CHABOT-LAS POSITAS
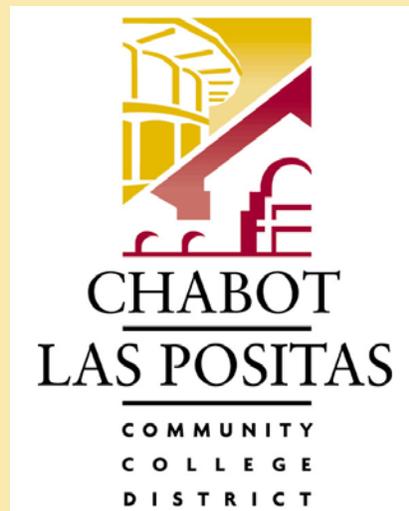
COMMUNITY COLLEGE DISTRICT

INFORMATION TECHNOLOGY PLANNING
MEASURE A BOND

Final Revision 011917

MEASURE A BOND
CLPCCD ITS AND COLLEGE TECHNOLOGY PROJECTS
2017-2026

The Measure B Bond has allowed CLPCCD to install and maintain a high level of computer and network connectivity for Colleges and District sites. State-of-the-art server and desktop equipment with high-speed access to the Internet allow users to receive high performance for application and web access.

However, as requirements increase, CLPCCD Information Technology Services (ITS) and the College Technology departments are faced with the need to upgrade and improve the installed technology. Technology improvements made under the Bond Measure B include classroom equipment, network devices, communication equipment to support data, video or voice, and all technology advancements that support the instructional environment. The most recent equipment procurements have been forward-looking so as to maximize the life span of the equipment and performance of the infrastructure. The anticipated life cycle of the technology equipment is as follows:

- Desktop/laptop computers: 4 years
- Servers: 5-7 years
- Printers: 5 years
- Network equipment: 7-10 years
- Network cabling: 20-25 years
- Audio-Visual equipment: 7 years
- Telephony systems: 8-12 years
- UPS: 15-20 years
- Generator: 20-30 years

With the approval of the **Measure A Bond in 2016**, CLPCCD ITS will be able to continue the deployments and replacements of technology shown above, incorporating the Total Cost of Ownership (TCO) of these systems. Staff and students will be able to enjoy a compute infrastructure that improves as applications demand it, and is well maintained by the CLPCCD ITS and the College Technology departments.

The scope of the Technology projects will include:

- Laptop, Tablet and Desktop refreshes and growth at campuses and locations.
- Server replacements for colleges and district.
- Server application software.
- Network equipment replacement at all sites.
- Limited cabling infrastructure (not included in Bond, Deferred Maintenance or other funding).

New items not previously funded in the Measure B bond may include:

- Audio-Visual equipment – funded through building modernization and new construction.
- Telephone system upgrades – funded through Measure B.
- Large scale cabling projects – funded through building modernization and new construction.
- Distributed Antenna System deployment – New Technology requirements, related to cell tower construction.

This document describes the technology projects planned for a **10-year window of time, from 2017 through 2026.**

DESKTOP/LAPTOP REFRESH CYCLE

Since the commencement of Measure B bond, CLPCCD ITS and College Technology departments have used a **four-year** Life Cycle model for replacement of desktop PCs/Macs. Desktops are provided and maintained by the College Technology staff in any area where a constant computer installation is required. This ensures a cost-effective computer deployment and that the proper hardware/software is available for instructional support.

Within the classroom, there is an increasing demand for tablets or laptop carts that can be used during lectures and labs. These devices are primarily used for Internet searches, but may be used with USB connections to specialized equipment such as in science labs. Laptops and tablets are more prone to damage and expensive to purchase than desktop PCs and are only supplied if required. Laptop and tablet PCs are also more difficult and costly to maintain since a failure tends to disable the entire device, requiring off-site service that can take multiple weeks.

Though BYOD (Bring Your Own Device) is gaining in popularity, it is not a solution for locations where specific software applications or hardware features are required. CLPCCD does not fund the software licensing for installation on BYOD devices if specific applications are needed. Given these issues, the BYOD environment is outside of the scope of support for CLPCCD ITS and College Technology Departments.

With the Measure A bond funding, CLPCCD ITS and College Technology departments will continue to use a four-year Life Cycle model for replacement of desktop, laptop and tablet PCs. Since the beginning of Measure B in 2005, the campuses have also experienced an average growth of desktops of 1.5 times the 2005 counts.

