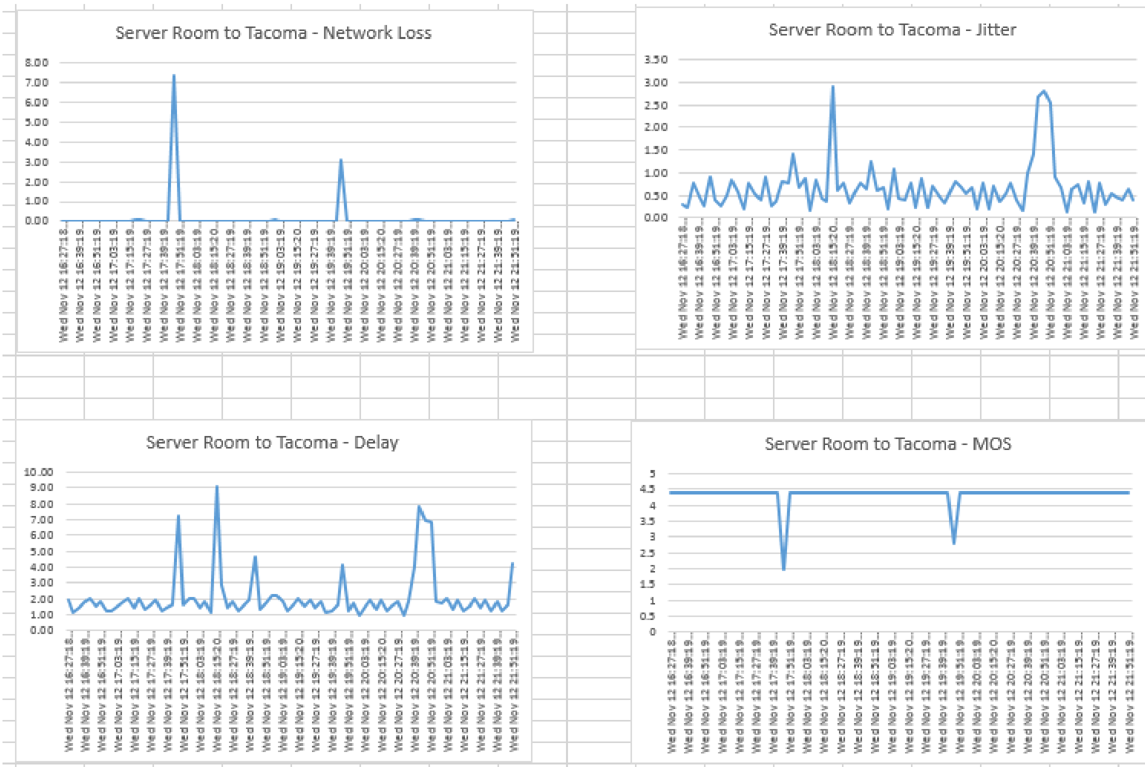




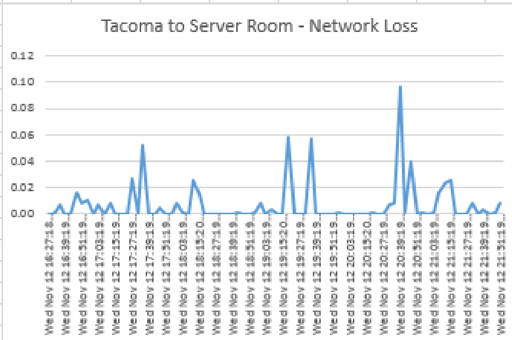


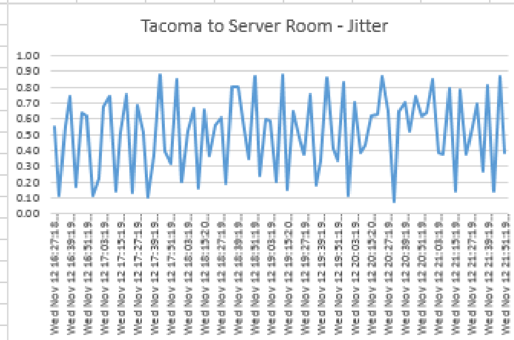


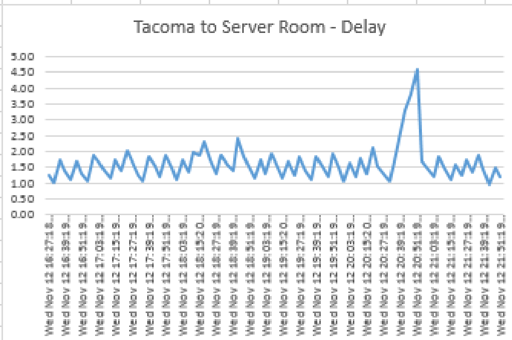
NetAlly Test Results – From Server Room to Tacoma

