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# FINAL REPORT

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## INFRASTRUCTURE MASTER PLAN UPDATE

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**Harper College**  
**Palatine, Illinois**

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## INFRASTRUCTURE MASTER PLAN UPDATE

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G/BA #P16-0569

March 31, 2017

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# INTRODUCTION

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In 2012, Harper College retained G/BA to develop a Campus Infrastructure Master Plan to support the Campus Architectural Master Plan developed by Ehrenkrantz Eckstut & Kuhn Architects and Graywood Design. The Campus Architectural Master Plan was completed to address the physical needs of the College through the year 2020.

In 2016, at the half-way point in the plan, the College commissioned Perkins Eastman to update the original Campus Architectural Master Plan so as to address current space and programmatic needs of the College and to prioritize associated capital investment over the latter years of the plan. This requires an updating of the original Campus Infrastructure Master Plan to support the proposed plan updates (additions and renovations) developed by Perkins Eastman.

This report updates the 2013 Campus Infrastructure Implementation Plan and includes the following systems:

1. Steam and Hot Water
2. Chilled Water
3. Air Handling Units
4. Water Mains
5. Fire Protection
6. Sanitary and Storm Sewer Mains
7. Natural Gas
8. Normal and Emergency Power
9. Telecommunication

The recommendations for utility infrastructure systems are documented in multiple implementation matrices. These matrices are organized by the system types listed above and include color-coded site utility plans showing existing and future utility systems as they relate to the proposed capital infrastructure projects.

- Implementation Matrix: A spreadsheet listing proposed capital infrastructure projects with their summarized scope, timeline (when a project needs to be completed), and budget (of probable construction cost).

The timeline in the Implementation Matrix takes into consideration the following:

- The projects are scheduled for completion to meet the Master Plan phasing requirements.
- The matrix includes a number of smaller “enabling” projects that are recommended to be completed before the “main” project as their precursor. The enabling projects are suggested when the main project does not coincide with the major renovation or new construction of the building. By executing enabling projects during a major renovation or construction, main project work in occupied buildings can be minimized.

- The timeline in the Matrix is based on the following phasing plan:
  - Phase 0: up to 2019
  - Phase 1: 2020 - 2023
  - Phase 2: 2024 - 2028
  - Phase 3: 2029 and beyond
- Budget for each project in the Implementation Matrix is a preliminary, predesign opinion of probable construction cost based on year 2020 indices. It is based on a 5% annual escalation through the year 2020 and includes design and construction costs.
- Opinion of probable construction costs are for infrastructure projects such as upgrades to the central boiler plant, new or replacement heat exchanger plants, replacement of air handling units, new emergency generator, domestic water heater replacement, etc. MEP costs for building services distribution systems associated with new or renovated buildings should be included as a part of the building construction and renovation costs. Costs for sanitary sewer mains upgrades and replacements are not included in the infrastructure budget. Sanitary mains upgrades costs are to be incorporated during the site/civil engineering evaluation. Detailed cost estimates should be undertaken for projects likely to be funded in any given year. The following is a summary of MEP infrastructure budget for Phase 0 through Phase 3.

Phase	Infrastructure Upgrade Budget Cost
0	\$9,233,000 <sup>1</sup>
1	\$11,895,000 <sup>2</sup>
2	\$5,836,000 <sup>2</sup>
3	\$9,386,000 <sup>2</sup>

<sup>1</sup>Budget for Phase 0 includes costs for the non-approved and on hold projects.

<sup>2</sup>Total budget cost does not include site sanitary and storm sewer upgrades.

- **Implementation Drawings:** Drawings or illustrations showing existing and future utility systems as they relate to the proposed capital infrastructure projects. Keyed notes on the drawings can be referenced to the project with the same number in the Implementation Matrix. All work planned to be implement in Phase 0 (up to 2019) is shown as existing, since these projects are either in construction or already designed and budgeted.

### STEAM AND HOT WATER SYSTEMS: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
0	1	<b>CENTRAL BOILER PLANT: VALIDATE OPERATION OF SUMMER BOILER B-5</b> Validate that the boiler B-5 is able to maintain required steam pressure at the most remote buildings in summer. This work will be done after completion of the utility tunnel evaluation project.	N/A
	2	<b>CENTRAL BOILER PLANT: BOILER B-1 (NEBRASKA) BURNER REPLACEMENT</b> Replace boiler B-1 burner with a new burner that has a higher turndown and more advanced controls. Replacement burner is to include linkageless burner controls, variable frequency drive for the forced draft fan, O <sub>2</sub> trim, and digital burner controller.  <i>The burner replacement project will qualify for natural gas incentive rebate program by the Illinois Department of Commerce and Economic Opportunity (DCEO). DCEO rebate could offset up to 50% of the project costs.</i>	Budgeted In design
	3	<b>CENTRAL BOILER PLANT: BOILER B-2 (NEBRASKA) BURNER REPLACEMENT</b> Replace boiler B-2 burner with a new burner that has a higher turndown and more advanced controls. Replacement burner is to include linkageless burner controls, variable frequency drive for the forced draft fan, O <sub>2</sub> trim, and digital burner controller.  <i>The burner replacement project will qualify for natural gas incentive rebate program by the Illinois Department of Commerce and Economic Opportunity (DCEO). DCEO rebate could offset up to 50% of the project costs.</i>	Budgeted In design
	4	<b>CENTRAL BOILER PLANT: NEW BOILER MANAGEMENT SYSTEM</b> Provide new plant master controller to schedule and control the five (5) boilers and two (2) deaerators including the feedwater and condensate transfer pumps. Master controller function to include equipment lead/lag rotation, base loading of Cleaver-Brooks boilers, monitoring of steam flow rate, utility usage, and alarms. Panel to be integrated with the campus BAS for remote monitoring.	Budgeted In design
	5	<b>CENTRAL BOILER PLANT: REPLACEMENT OF NORTH BOILER HOUSE DEAERATOR</b> Replace existing deaerator with a pressurized deaerator for high pressure boiler applications. Unit to be factory packaged with two-compartment design (surge tank and deaerator), duty/standby transfer and feedwater pumps, and electrical control panels.	\$858,000 Submitted for FY18