Measure B Desktop/Laptop Growth

Location	2005	2016	Growth
Chabot	1600	2370	1.48 times
Las Positas	1175	1955	1.66 times
District	74	205	2.77 times

It can be expected that with future college construction and modernization scope for Measure A, comparable growth will continue. College Technology staff refreshes 25% of the installed computers each year. The estimates for annual computer refresh purchases are shown below. * Note that the counts shown are 25% of the current installed base of desktop/laptop/tablet systems, and growth has been estimated as needed for new/modernized building implementations.

Measure A Estimated Desktop/Laptop Purchases per Year

Year	Chabot	LPC
2017	685	515
2018	1085 *	850 **
2019	965	660
2020	1065	695
2021	1170	730
2022	1270	765
2023	1370	800
2024	1475	835
2025	1580	870
2026	1680	905

* Including additional units for Chabot New Biology labs.
** Including additional units for LPC B100 labs.

During the Measure B bond, CLPCCD ITS prepared bid packages to select the equipment supplier for a 3-5 year window of time for desktop purchases. The timeline varied from three to five years based on the specific contract. The duration of each contract varied with the supplier and contract award details. The contracts awarded were:

Timeframe	Successful Bidder	Brand
May 2005	Gateway	Gateway
May 2005	Apple	Apple
April 2009	Atacom	H-P

With limited purchase quantities needed at the end of Measure B, CLPCCD used the WCSA purchasing contract for the last two years (2013-2015) of low-quantity purchases. Beginning with Measure A funding, a new bid package should be prepared for supplier selection.

SERVER REPLACEMENTS

CLPCCD ITS and College Technology departments maintain application and file servers in the site data centers. These servers provide resources for college-specific applications used by the faculty and in support of the students. At the start of the Measure B Bond, a detailed analysis of server hardware platforms was conducted. The result was the selection of Hewlett-Packard server hardware as the College and District standard.   Hewlett-Packard (HP) Servers were implemented as standalone units, typically sized and configured for a single application per chassis. The HP servers have performed reliably, but many of the servers are now reaching obsolescence since they have exceeded the **5-7 year** typical life cycle.

Location	2005	2016	Operating System	Growth
Chabot	11	28	Windows	
Chabot	1	1	Linux	
Chabot	3	1	MacOS	
Chabot Totals	**15**	**30**		2 times
Las Positas	6	19	Window	
Las Positas	2	2	Linux	
Las Positas	0	1	MacOS	
LPC Totals	**8**	**22**		2.75 times
District	5	51	Windows	
District	2	44	Linux	
District	6	22	AIX	
District	18	0	Netware	
District	2	19	Enterprise	
District Totals	**31**	**136**		4.38 times

With the industry move towards virtual environments, shared SAN storage and blade systems, application servers now share CPU and disk resources across many servers. This optimizes the

use of the hardware and presents an environment with lower operating costs. CLPCCD District ITS has migrated many standalone servers to the HP blade/SAN environment and are continuing to deploy more servers on these platforms as needed by new applications.

In the College Technology server environments, the move to blade/SAN architectures has been limited. However, since dedicated server hardware is reaching the end of its usable life, the move to blade/SAN architectures need to occur. Since the blade/SAN environment presents a completely different physical and operating environment from standalone servers, College Technology staff should engage the consulting resources from proven HP partners to ensure a proper design and implementation. With the availability of Measure A funding, it would be appropriate to begin the careful planning, architecture and procurement of the new server infrastructure.

As the new architecture is deployed in 2017 and 2018, the server operating environment will be optimized for application growth. However, the life cycle for server hardware continues to be 5-7 years. As such, CLPCCD ITS anticipates that the replacement purchase of the blade/SAN hardware will be performed once at the commencement of Measure A in 2017, and again in 2021/22 and 2025/26.

Enterprise Server Upgrades

The Banner Enterprise application runs on a set of IBM AIX servers. This includes the main database server, and its redundant failover system, along with a series of front end application servers. During the Measure B bond, the bids for replacement equipment were performed in 2007 and 2015. These were in keeping with the standard life cycle of 5-7 years for servers.

Anticipating comparable aging for the Measure A bond, CLPCCD ITS has planned for the Banner Enterprise server hardware replacements in 2020 and 2025.

Server Monitoring and Support

In addition to the hardware and software for the new blade/SAN servers, there are ongoing requirements for server performance monitoring and support. These include:

- backup utilities for centralization of control, off-site storage and restoration of data.
- Tools for monitoring the performance of the virtual hosts, and complex applications like MS Exchange are also necessary.
- Load balancers for redundancy and performance management of highly accessed applications.

Some of these items are specified as part of a new server or application rollout. As need be, these products will be evaluated and procured for best management of the server environment.