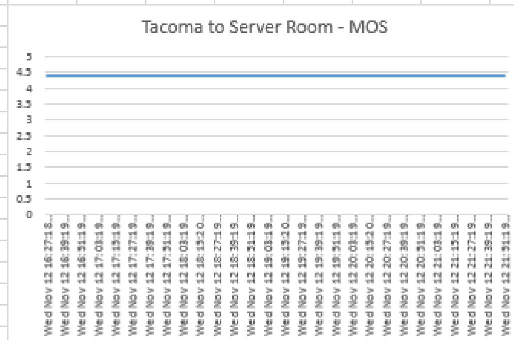


NetAlly Test Results – From Tacoma to Server Room

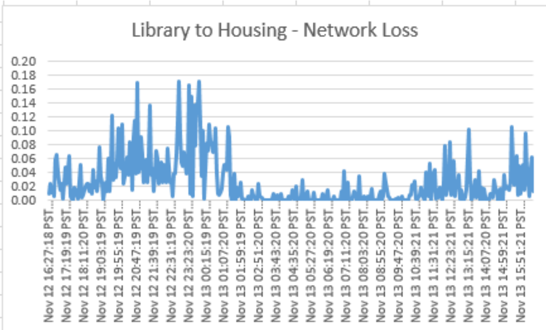


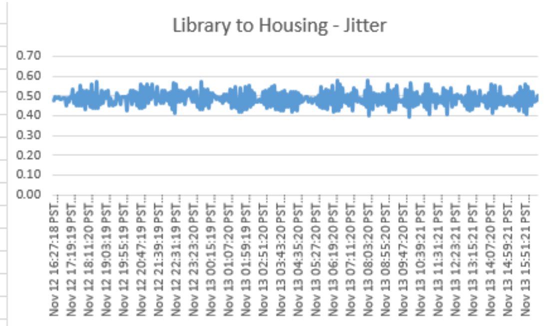


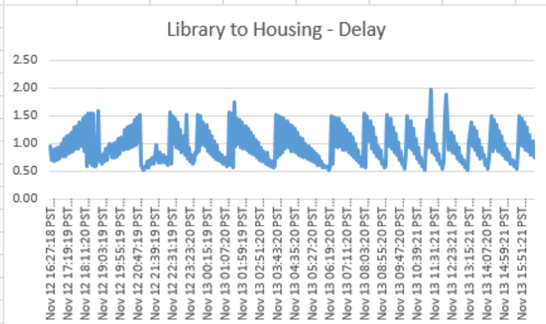


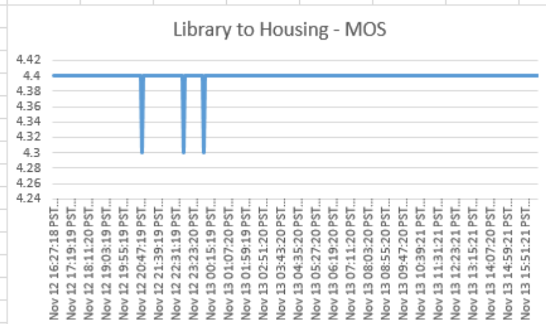