### STEAM AND HOT WATER SYSTEMS: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	<b>6</b>	<b>BUILDING F: HX PLANT REPLACEMENT</b> a. Replace existing outdated heat exchanger plant in Building F with a new plant. The new plant to be sized to serve only Building F heating load. b. Hot water distribution system replacement (hot water piping and equipment beyond mechanical rooms) should be part of the Building F Renovation project and it is not included in this cost.	Budgeted/ In construction
	<b>7</b>	<b>BUILDINGS L &amp; P: HX PLANT L UPGRADE &amp; NEW HW PIPING TO CONNECT BUILDING P TO PLANT L</b> a. Upgrade existing HX Plant L so it can serve heating load of Building P. Replace the existing steam-to-hot water heat exchanger with a larger one and replace the existing primary hot water loops to match the new heating load. Add two new secondary loop hot water pumps to serve Building P heating load. The project to include repair of existing hot water piping insulation, steam flow meter, pump controls upgrade (add VFDs), and PRV pilot pipe pitching in heat exchanger plant. b. Add new hot water supply and return piping to connect Building P hot water system to the heat exchanger Plant L. c. Demo existing HX plant in Building P.	Budgeted/ In construction
	<b>8</b>	<b>BUILDING M: HX PLANT REPLACEMENT</b> a. Replace existing heat exchanger plant in Building M with a new plant.	Budgeted/ In construction
	<b>9</b>	<b>BUILDING A: HX PLANT REPLACEMENT</b> a. Replace the existing heat exchanger plant in Building A with a new plant.	Budgeted/ On hold \$550,000
	<b>10</b>	<b>BUILDING C: HOT WATER MAIN REPLACEMENT</b> The project to include replacement of existing 4" heating hot water and 2-1/2" radiant heat hot water supply and return piping branches serving Building C. The new piping to be sized to satisfy additional load of future Building C1.	\$75,000 Concurrently with Building A renovation
<b>1</b>	<b>11</b>	<b>CENTRAL BOILER PLANT: REBUILD BOILER B-1 (NEBRASKA) SHELL AND TUBES</b> Rebuild boiler B-1 shell and tubes if recommended upon a boiler inspection.	\$570,000 No later than FY21

### STEAM AND HOT WATER SYSTEMS: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	<b>12</b>	<b>BUILDING K: NEW HW PLANT</b> <ul style="list-style-type: none"> <li>a. A new hot water plant to serve Building K and the interconnecting bridge with Building W. New plant to include following: <ul style="list-style-type: none"> <li>• (2) Condensing hot water boilers each 2,800 MBH (N+1 redundancy)</li> <li>• variable primary flow system</li> <li>• hot water centrifugal pumps</li> <li>• water filtration and treatment</li> <li>• automatic controls</li> </ul> </li> </ul> <p><i>The cost does not include the plant building. It is assumed that the plant will be housed in the new Building K.</i></p>	\$1,100,000 Concurrently with Building K
<b>2</b>	<b>13</b>	<b>BUILDING R: HX PLANT R UPGRADE AND NEW HW PIPING TO CONNECT BUILDINGS R1 &amp; N TO PLANT R</b> <ul style="list-style-type: none"> <li>a. Upgrade existing HX Plant R so it can serve future buildings R1, R2, and N. Add a new steam to hot water heat exchanger and associated centrifugal pump(s).</li> <li>b. The project to include a new hot water supply and return branch routed through Building R to connect future buildings R1 and N to Plant R.</li> <li>c. Route hot water supply and return piping between Buildings R and N through the new utility tunnel.</li> </ul> <p><i>Cost of the utility tunnel is not included.</i></p>	\$230,000 Concurrently with Building R1
	<b>14</b>	<b>BUILDING Y2: NEW HX PLANT Y2 AND HIGH PRESSURE STEAM &amp; CONDENSATE PIPING</b> <ul style="list-style-type: none"> <li>a. Project includes a new hot water HX plant to serve new Buildings Y2 and Y1.</li> <li>b. Add new high pressure steam and condensate return piping routed through Building Y to serve new HX Plant Y2.</li> <li>c. Route hot water supply and return piping between Buildings Y2 and Y1 through the first floor of Building Y.</li> </ul> <p><i>The cost does not include the HX plant building. It is assumed that the plant will be housed in the new Building Y2.</i></p>	\$230,000 Concurrently with Building Y2
	<b>15</b>	<b>BUILDING C: HW PIPING SYSTEM REPLACEMENT</b> <p>Hot water distribution system replacement (hot water piping and equipment beyond mechanical rooms) should be part of the Building C Renovation project.</p>	Cost to be included in the Building C Renovation project



# STEAM AND HOT WATER SYSTEMS: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
3	16	<b>BUILDING S: HW PLANT REPLACEMENT</b> Replace existing gas fired hot water boiler and pumps.	\$100,000
	17	<b>BUILDING V: STEAM PLANT REPLACEMENT</b> Replace existing gas fired steam boiler and accessories.	\$125,000