DATA CENTER UPGRADES

During the Measure B bond, new data center and server rooms were constructed as part of building projects. The primary District Data Center is located in the Las Positas IT Building 1900 and has been in operation since 2009. In addition, there are remote server rooms at the Chabot and District locations. These facilities provided power protection with UPSes and generators and HVAC controls. The upgrades planned for Measure A will focus on improved robustness of the Data Center for redundancy to avoid CUP and switch failures, and establish HVAC independence. Now in operation for several years, the following upgrades need to be evaluated and executed as needed during Measure A:

- LPC IT Building HVAC – Because of reliability issues with the HVAC, CLPCCD ITS would like to have the HVAC for the LPC IT Building computer rooms reengineered so there is no reliance on the CUP. This would need to include primary and backup HVAC sources. Engineering design and construction would be required.
- Chabot B200 MPOE UPS – This UPS, purchased in *2007,* was excessed from the old B300 server room when B300 was modernized. It is expected that this UPS will be replaced during the relocation of the MPOE
- Chabot B300 MDF UPS – The expected life cycle of a UPS is 15-20 years. The UPS in B300 was put into service as part of the B300 remodel in 2011. Depending on its performance, there may be a need for replacement of this UPS.
- Generators – The life cycle of generators varies with usage and maintenance, spanning from 20-30 years for intermittent emergency use. During the span of the Measure A bond, the generator at the LPC IT building or Chabot B300 may reach the end of their useful lives. Funding for replacements will need to be budgeted from Measure A.

DATA NETWORK EXPANSION

With the increasing number of computer desktop, laptop and tablet systems, CLPCCD ITS has also expanded the number and performance of the data network connections. At the beginning of Measure B, the campus networks consisted of minimal home-grown cabling that supported 10Mbps hubs for workgroup connectivity. Building modernizations, computer lab growth and wireless connectivity requirements have resulted in network connectivity growth to more than 5000 connections per campus. Current network deployments support 100Mbps or 1Gbps switch speeds to the desktop, based on the Cisco hardware standard.

During the course of the Measure B bond, CLPCCD ITS prepared and awarded several bid packages for the expansion of the switch/router/firewall infrastructure.

Measure B Network Bids

Year	Scope
2006	All campus 10 Mb hubs Campus Core switches Campus routers, firewalls
2009	Chabot: B500, CSSC, IOB, B2200, B2700, B4100 LPC: CCA, CDC, M&O, Pool, PE Spares
2012	Chabot: B1200, B1700, B1800 LPC: SSA Spares
2014	4506 replacements (21),10G backbones, routers, firewalls Chabot: B100/Library LPC: B2000/Library

These procurements included the data switching equipment infrastructure required for the campus building modernizations and new construction. Additional smaller procurements for wireless access points and small switches were done as needed based on user requirements. SmartNet costs for on-going vendor equipment support of the Core equipment and high-density switches also added to the total of cost of acquisition of the data network equipment.

With the Measure B building expansion, the growth in network connectivity is shown below:

Location	2005 ports	2016 ports	Growth
Chabot	<1800	5520	3.06 times
Las Positas	<1200	4720	3.93 times
District	<48	384	8 times

With Measure A, the number of network connections will continue to increase with building construction, and the speeds of those connections will move towards a consistent 1Gbps connectivity for desktops and 10Gb+ connectivity between buildings and the Internet. CLPCCD ITS will continue to scope and configure the data network equipment for the new/modernized buildings. As bandwidth and vendor obsolescence dictates, data network equipment will be replaced as needed.

WAN

CLPCCD ITS initially supported limited bandwidth for site-to-site connectivity as provisioned by T-1 WAN circuits. As network activity increased at each site, CLPCCD ITS was able to incrementally add connections and redundancy to the WAN topology.

In 2008, CLPCCD ITS upgraded the WAN router infrastructure to be able to support the AT&T OPT-E-MAN Ethernet service. These connections far exceed the bandwidth offered by multiple T-1 connections, with a simplicity of operation and upgrade.