NetAlly Test Results – From Library to Housing

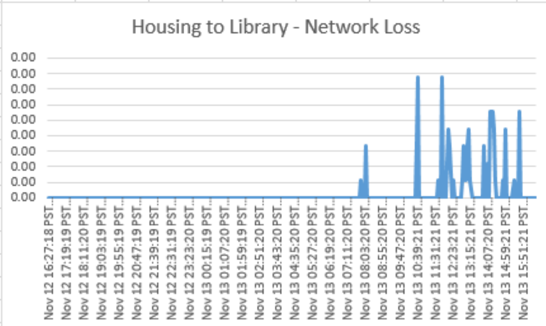


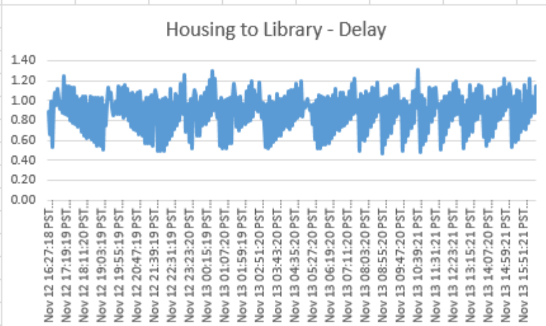


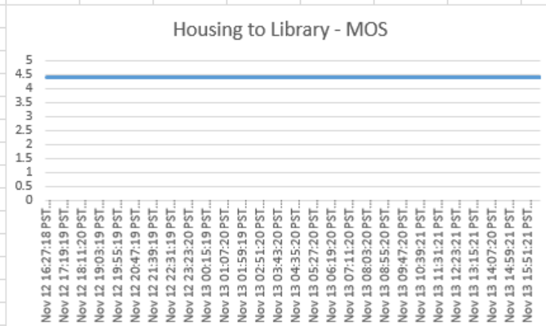




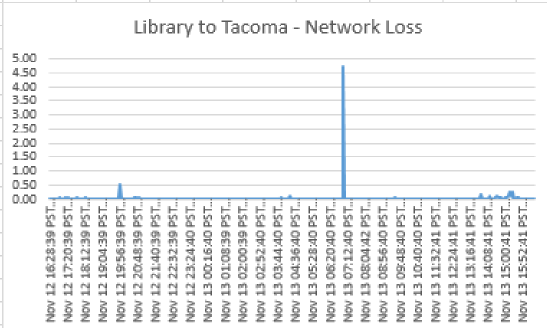
NetAlly Test Results – From Housing to Library