Campus Steam and Hot Water Implementation Plan

### CHILLED WATER SYSTEM: IMPLEMENTATION MATRIX

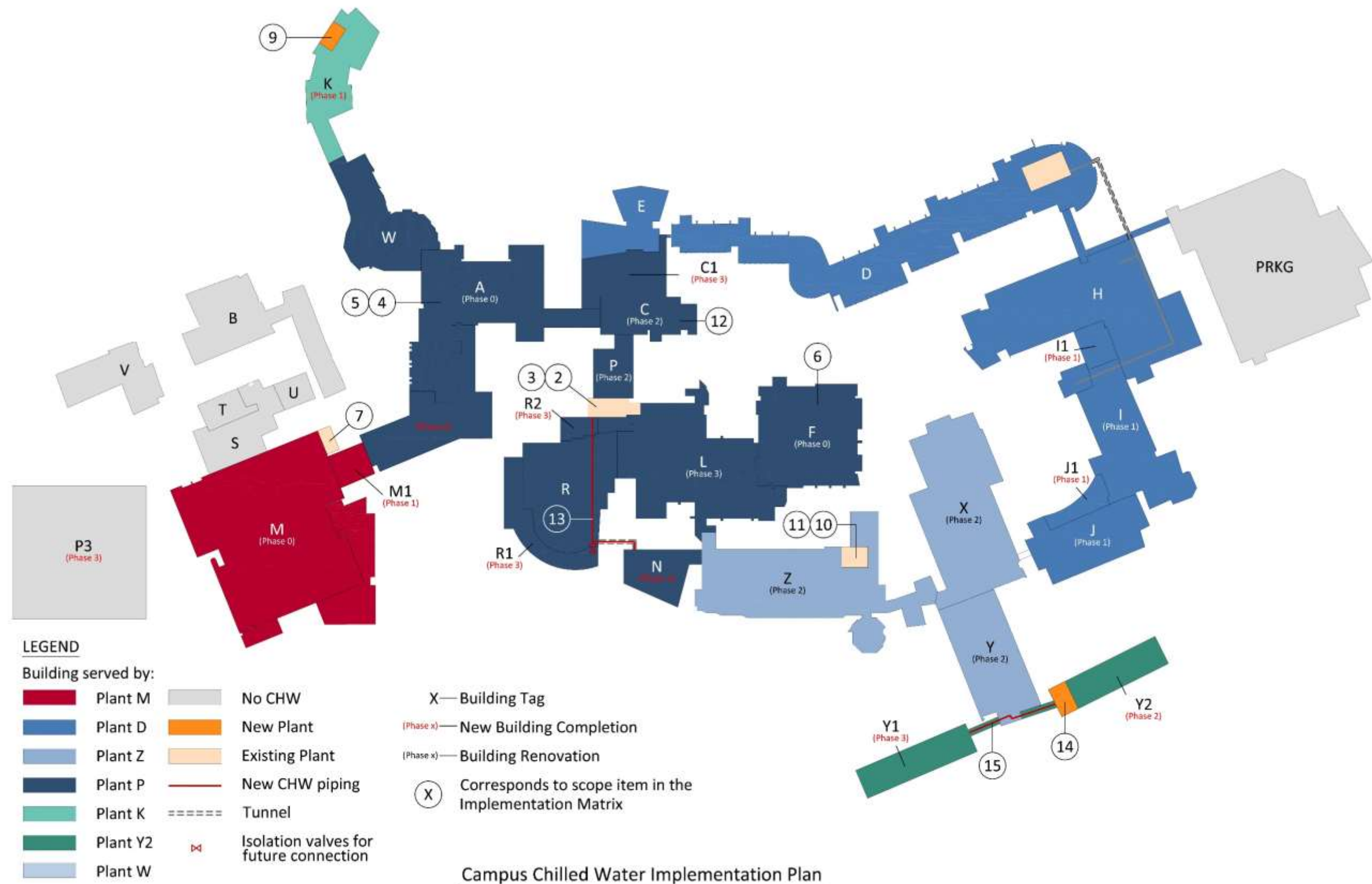
Phase	No	Project / Scope	Budget
0	1	<b>EXISTING CHILLED WATER PLANTS: CONDENSER WATER CHEMICAL TREATMENT ASSESSMENT</b> Conduct a third party assessment of current chemical treatment for condenser water system for existing chilled water plants.	Budgeted/ In construction
	2	<b>BUILDING P: CHILLER PLANT EXPANSION</b> Add two (2) 390 Ton water cooled centrifugal chillers and associated cooling towers.	Budgeted/ In construction
	3	<b>BUILDING P: CHILLER PLANT COMMISSIONING</b> Commissioning of expanded chiller plant P to improve operation of systems and equipment to ensure they operate at peak efficiency. It also includes training of the operators to use and adjust plant's existing packaged control system.	Budgeted/ In construction
	4	<b>BUILDING A: CHW DISTRIBUTION SYSTEM REPLACEMENT</b> The Building A Renovation project to include replacement of all chilled water distribution system in the building.	Budgeted/ On hold \$700,000
	5	<b>BUILDING A: EXISTING CHILLER PLANT A DEMOLITION</b> Demo existing outdated and inefficient plant A upon completion of new plant A. Demo associated existing cooling towers and condensate piping in the utility tunnel.	Budgeted/ In construction
	6	<b>BUILDING F: CHW DISTRIBUTION SYSTEM REPLACEMENT</b> The Building F Renovation project to include replacement of all chilled water distribution system in the building.	Budgeted/ In construction
	7	<b>BUILDING M: CHW SYSTEM UPGRADE</b> The Building M chilled water system upgrade to include replacement of all chilled water system distribution piping in the building and the existing air cooled chiller.	Budgeted/ In construction

### CHILLED WATER SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
1	8	<b>NOT USED</b>	
	9	<b>BUILDING K: NEW CHILLER PLANT K</b> New chilled water plant to serve new building K. New plant to include following: <ul style="list-style-type: none"> <li>• Two (2) air cooled chillers each 300 tons (N+1 redundancy)</li> <li>• Variable primary flow system</li> <li>• Chilled water centrifugal pumps</li> <li>• Water filtration and treatment</li> <li>• Automatic controls</li> </ul> <i>It is assumed that the plant will be housed in the new Building K. Cost of outdoor screen and pad included.</i>	\$1,200,000 Concurrently with Building K
2	10	<b>BUILDING Z: RETRO-COMMISSIONING CHILLER PLANT</b> Retro-commissioning of chiller plant Z to improve operation of systems and equipment to ensure they operate at peak efficiency. <b><i>The cost includes retro-commissioning service cost and an estimated cost to implement recommended retro-commissioning measures.</i></b>	\$175,000
	11	<b>NOT USED</b>	
	12	<b>BUILDING C: CHW SYSTEM REPLACEMENT</b> The Building C Renovation project to include replacement of all chilled water distribution system in the building.  <i>Cost of replacement of chilled water piping and equipment in <u>mechanical rooms</u> is included in Building C AHU Replacement project.</i>	Cost to be included in the Building C Renovation project