Connection	2005	2007	2016	Growth from 2005
Chabot to LPC	3 x T-1 (4.5 Mbps)		100 Mbps	22 times
Chabot to District	1 x T-1 (1.5 Mbps)	2 x T-1 (3 Mbps)	20 Mbps	13 times
District to LPC (redundant link to Chabot)	1 x T-1 (1.5 Mbps)		20 Mbps	13 times

The current topology is:
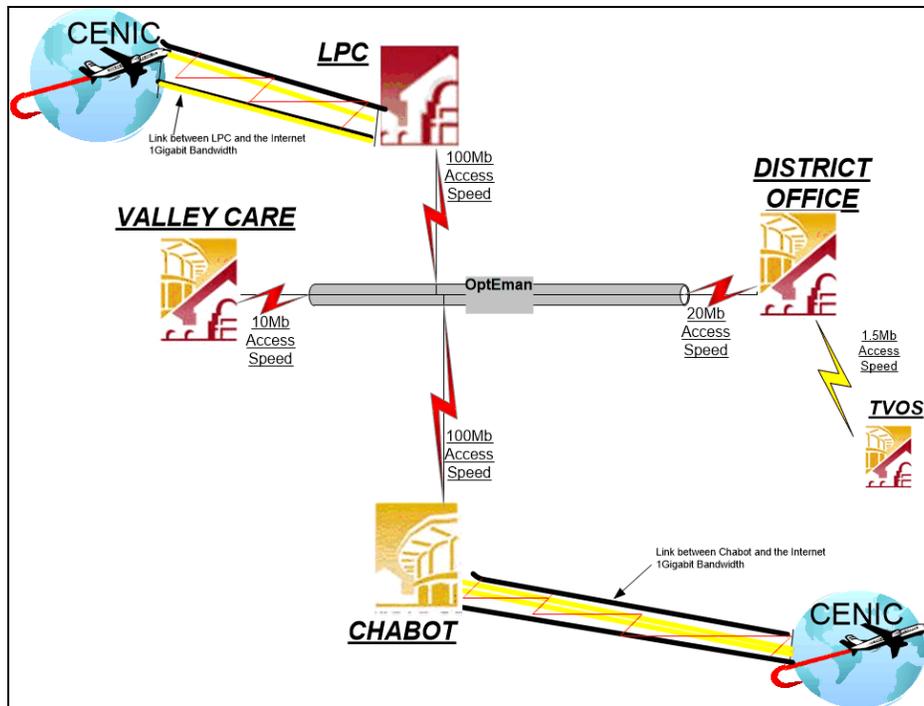
Measure A will continue to fund equipment and bandwidth in support of the increasing application connectivity required across the WAN.

Wireless

A completely separate network environment is the wireless infrastructure. At the beginning of the Measure B bond, wireless did not exist. CLPCCD ITS first began deployments of 802.11a/b/g infrastructure in 2009. This was upgraded in performance and functionality to the current 802.11n network. Licensed for 150 access points at each campus, the wireless infrastructure has been installed to service inside buildings, focusing on buildings that had been renovated and equipped with network cabling for the access points. Access points are installed in most buildings on each campus as shown in the following maps:

Chabot: 118 access points in 39 buildings

LPC: 80 access points in 28 buildings

All of the wireless installations were new to the Bond Measure B since 2005, so the growth factor is also the current installed base of 118 access points at Chabot and 80 access points at Las Positas.

Wireless technology has continued to develop in areas of increased bandwidth. The current standard is 802.11ac, whose Wave 2 version has just become readily available in the industry. Since this technology has significantly different transmission characteristics, CLPCCD ITS will initiate Measure A projects to:

- Survey campus buildings and infrastructure for the support of an 802.11ac Wave 2 technology.
- Analyze outdoor areas and develop a topology to enable wireless coverage in student congregation areas.
- Augment cabling and electrical infrastructure to support additional 802.11ac Wave 2 access point installations.
- Assess centralized controllers and licensing requirements to support 802.11ac Wave 2 access point rollouts.
- Bid and award a wireless upgrade package, including hardware, software, monitoring tools and installation services.
- Deploy and operate new infrastructure for 802.11ac Wave 2 access points.

As the Measure A bond progresses, the wireless technology will continue to develop new standards and new frequency ranges. The first wireless upgrade will occur as a high-priority project at the start of Measure A in 2017, with future upgrades planned in 5 year spans in 2021/22 and 2025/26.

Network Monitoring tools

With the growing sophistication of hacking tools, it becomes increasingly important for CLPCCD ITS to have a more detailed view of the network traffic. This includes the use of tools to:

- Perform logon and authentication of users in open wireless networks.
- Monitor bandwidth and utilization of networks to forecast and address potential bottlenecks and performance issues.
- Detect and alert unusual network traffic. Provide mitigation response to prevent network issues.
- Log events and traffic that could be later analyzed for incidence handling.

A number of the tools currently in use need updating. These are:

- **ManageEngine** – This tool is used for log file archival and management. It needs to be upgraded to a newer server and current software version 12.
- **Intermapper** – This is a basic outage alerting software that can email or page appropriate personnel when a device goes down/up. This software needs to be upgraded, and put on annual maintenance so upgrades can be downloaded. Additional modules for NetFlow

analysis can be added to provide detailed information on top-talkers, traffic destinations and port usage.