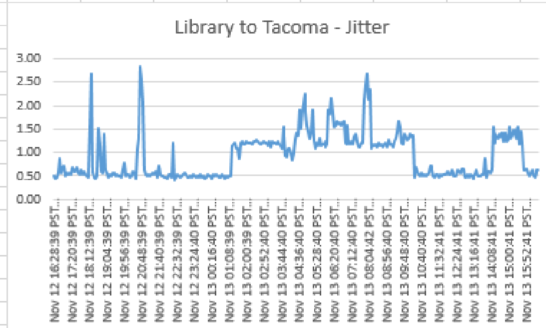


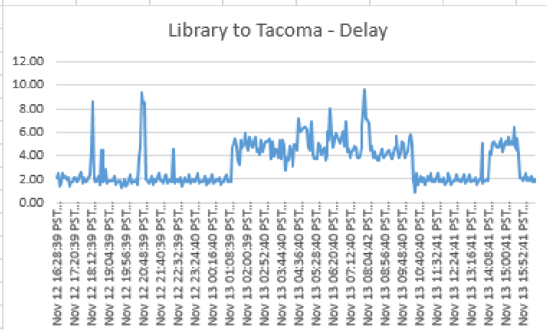


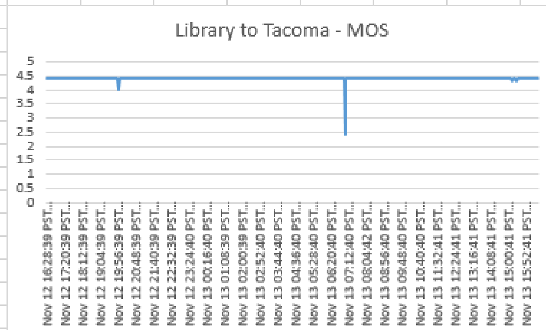


NetAlly Test Results – From Library to Tacoma









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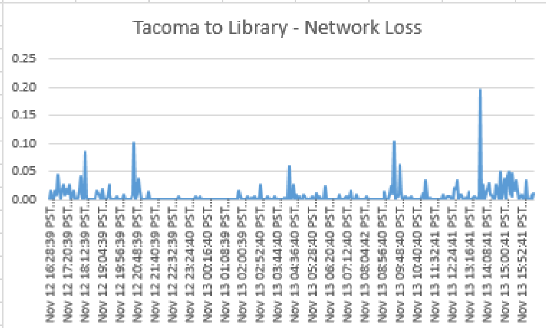
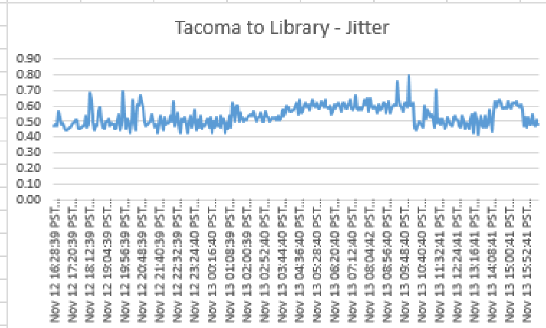
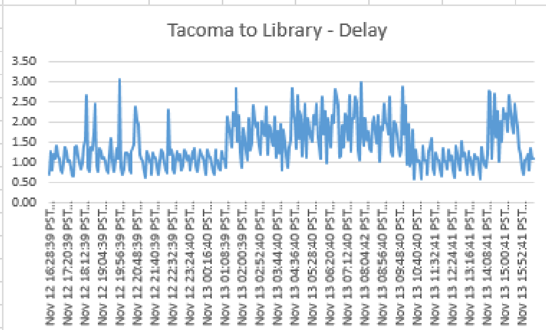
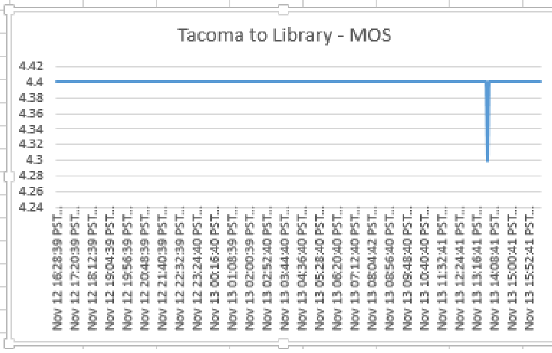
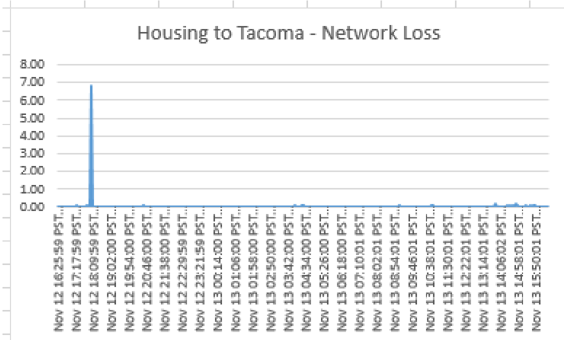