### CHILLED WATER SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
3	13	<b>BUILDING R: NEW CHW PIPING TO CONNECT BUILDINGS N &amp; R1 TO PLANT P</b> a. A new 4" chilled water supply and return branch routed through Building R to connect new Building N and future Building R1 to Plant P. Add piping during the renovation of Building R to minimize construction in occupied Building R. b. A new utility tunnel and 4" chilled water supply and return piping between Buildings R and N.  <i>Cost of shallow utility tunnel included.</i>	\$330,000 Concurrently with Building N
	14	<b>BUILDING Y2: NEW CHILLER PLANT Y2</b> a. New regional chilled water plant to serve new buildings Y2 and Y1. New plant to include following: <ul style="list-style-type: none"> <li>• Two (2) air cooled chillers each 300 tons (N+1 redundancy)</li> <li>• Variable primary flow system</li> <li>• Chilled water centrifugal pumps</li> <li>• Water filtration and treatment</li> <li>• Automatic controls</li> </ul> b. A new chilled water supply and return piping routed through the first floor of the existing Building Y to connect Building Y1 to Plant Y2.  <i>It is assumed that the plant will be housed in the new Building Y2. Cost of outdoor screen and pad included.</i>	\$1,200,000 Concurrently with Building Y2
	15	<b>BUILDING Y1: CONNECT BUILDING Y1 TO CHILLED WATER PLANT Y2</b> Provide 5" chilled water supply and return piping to connect Building Y1 to Y2 chilled water plant.	\$75,000 Concurrently with Building Y1



### AIR HANDLING UNITS: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
0	1	<b>BUILDING A: REPLACEMENT OF ALL AHUs</b> Replace all air handling units (AHUs) in Building A. The project should coincide with the Building A Renovation project. The scope of the project includes: <ul style="list-style-type: none"> <li>• Demolition of 12 AHUs, controls, and associated chilled water (CHW) and hot water (HW) piping in mechanical rooms</li> <li>• New rooftop outdoor custom VAV AHUs with service vestibules and return air fans</li> <li>• New temperature controls for AHUs and their integration to AX Supervisor</li> <li>• New CHW and HW piping and accessories that serve AHUs</li> </ul>	Budgeted/ On hold \$3,500,000
	2	<b>BUILDING E: REPLACEMENT OF AHU-E3 &amp; -E4</b> Replace AHU-E3 and AHU-E4 in Building E. The scope of the project includes: <ul style="list-style-type: none"> <li>• Demolition of 2 AHUs, controls, and associated chilled water (CHW) and hot water (HW) piping in mechanical rooms</li> <li>• New indoor custom CV AHUs including return air fans</li> <li>• New temperature controls for new AHUs and their integration to AX Supervisor</li> <li>• New CHW and HW piping and accessories in mechanical rooms</li> <li>• New CHW and HW control valve and associated piping modification for units AHU-E1 and E2</li> <li>• New temperature controls for existing AHU-E1 and E2 and their integration to AX Supervisor</li> </ul>	Budgeted/ In construction
	3	<b>BUILDING F: REPLACEMENT OF ALL AHUs</b> Replace all air handling units (AHUs) in Building F.	Budgeted/ In construction
	4	<b>BUILDING M: REPLACEMENT OF ALL AHUs</b> Replace all air handling units (AHUs) in Building M.	Budgeted/ In construction
1	5	<b>BUILDING A: ADD CRAC UNIT</b> Add Liebert CRAC unit to serve the server room in Building A. The scope of the project includes: <ul style="list-style-type: none"> <li>• A new 20 Ton CRAC unit with dual cooling source, chilled water cooling coil, and redundant DX coil with the remote glycol based dry cooler for heat rejection.</li> <li>• Chilled water supply and return piping to connect the unit to the chiller Plant P</li> </ul>	\$170,000 No later than FY20

### AIR HANDLING UNITS: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	6	<b>BUILDING I: REPLACEMENT OF AHU-I1 &amp; -I3</b> Replace AHU-I1 and AHU-I3 in Building I. The scope of the project includes: <ul style="list-style-type: none"> <li>• Demolition of 2 AHUs, controls, and associated chilled water (CHW) and hot water (HW) piping in mechanical rooms</li> <li>• New indoor custom VAV 3-deck multi zone AHUs with return air fans installed in the existing mechanical rooms</li> <li>• New temperature controls for all AHUs including and their integration to AX Supervisor</li> <li>• New CHW and HW piping and accessories in mechanical rooms</li> </ul> <p>Cost of the air distribution system replacement is not included.</p>	\$540,000 Due to age replacement may be required prior to Building I renovation



### AIR HANDLING UNITS: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	7	<b>BUILDING J: REPLACEMENT OF ALL AHUs</b> Replace all AHUs in Building J. The scope of the project includes: <ul style="list-style-type: none"> <li>• Demolition of 3 AHUs, controls, and associated chilled water (CHW) and hot water (HW) piping in mechanical rooms</li> <li>• New indoor custom VAV 3–deck multi zone AHUs with return air fans installed in the existing mechanical rooms</li> <li>• New temperature controls for AHUs and their integration to AX Supervisor</li> <li>• New CHW and HW piping and accessories in mechanical rooms</li> </ul> <p>Cost of the air distribution system replacement is not included.</p>	\$750,000 Due to age replacement may be required prior to Building J renovation