- **Cisco Access Control Server (ACS)** – CLPCCD purchased the Cisco ACS software, with the plans to deploy it for more Identity Management of wireless users and network device authentication. This software should be reviewed in conjunction with the authentication capabilities already on the 5508 wireless controllers.

In addition to these tools, CLPCCD ITS needs to evaluate and procure Intrusion Prevention/Detection security tools that can augment the capabilities of the ASA 5585 firewalls. Specifically, the FirePOWER module can provide threat/breach detection with automatic mitigation and protection against targeted and persistent malware attacks.

For further network optimization, CLPCCD ITS should investigate bandwidth management tools, such as the Bluecoat PacketShaper, so that traffic prioritization can optimize WAN and Internet performance. During the course of the Measure A bond, additional tools will be evaluated and implemented as needed, so that CLPCCD ITS can continue to optimize network performance as network utilization changes and increases.

AUDIO-VISUAL UPGRADES

Key to the effectiveness in the classroom is the availability of a consistent and reliable Audio-Visual equipment. Instructors present their materials from a variety of sources including, printed papers and books, CD/DVD/Blu Ray, graphical tools (Powerpoint, etc.) and the Internet.

At the beginning of the Measure B bond, College Technology individually developed AV Technology standards for the "smart" classrooms at each campus. Beginning with the renovation of the first classrooms on each campus, the "smart" classroom was installed in every teaching room providing:

- Drop-down screens (16:10)
- Projectors (LED)
- Push-button SP input controllers using AV sources including document cameras, VCRs, and laptops
- Speakers
- Assisted listening devices

This technology replaced the old system of pushing TVs on carts around to the classrooms, but introduced an additional level of technology sophistication to be supported by College Technology staff.

As of 2016, many of the classrooms are nearing ten years of use. Equipment has become unreliable, or has failed due to its age. Given the typical life-span of 5-7 years for AV equipment, one of the key projects for the Measure A bond will be to do an Audio-Visual equipment refresh of the classrooms to replace their aging infrastructure with newer technology, including:

- High Definition (HD) AV resolution
- 5000+ ANSI Lumen Projectors (LCD), for crisper and brighter displays
- Crestron input controllers with touch-screen input controls
- Cordless AV connectivity for instructors
- Improved instructor microphones
- Blu-ray disc player
- Enhanced speakers

In buildings that are listed for new or modernized Measure A building construction, the AV upgrades will be designed and constructed with the new standards. However, in buildings already modernized by the Measure B bond projects, the classrooms will be renovated in order of age of installation, as shown below.

Year	Chabot Building	Rooms	LPC Building	Rooms
Pre-2008	B1300 B1500 B1600 B2000 B2100 B2200 B3100 B3900	2 classrooms 3 rooms 10 classrooms 2 classrooms 8 classrooms 5 classrooms 3 classrooms 14 classrooms	B2200 B800 B2500 PE	6 classrooms 8 classrooms 7 classrooms
2008	B900	5 classrooms	M&O	2 rooms
2009	B2200 Health B800 B3500	1 classroom 18 classroom 1 classroom	B2400 MD Aquatics	12 classrooms - none
2010	B700 CSSC B400 IOB B1900 Planet. B500	4 rooms 2 classrooms 2 classrooms 17 classrooms	B2300 CDC B4000 CCA B1900 IT B900	2 classroom 11 classrooms 1 room 1 classroom
2011			B400/500/600	13 classrooms
2012	B4000 B300 B1400/B1600	- none 14 classrooms 4 classrooms	B1800/1850 B1700	19 classrooms 1 room
2013	B1800 B2500, 2600, 2700, 2800, 2900 B3400 B1200	9 classrooms 12 classrooms 2 classrooms 5 classrooms	B1600 SSA	17 classrooms
2014	B1700	13 classrooms	B1310/1320 Temp 100	1 room 6 classrooms
2015	B100	5 classrooms	B2000	7 classrooms
2016			B700	2 classrooms
Totals		161 classrooms		114 classrooms

All of these new smart classrooms listed above, 161 for Chabot and 114 for LPC, reflect the substantial growth funded by Measure B since 2005.

In addition to the refresh of classroom equipment, conference room AV equipment will also need to be replaced. This includes meetings rooms, board rooms and student collaboration spaces.

The AV requirements for these spaces may be custom designed dependent on the specific utilization and purpose of each space.