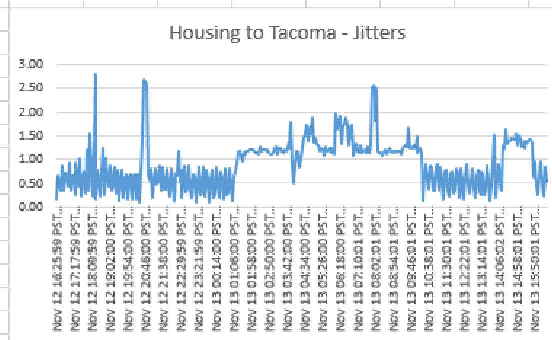


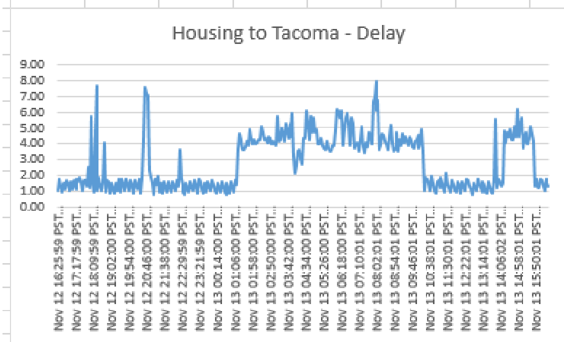


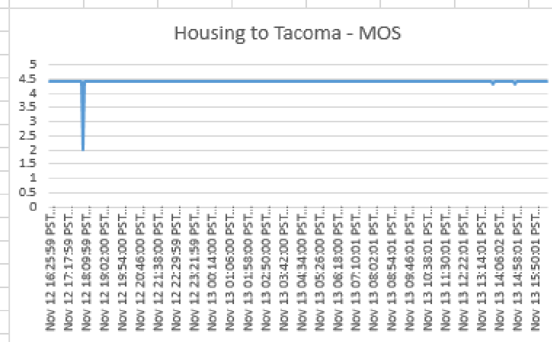


NetAlly Test Results – From Housing to Tacoma

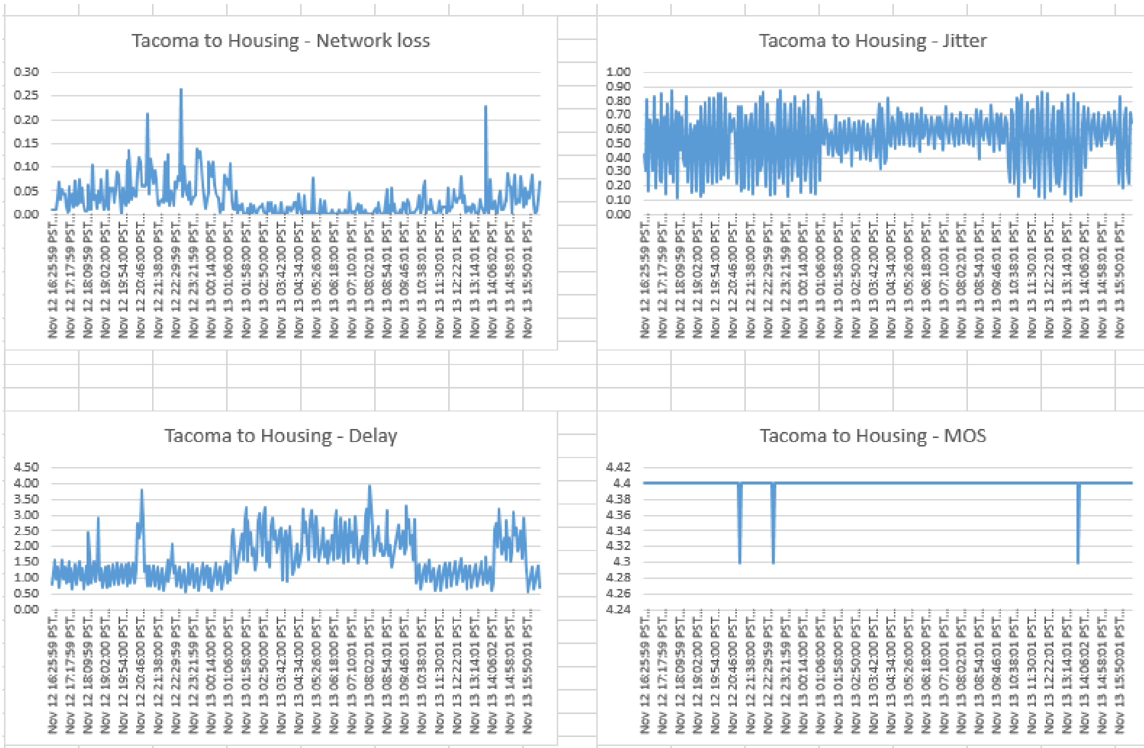








NetAlly Test Results – From Tacoma to Housing



Attachment B – IP Phone Power Draw per IDF

The following charts show the number of phones per IDF, broken down by type because in a future VoIP system, the "bigger" the phone, the more wattage it requires. For power draw and UPS analysis, the calculations used an average of 5.9w for all digital phones because 5.9w is the wattage for most common IP phones with gigabit throughput for the data port.