### AIR HANDLING UNITS: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	8	<b>BUILDING B: REPLACEMENT OF AHU &amp; FCU</b> Replace AHU–B1 and FCU–1 in Building B. The scope of the project includes: <ul style="list-style-type: none"> <li>• Demolition of AHU–B1 and FCU–1, controls, and associated chilled water (CHW) and hot water (HW) piping in mechanical rooms</li> <li>• A new <u>outdoor</u> custom VAV AHU with a service vestibule and return air fan to serve office zones</li> <li>• New VAV air terminal boxes</li> <li>• New air distribution system</li> <li>• New temperature controls for VAV air terminal boxes, AHUs, and their integration to AX Supervisor</li> <li>• New CHW and HW piping and accessories</li> <li>• Modification the existing HX plant to accommodate new AHUs and reheat coils</li> </ul>	\$550,000 No later than FY22
2	9	<b>BUILDING C: REPLACEMENT OF ALL AHUs</b> Replace all air handling units (AHUs) in Building C. The scope of the project includes: <ul style="list-style-type: none"> <li>• Demolition of 2 AHUs, controls, and associated chilled water (CHW) and hot water (HW) piping in mechanical rooms</li> <li>• New indoor custom VAV 3–deck multizone AHUs with return air fans installed in the existing mechanical rooms</li> <li>• New temperature controls for AHUs and their integration to AX Supervisor</li> <li>• New CHW and HW piping and accessories in mechanical rooms</li> </ul> <p>Cost of the air distribution system replacement is not included.</p>	\$540,000 Concurrently with Building C renovation

### AIR HANDLING UNITS: IMPLEMENTATION MATRIX

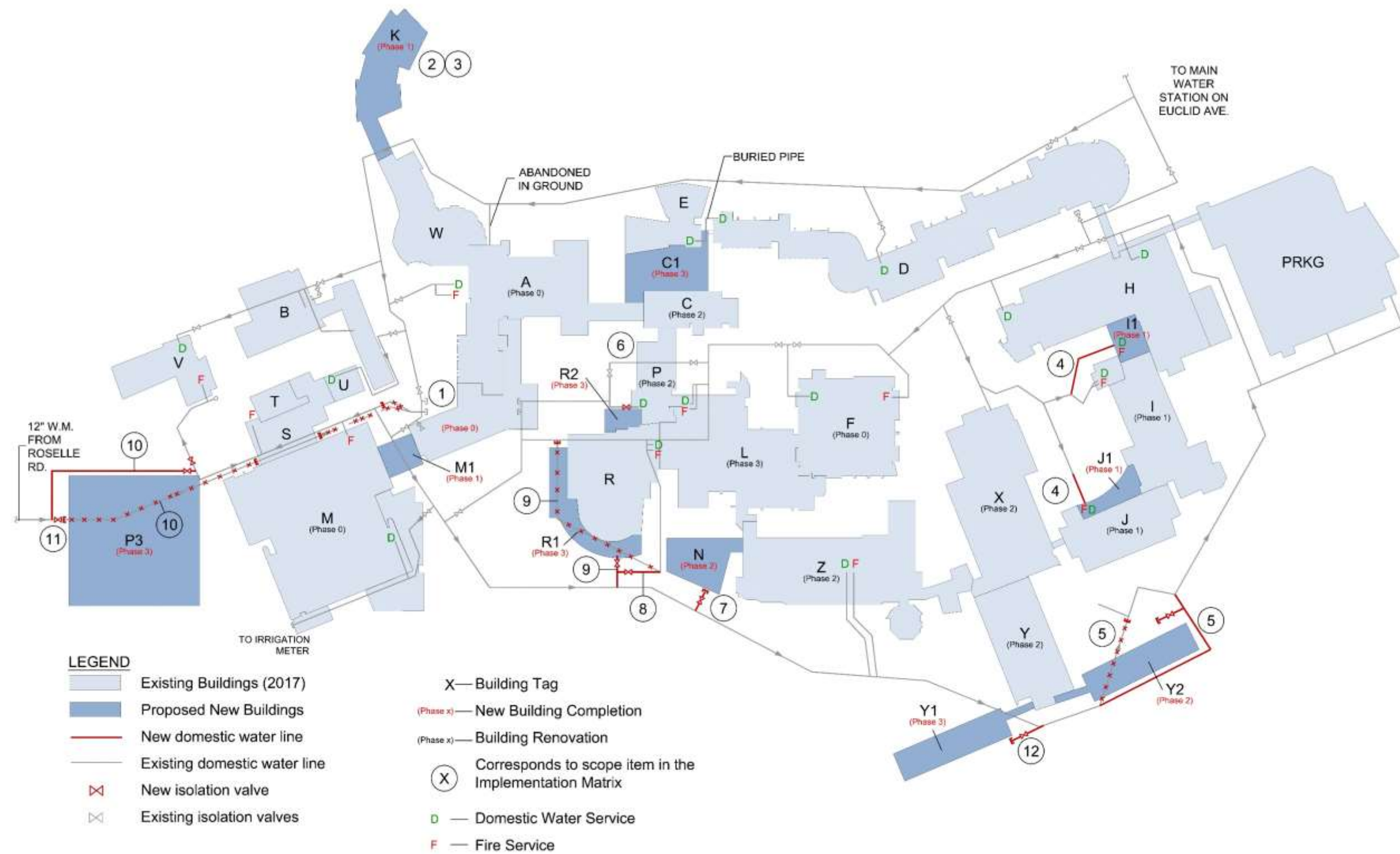
Phase	No	Project / Scope	Budget
	10	<b>BUILDING P: REPLACEMENT OF ALL AHUs</b> Replace all AHUs in Building P. The scope of the project includes: <ul style="list-style-type: none"> <li>• Demolition of 3 AHUs, controls, and associated chilled water (CHW) and hot water (HW) piping in mechanical rooms</li> <li>• New indoor custom VAV 3–deck multi zone AHUs with return air fans installed in the existing mechanical rooms</li> <li>• New temperature controls for AHUs and their integration to AX Supervisor</li> <li>• New CHW and HW piping and accessories in mechanical rooms</li> </ul> Cost of the air distribution system replacement is not included.	\$570,000 Concurrently with Building P renovation
	11	<b>BUILDING B: REPLACEMENT OF MAKE–UP AIR UNIT</b> <ul style="list-style-type: none"> <li>• Replace the boiler room make–up air unit CAU-1. The scope of the project includes:</li> <li>• Demolition of the existing 100% make–up air unit with steam coil, and associated steam and condensate piping</li> <li>• A new indoor gas fired 100% OA unit</li> <li>• New temperature controls and their integration to AX Supervisor</li> <li>• Natural gas piping for the new AHU</li> </ul>	\$150,000
	12	<b>BUILDING B: UPGRADE RTU–1 WITH VFD</b> Upgrade supply fan on the boiler room make–up air unit RTU–1 with variable frequency drive (VFD). Upgrade unit’s controls and interlock with boilers’ status.	\$30,000