It is important to note that classroom AV was previously provided through Measure B bond funding associated with design engineers hired as part of the building construction or modernization team. The same process will be followed for providing Audio-Visual equipment for Measure A new building construction and/or renovation.

Up to this point, a few equipment replacements have been made for failed components in Measure B installations. As a high-priority, an AV refresh project will commence in 2017. This will include 1) defining the new AV standards with College Technology departments who will specify the new requirements, 2) working with an AV designer to creating a bid package with the detailed design and 3) bidding and awarding the work to an AV contractor who will do the replacement/upgrade work.

TELEPHONE AND VOICEMAIL SYSTEMS

Through the Measure B bond, new construction and building growth at Chabot and Las Positas College have expanded the number of new classrooms, offices and staff. An increase in the connectivity requirements to the current telephone systems had paralleled this building growth, requiring the addition of telephone extensions, voicemail boxes and cabling. The Measure A bond will continue that growth. New Security alerting systems will present additional requirements for a state-of-the-art telephony based communication system. This document covers the progression of the CLPCCD telephone systems and the requirements for expansion and replacement. The objective is to standardize on a telephony system with common functionality and communication across all of the District and College sites, which will support district-wide operations and the security alerting system.

The telephone systems at the Chabot and Las Positas campuses operate as independent systems for both calling and voicemail. All systems use analog and digital telephone sets connected to the main telephone system over copper cabling. Inbound/outbound PRI service is used for telephone calls to and from campus. During power outages, the centralized telephone systems are kept powered by large UPSes or generators. This keeps the telephones working in the building for a minimum of four hours during emergencies.

At Chabot, a Fujitsu telephone system was in production at the start of the Measure B bond. This system was configured as two separate components, one housed in the main telephone room (MPOE) in Building 200, and the other located in the Building 1400 IDF. Since the Fujitsu systems were not expandable and nearing the end-of-life, in 2007, CLPCCD ITS and Chabot Technology worked with the current telephony maintenance organization, Altura, to implement a minimal upgrade whereby the Fujitsu systems were gatewayed to an Avaya Communications Manager S8300 system. This upgrade positioned Chabot to begin a gradual transition of the telephone services off the obsolete Fujitsu, and onto a current Avaya platform, and allowed deployment of Avaya telephone service to new buildings such as the IOB and CSSC. During the renovation of Building 1400 in 2011, the replacement of the Fujitsu system in the B1400 IDF, was performed. This upgraded the system in B200 to an S8500, and allowed the connectivity of

Building 3500, 3400, 1400, 1600, 1700, 1800 and smaller buildings which had been connected to the old B1400 Fujitsu. The remaining Fujitsu system in B200 was also removed.

The District Office telephone system was linked to the Chabot Fujitsu system for voicemail. As Chabot gradually migrated off the Fujitsu system, it became clear that the District Office system similarly needed to be replaced. When the District Office moved to the current Dublin location in 2013, its Fujitsu system was decommissioned, and replaced with an Avaya S8300 system. While using separate calling through its own in/outbound PRI service, the District Office system currently connects to the Chabot system for voicemail storage.

Another District site, the Tri-Valley One STOP (TVOS) uses a Centrex system which is also completely independent of the other CLPCCD systems. Services are limited, and require a separate support contract with AT&T. An analysis will need to be performed to determine if the TVOS system can be connected to the District system in a cost-effective manner.

Many years ago, Las Positas purchased a Siemens HiCom 300 system, and at the start of the Measure B bond expansion, it was running at 50% of its capacity. This has been a discontinued product for Siemens for several years although support and refurbished parts have been available. The system is now expanded to its maximum capacity and a full system replacement is needed. Additional expansion on campus cannot be supported on the existing system. With the new LPC Building 100A coming online, there is an urgency to get a bid prepared, issued and awarded by Summer of 2017. For consistency of operation and to leverage existing knowledge, the LPC system will also be based on Avaya technology. This is a "first priority" project for CLPCCD ITS, since the current phone system lacks the needed capacity to support LPC.

As the LPC system is upgraded, comparable upgrades to the Chabot and District systems may also be necessary. A critical need at Chabot is the MPOE room expansion. The MPOE is located in Building 200 on campus. It is impacted without any room for expansion to accommodate protector panels and splices beyond the New Biology building, and for the Measure A construction. In addition, a remodel and possible building demolition for the Building 200 has been recommended in the 2012 Facilities Master Plan. It is a disruptive project to move the MPOE, involving 1) construction of the new facility, 2) rerouting/recabling of the building feeders, 3) move of the Telephone system, 4) relocation of the AT&T Services and 5) the relocation of the CENIC Internet connections. These changes are quite time-consuming and sequential, so it might take one or two years to execute. All of these tasks would present significant downtime to the campus voice and data services during specific transitions. This is a high-priority project for CLPCCD ITS.