IDF	Phone Type	Number of phones	Wattage by phone type	Total Wattage
Library A1	Analog	36		
	3902	36	212.4	
	3903	32	188.8	
	3904	19	112.1	513.3
Library A2	Analog	24		
	3902	29	171.1	
	3903	25	147.5	
	3904	7	41.3	359.9
Library A4	Analog	22		
	3902	55	324.5	
	3903	24	141.6	
	3904	3	17.7	483.8
Library BB	Analog	53		
	3902	20	118	
	3903	5	29.5	
	3904	1	5.9	153.4
Library B2	Analog	13		
	3902	25	147.5	
	3903	3	17.7	
	3904	3	17.7	182.9
Library C2	Analog	29		
	3902	44	259.6	
	3903	28	165.2	
	3904	9	53.1	477.9
Lecture Hall	Analog	30		
	3902	0	0	
	3903	0	0	

	3904	2	11.8	11.8
CRC (gym)	Analog	23		
	3902	10	59	
	3903	5	29.5	
	3904	0	0	88.5
Shops	Analog	17		
	3902	0	0	
	3903	0	0	
	3904	0	0	0
Sem I	Analog	48		
	3902	35	206.5	
	3903	11	64.9	
	3904	5	29.5	
	3905	2	11.8	312.7
Lab I	Analog	25		
2nd Flr - Office Wing	3902	68	401.2	
	3903	7	41.3	
	3904	0	0	442.5
Lab I	Analog	17		
1st Flr - Lab Wing	3902	3	17.7	
	3903	1	5.9	
	3904	0	0	23.6
Lab II	Analog	29		
	3902	50	295	
	3903	16	94.4	
	3904	1	5.9	395.3
COMM	Analog	50		
	3902	14	82.6	
	3903	6	35.4	
	3904	0	0	118
Lab Annex	Analog	8		
	3902	1	5.9	
	3903	0	0	

	3904	0	0	5.9
CAB	Analog	73		
	3902	21	123.9	
	3903	11	64.9	
	3904	2	11.8	200.6
Child Care	Analog	10		
	3902	3	17.7	
	3903	0	0	
	3904	0	0	17.7
Longhouse	Analog	9		
	3902	5	29.5	
	3903	0	0	
	3904	0	0	29.5
CUP	Analog	19		
	3902	1	5.9	
	3903	3	17.7	
	3904	0	0	23.6
Mod Shops	Analog	3		
	3902	2	11.8	
	3903	3	17.7	
	3904	0	0	29.5
Sem II A-2	Analog	14		
	3902	12	70.8	
	3903	0	0	
	3904	0	0	70.8
Sem II B-2	Analog	14		
	3902	12	70.8	
	3903	0	0	
	3904	0	0	70.8
Sem II C-2	Analog	14		
	3902	12	70.8	
	3903	0	0	
	3904	0	0	70.8

Sem II C-4	Analog	3		
	3902	6	35.4	
	3903	0	0	
	3904	0	0	35.4
Sem II D-2	Analog	14		
	3902	12	70.8	
	3903	0	0	
	3904	0	0	70.8
Sem II D-4	Analog	4		
	3902	6	35.4	
	3903	0	0	
	3904	0	0	35.4
Sem II E-2	Analog	15		
	3902	13	76.7	
	3903	0	0	
	3904	0	0	76.7
Sem II E-4	Analog	3		
	3902	6	35.4	
	3903	0	0	
	3904	0	0	35.4
Sem II PTS	Analog	5		
	3902	34	200.6	
	3903	1	5.9	
	3904	0	0	206.5
Sem II PSC	Analog	9		
	3902	25	147.5	
	3903	9	53.1	
	3904	0	0	200.6
Tacoma	Analog	26		
	3902	18	106.2	
	3903	2	11.8	
	3904	4	23.6	141.6