**DOMESTIC WATER: IMPLEMENTATION MATRIX**

<b>Phase</b>	<b>No</b>	<b>Project / Scope</b>	<b>Budget</b>
<b>0</b>	<b>1</b>	<b>NEW 12" WATER MAIN BYPASS AT BUILDING A2</b> a. A new 12" water main bypass is required for new Building A2. The existing mains are routed in location where new Building A2 is to be located. Provide new water service valve stub.  b. Demolish two 12" existing water mains and cap in order to remove mains from area of proposed Building A2.	Budgeted/ In progress \$300,000
<b>1</b>	<b>2</b>	<b>SITE CIVIL SURVEY FOR FUTURE BUILDING K (2022)</b> The existing campus water main loop does not extend to north of the retention pond and a new water main will be required to supply the new proposed buildings.	\$75,000
	<b>3</b>	<b>NEW WATER MAIN SERVICE INSTALLATION FOR FUTURE BUILDING K</b> New water main service required at north end of campus. Provide new water service to building K.	\$350,000
	<b>4</b>	<b>NEW WATER MAIN SERVICES- NEW BUILDINGS I.1 &amp; J.1</b> a. Building I.1; New 6" Combined Domestic/Fire Service. b. Building J.1; New 6" Combined Domestic/Fire Service.	\$260,000 Concurrently with Buildings I.1 and J.1
<b>2</b>	<b>5</b>	<b>NEW 12" WATER MAIN BYPASS AT BUILDINGS Y1 and Y2 (2019)</b> A new 12" water main bypass is required for new Buildings Y1 and Y2. The existing 12" main is routed where new Building Y2 is to be located.	\$500,000 Concurrently with Building Y2
	<b>6</b>	<b>WATER MAIN UPGRADES- EXISTING BUILDINGS</b> Building P; New 8" Combined domestic/ fire service valve.	\$150,000
	<b>7</b>	<b>WATER MAIN NEW SERVICES- NEW BUILDINGS</b> Building N; New 6" Combined domestic/ fire service.	\$150,000 Concurrently with Building N


# DOMESTIC WATER: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
3	8	<b>NEW 12" WATER MAIN BYPASS AT BUILDING R1</b> A new 12" water main bypass is required for new Building R1. The existing mains are routed in location where new Building R is to be located. Extend water from Building R to new building R.2.	\$520,000 Concurrently with Building R1
	9	<b>NEW WATER MAIN TO BUILDING R1</b> a. New water main service required for Building R1.  b. Demolish existing 12" water main in order to eliminate water main under Building R1.	a. \$150,000 Concurrently with Building R1  b. \$150,000 Concurrently with Building R1
	10	<b>NEW 12" WATER MAIN BYPASS AT BUILDING P.3</b> A new 12" water main bypass is required for new Building P.3. The existing mains are routed in location where new Building P.3 is to be located.	\$200,000 Concurrently with Parking P.3
	11	<b>WATER MAIN NEW SERVICES- NEW BUILDINGS</b> a. Parking P.3; new 6" fire service. b. Sprinkler coverage (assumed for the first floor only).	\$150,000 Concurrently with Parking P.3
	12	<b>WATER MAIN NEW SERVICES- NEW BUILDINGS</b> Building Y1; New 8" Combined domestic/ fire service.	\$150,000 Concurrently with Building Y1
	13	<b>ATHLETIC FACILITIES INFRASTRUCTURE IMPROVEMENTS</b> Combined domestic/ fire service to the new athletic facilities.	\$1,000,000




Campus Underground Water Main Implementation Plan

### FIRE PROTECTION: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
0	1	<b>FIRE PROTECTION UPGRADES- EXISTING BUILDINGS</b> Building A; New fire service from building W and sprinklers throughout.	Budgeted/ On hold \$550,000
	2	<b>FIRE PROTECTION NEW SERVICES- NEW BUILDINGS</b> Building A1; new 6" fire service and sprinkler coverage.	Budgeted/ On hold
	3	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building A2; new 6" fire service and sprinkler coverage.	Budgeted/ On hold
1	4	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building K; new 6" fire service and sprinkler coverage.	Cost included under building renovation  
	5	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building M1; new 6" fire service and sprinkler coverage.	
	6	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building I.1 & J.1; new sprinkler coverage.	
2	7	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building N; new 6" fire service and sprinkler coverage.	
	8	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building Y2; new 6" fire service and sprinkler coverage.	
	9	<b>FIRE PROTECTION UPGRADES- EXISTING BUILDINGS</b> Building P; new 6" fire service and sprinkler coverage.	
	10	<b>FIRE PROTECTION UPGRADES- EXISTING BUILDINGS</b> Building C; new 6" fire service and sprinkler coverage.	

### FIRE PROTECTION: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
3	11	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building C and CI; new 6" fire service and sprinkler coverage.	Cost included under building renovation 
	12	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building R1; new 6" fire service and sprinkler coverage.	
	13	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building R2; new 6" fire service and sprinkler coverage.	
	14	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> Building Y1; new 6" fire service and sprinkler coverage.	
	15	<b>FIRE PROTECTION UPGRADES- NEW BUILDINGS</b> a. Building P.3; new 6" fire service.  b. Sprinkler coverage (assumed for the first floor only).	