CABLING

A number of buildings on the campuses are still equipped with low grade voice and data cabling installed in the 1990s. This cabling is inadequate to provide reliable and high-performance connectivity. The following buildings have the greatest needs for upgrades:

- Chabot College – Buildings 1100, 1500, 2000, 2400, 3000, 3900
- Las Positas – Buildings 800, 1800, 2200, 400, 2100

Some of these buildings have also been identified for modernization. As the modernization priorities are defined, CLPCCD ITS will evaluate whether separate cabling projects should be scoped and executed.

A key requirement at Chabot College is the replacement of the multimode fiber backbone cables. Any new buildings or buildings that have been modernized have already been cabled with single mode fiber cabling and new copper backbones. Remaining buildings needing single mode fiber and new copper cables include buildings 3800, 2400, 3000, 2000, 3900, 1500, 3500, 3600, 3700. A project to install new backbone cabling will be evaluated with respect to building modernization schedules and priorities. Any expansion to wireless or wired networking or DAS connectivity cannot be supported in these older buildings until new single mode fiber backbones are installed. This is a high priority project for CLPCCD ITS.

In addition to the new backbones described above, the modernization or replacement of building 200 has a huge impact to the connectivity on campus. The following items will need to be addressed:

- New MPOE room – A new MPOE room will need to be built. New pathway from the campus Telecommunications loop will be provided.
- New AT&T pathway – The conduits from AT&T run directly from Hesperian to the MPOE room in B200. New pathway will need to be built to the New MPOE. This will provide pathway for AT&T copper facilities (PRIs, 1Mbs, COTs, etc.) and fiber for Internet connections.
- New backbones to existing buildings – Depending on the footprint of the replacement B200, and nearby B2300 and B3800, new conduits, vaults and cabling may be required to many buildings cabled with the Measure B bond construction projects.
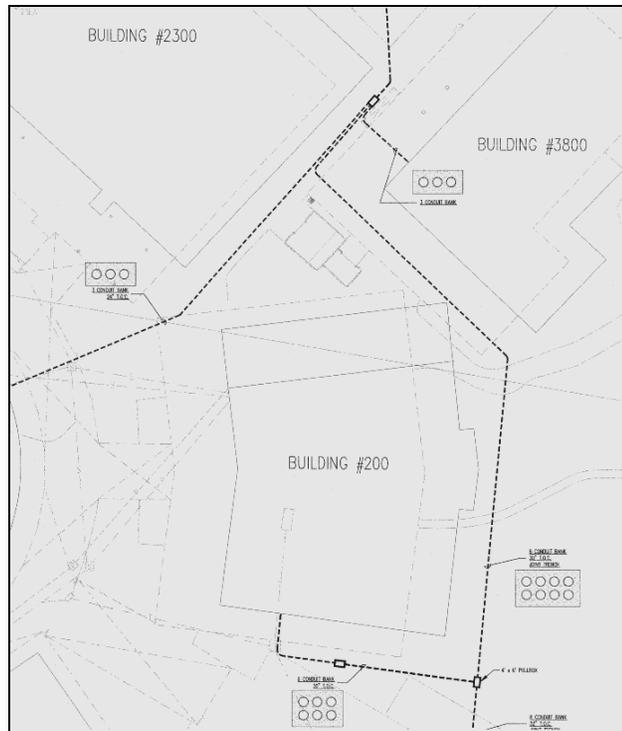
- Cable rerouting – Depending on the location of the new MPOE, the existing voice feeder cables may need to be spliced before rerouting into the new terminations.
- Equipment relocation – The telephone system and any Internet routing/switching equipment will need to be moved. Connectivity for all telephones on campus will need to be reconnected after the equipment move.
- Internet relocations – Both the primary and redundant Internet connections require coordination with the State Chancellor's office, who support the CENIC connections to the campus.

This transition will be extremely disruptive to the campus voice and data network. It must be carefully planned and executed.

DISTRIBUTED ANTENNA SYSTEM

Cellular service at the Las Positas College campus is spotty and unreliable. The best cellular service is available in the outside areas, but even that is of limited strength. In the newest buildings on campus, such as the LPC SSA, the cellular service is almost completely blocked by the building infrastructure, most specifically the high efficiency, IR reflecting, low-emissions glass. LPC is currently working with Verizon to do the initial cell tower installation on the LPC campus. Once this Verizon cell tower capability is available, cellular signals will improve outside the buildings. LPC anticipates that other carriers like AT&T and T-Mobile will also bring cellular tower projects to the campus.