**SANITARY AND STORM SEWER MAINS: IMPLEMENTATION MATRIX**

<b>Phase</b>	<b>No</b>	<b>Project / Scope</b>	<b>Budget</b>
<b>0</b>	<b>1</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building A1; A new sanitary sewer main is required with connection to existing campus sanitary main.	Budgeted/ On hold
	<b>2</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building A2; A new sanitary sewer main is required with connection to existing campus sanitary main.	Budgeted/ On hold
	<b>3</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building A1; A new storm sewer main is required with connection to existing campus sanitary main.	Budgeted/ On hold
	<b>4</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building A2; A new storm sewer main is required with connection to existing campus sanitary main.	Budgeted/ On hold
<b>1</b>	<b>5</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building K; A new sanitary sewer main is required with connection to existing campus sanitary main.	\$350,000
	<b>6</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building K; A new storm sewer main is required with connection to existing campus sanitary main.	\$350,000
	<b>7</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building M1; A new sanitary sewer main is required with connection to existing campus sanitary main.	Cost included under building renovation
	<b>8</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building M1; A new storm sewer main is required with connection to existing campus sanitary main.	Cost included under building renovation
	<b>9</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building I.1 and J.1; A new sanitary sewer main is required with connection to existing campus sanitary main.	\$200,000

**SANITARY AND STORM SEWER MAINS: IMPLEMENTATION MATRIX**

<b>Phase</b>	<b>No</b>	<b>Project / Scope</b>	<b>Budget</b>
	<b>10</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building I.1 and J.1; A new storm sewer main is required with connection to existing campus sanitary main.	\$200,000
<b>2</b>	<b>11</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b> a. Building Y2; A new sanitary sewer main is required with connection to existing campus sanitary main. b. Re-routing campus main sanitary main.	\$250,000
	<b>12</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b> a. Building Y2; A new storm sewer main is required with connection to existing campus sanitary main. b. Re-routing campus main storm main.	\$250,000
	<b>13</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building N; A new sanitary sewer main is required with connection to existing campus sanitary main.	\$250,000
	<b>14</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b> Building N; A new storm sewer main is required with connection to existing campus sanitary main.	\$250,000
<b>3</b>	<b>15</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b> a. Building C and C1; A new sanitary sewer main is required with connection to existing campus sanitary main. b. Re-routing campus main sanitary mains.	\$150,000
	<b>16</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b> a. Building C and C1; A new storm sewer main is required with connection to existing campus sanitary main. b. Re-routing campus main storm mains.	\$150,000

**SANITARY AND STORM SEWER MAINS: IMPLEMENTATION MATRIX**

<b>Phase</b>	<b>No</b>	<b>Project / Scope</b>	<b>Budget</b>
	<b>17</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b>	
		a. Building R1 and R.2; A new sanitary sewer main is required with connection to existing campus sanitary main.	\$200,000
		b. Re-routing campus main sanitary main.	
	<b>18</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b>	\$200,000
		a. Building R1 and R.2; A new sanitary sewer main is required with connection to existing campus sanitary main.	
		b. Re-routing campus main sanitary main.	
	<b>19</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b>	\$250,000
		a. Building Y1; A new sanitary sewer main is required with connection to existing campus sanitary main.	
		b. Re-routing campus main sanitary main.	
	<b>20</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b>	\$250,000
		a. Building Y1; A new storm sewer main is required with connection to existing campus sanitary main.	
		b. Re-routing campus main storm main.	
	<b>21</b>	<b>SANITARY SEWER MAIN UPGRADES AND REPLACEMENTS</b>	\$150,000
		Building P.3; A new sanitary sewer main is required with connection to existing campus sanitary main.	
	<b>22</b>	<b>STORM SEWER MAIN UPGRADES AND REPLACEMENTS</b>	\$150,000
		Building P.3; A new storm sewer main is required with connection to existing campus sanitary main	
	<b>23</b>	<b>ATHLETIC FACILITIES INFRASTRUCTURE IMPROVEMENTS</b>	\$1,800,000
		Sanitary and storm sewer mains to the new athletic facilities.	

# **NATURAL GAS: IMPLEMENTATION MATRIX**

<b>Phase</b>	<b>No</b>	<b>Project / Scope</b>	<b>Budget</b>
<b>0</b>	<b>1</b>	<b>NATURAL GAS MAIN UPGRADES</b>	<b>\$75,000</b>
		a. New main gas valve at main campus service line.	
<b>2</b>	<b>2</b>	<b>NATURAL GAS PIPE REPLACEMENT</b>	<b>\$30,000</b>
		Re-routing of existing with new 2" natural gas service line to building N.	

### NORMAL AND EMERGENCY POWER SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
0	1	<b>BUILDING A: SWITCHBOARD MSB-A REPLACEMENT</b> The main switchboard MSB-A is 43 years old and at the end of its useful life. There is also evidence of water damage and should be replaced.	Budgeted/ On hold \$180,000 No later than FY20
	2	<b>BUILDING A: PANEL REPLACEMENTS</b> Panels that are original to the building are at the end of their useful life and some show evidence of water damage. These panels should be replaced.	Budgeted/ On hold \$40,000 No later than FY20
	3	<b>BUILDING A: MOTOR CONTROL CENTER MCC-A REPLACEMENT</b> Motor Control Center MCC-A is original to the building and at the end of its useful life. There is evidence of water damage and should be replaced.	Budgeted/ On hold \$200,000 No later than FY20
	4	<b>BUILDING A: NEW EMERGENCY GENERATOR</b> Provide new 1000 kW Generator A and new automatic transfer switch and distribution equipment for all building served.	\$1,500,000 No later than FY20
	5	<b>BUILDING F: SWITCHBOARD MSB-F REPLACEMENT</b> Main switchboard MSB-F is original to the building and at the end of its useful life. The existing installation does not meet working clearance requirements outlined in the National Electrical Code. This switchboard should be replaced and code deficiencies should be remedied during this time.	Budgeted/ In construction
	6	<b>BUILDING F: PANEL REPLACEMENTS</b> Panels that are original to the building are at the end of their useful life and should be replaced.	Budgeted/ In construction
	7	<b>BUILDING F: MOTOR CONTROL CENTER MCC-F REPLACEMENT</b> Motor Control Center MCC-F is original to the building and at the end of its useful life. This motor control center should be replaced.	Budgeted/ In construction