As a Measure A project, CLPCCD District ITS and LPC Technology are investigating the use of the Distributed Antenna System (DAS) technology to improve the cellular service on campus. DAS is a solution for improving within-building cellular connectivity. The cellular carriers provide Signal Source equipment for their cellular network which is re-broadcasted through the DAS network to antennae that are placed in the ceilings of buildings. Each cellular carrier would construct their proprietary cellular Signal Source equipment on campus. CLPCCD would provide space, power and HVAC for continuous operation of the carrier's equipment. The CLPCCD-owned DAS equipment would then transmit the cellular communication to/from the building antennae and the carrier's network.

Like the data network, DAS uses cabling and specialized equipment within the buildings to distribute, repeat and magnify the cellular signal provided by the carriers from one central point of the campus. The DAS system must be designed to support multiple carriers, so it is usable with any cellular carrier (AT&T, Sprint, Verizon, T-Mobile) who brings connectivity to the campus.

The steps in the DAS project would include:

1. Performing a site survey to determine how many and where DAS antennae would need to be placed in each building.
2. Installing cabling as needed to support DAS antennae connectivity.
3. Designing the equipment for each IDF that would connect to the DAS antennae.
4. Designing the Head-end equipment to be placed in the LPC B1900A building.
5. Coordinating with carriers for service delivery.
6. Proposal preparation, bid and award. Rollout.

This project is of lengthy duration (6+ months) because of the unknown timeline for carrier service delivery. CLPCCD will also need to carefully analyze space requirements for the carriers to best determine how to provide maintenance and access. Because of the safety issues with unreliable cell service on campus, this is regarded as a high-priority project.

TIMELINE OF PRIORITY TECHNOLOGY PROJECTS FOR 2017-2018 FOR MEASURE A

Item	Description	Timeline
LPC Telephone Upgrade	- Define requirements and scope. - Prepare BOM with Avaya, prepare bid documents, bid, assess and award. - Implement new solution	Jan-May 2017 June-August 2017
Chabot fiber	- Assess requirements with respect to building modernization schedule. Design new backbones that may flexibly accommodate building MDF - Prepare bid documents, bid and award - Install new backbones and cut over to new infrastructure.	November 2017 December 2017 June 2018
Chabot MPOE	- Assess requirements for MPOE relocation. - Design new MPOE building facilities including building, pathway, power protection, HVAC, etc. - Bid and build new MPOE facilities - Design cable and equipment transition	February 2017+
Chabot/DO	- Upgrade of telephone systems for compatibility with LPC system	Fall 2017
Desktop Bid	- Define desktop/laptop/surface standards - Define supplemental installation/support services required. - Prepare, bid, select new supplier - Purchase for 2017 calendar year rollouts	June-Sept 2017 Nov 2017-Jan 2018 Chabot LPC
Wireless Upgrade Planning	- Scope project - Perform analysis and site survey for 802.11ac Wave 2 wireless design - Prepare bid package for product and implementation - Bid, procure and rollout	Feb 2017 May 2017 June 2017 July/August 2017
AV classroom upgrade	- Define requirements and scope. - Prioritize timeline for implementations. - Prepare BOM, bid documents, bid, assess and award. - Implement summer 2017 new solutions.	Jan-Apr 2018 June 2018
DAS	- Begin analysis and design for DAS systems at LPC campus. - Prepare bid package, bid, award. - Begin carrier coordination. - Rollout	Jan-May 2018 June 2018 July 2018 Oct-Dec 2018

Measure A Funding

Measure A - Estimated Technology Funding Allocation							
Summary - February 2017							
Cost Estimates for 2017-2021 Phase 1 (5 Years)							
Measure A IT Projects to Steinberg				Year			
Category		2017	2018	2019	2020	2021	Total
Chabot		$ 5,267,500.00	$ 4,319,500.00	$ 3,677,500.00	$ 4,352,500.00	$ 3,657,500.00	$ 21,274,500.00
CLPCCD District		$ 2,749,950.00	$ 5,721,837.00	$ 1,452,700.00	$ 1,977,950.00	$ 3,165,950.00	$ 15,068,387.00
LPC		$ 5,645,000.00	$ 3,337,500.00	$ 2,862,500.00	$ 2,570,000.00	$ 2,587,500.00	$ 17,002,500.00
Totals by year		$ 13,662,450.00	$ 13,378,837.00	$ 7,992,700.00	$ 8,900,450.00	$ 9,410,950.00	$ 53,345,387.00