### NORMAL AND EMERGENCY POWER SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	8	<b>BUILDING F: NEW EMERGENCY GENERATOR</b> Provide new 250 kW Generator F and new automatic transfer switch and distribution equipment.	\$240,000 No later than FY18
	9	<b>BUILDING M: SWITCHBOARD MSB-M REPLACEMENT</b> Main switchboard MSB-M is 35 years old and will be at the end of its useful life by 2016. There is currently no main disconnect switch and 10 feeder disconnect switches on the main bus. The existing installation does not meet working clearance requirements outlined in the National Electrical Code. This switchboard should be replaced and code deficiencies should be remedied during this time.	Budgeted/ In construction
	10	<b>BUILDING M: PANEL REPLACEMENTS</b> Panels that are original to the building will be at the end of their useful life by 2016 and should be replaced. Some existing panel and transformer installation locations do not meet working clearance requirements outlined in the National Electrical Code. Code deficiencies should be remedied during this time.	Budgeted/ In construction
	11	<b>BUILDING M: ELECTRICAL SERVICE EVALUATION</b> Evaluate existing Building M transformer to determine if it can accommodate the new Building M1 load.	Budgeted/ In construction
	12	<b>BUILDING B: MOTOR CONTROL CENTER MCC-1 REPLACEMENT</b> Motor Control Center MCC-1 is 46 years old and at the end of its useful life. This motor control center should be replaced.	\$235,000 No later than FY20
	13	<b>BUILDING B: PANEL REPLACEMENTS</b> Panels that are original to the building will be at the end of their useful life by 2020 and should be replaced. Some existing panel and transformer installation locations do not meet working clearance requirements outlined in the National Electrical Code. Code deficiencies should be remedied during this time.	\$50,000 No later than FY20
1	14	<b>BUILDING K: NEW ELECTRICAL SERVICE</b> A new electrical service will be incorporated in the design budget.	\$400,000 Concurrently with Building K

### NORMAL AND EMERGENCY POWER SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	15	<b>BUILDING K: RELOCATED EMERGENCY GENERATOR</b> Relocate existing 175 kW Data Center Generator. Provide new automatic transfer switch and distribution equipment. Demolish old Data Center automatic transfer switch and distribution equipment.	\$1,200,000 Concurrently with Building K
	16	<b>BUILDING B: NEW EMERGENCY GENERATOR</b> Demolish existing Generator B and associated transfer switch and distribution equipment. Provide new 750 kW Generator B and new automatic transfer switch and distribution equipment for all buildings being served.	\$1,800,000 No later than FY23
	17	<b>BUILDING I: SWITCHBOARD MSB-I1 REPLACEMENT</b> Main switchboard MSB-I1 is original to the building and will be at the end of its useful life by 2020. This switchboard should be replaced.	\$235,000 Concurrently with Building I renovation
	18	<b>BUILDING I: SWITCHBOARD MSB-I2 REPLACEMENT</b> Switchboard MSB-I2 is original to the building and will be at the end of its useful life by 2020. This switchboard should be replaced.	\$235,000 Concurrently with Building I renovation
	19	<b>BUILDING I: MOTOR CONTROL CENTER I-MCC REPLACEMENT</b> Motor Control Center I-MCC is original to the building and will be at the end of its useful life by 2020. This motor control center should be replaced.	\$235,000 Concurrently with Building I renovation
	20	<b>BUILDING I: PANEL REPLACEMENTS</b> Panels that are original to the building will be at the end of their useful life by 2020 and should be replaced.	\$95,000 Concurrently with Building I renovation Replace if building is not renovated
	21	<b>BUILDING I: ELECTRICAL SERVICE EVALUATION</b> Evaluate existing Building I transformer to determine if it can accommodate the new Building J1 load.	\$9,000

### NORMAL AND EMERGENCY POWER SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	22	<b>BUILDING J: PANEL REPLACEMENTS</b> Panels that are original to the building will be at the end of their useful life by 2020 and should be replaced. It is recommended that panels presently installed in salt storage areas be relocated to a more non-corrosive environment during renovation.	\$50,000 Concurrently with Building J renovation Replace if building is not renovated
	23	<b>INTEGRATE I AND J TO EXISTING EMERGENCY GENERATOR H</b> New automatic transfer switch and distribution equipment to integrate Building I and J to existing generator H.	\$100,000 Concurrently with Buildings I and J renovation
	24	<b>BUILDING S: SWITCHBOARD MSB-S EVALUATION</b> Switchboard MSB-S is 22 years old and should still be in good condition by 2020 with annual preventative maintenance. Complete replacement is not warranted as of this writing but an evaluation of the existing switchboard should be done during renovation.	\$10,000
	25	<b>BUILDING T: PANEL U-3 EVALUATION</b> Panel U-3 is less than 20 years old and should still be in good condition by 2020 with annual preventative maintenance. Complete replacement is not warranted as of this writing but an evaluation of the existing switchboard should be done during renovation.	\$6,000
	26	<b>BUILDING U: PANEL REPLACEMENT</b> Panel DP-U is original to the building will be at the end of its useful life by 2020 and should be replaced.	\$15,000
	27	<b>BUILDING W: ELECTRICAL SERVICE EVALUATION</b> The electrical distribution system is 13 years old and should still be in good condition by 2020 with annual preventative maintenance. Complete replacement is not warranted as of this writing but an evaluation of the existing system should be done during renovation.	\$10,000
2	28	<b>BUILDING P: PANEL REPLACEMENTS</b> Panels that are original to the building will be at the end of their useful life by 2024 and should be replaced. Panels replaced in 2012 or later should be thermal scanned and defective parts replaced.	\$26,000



### NORMAL AND EMERGENCY POWER SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	29	<b>BUILDING P: ELECTRICAL SERVICE EVALUATION</b> Evaluate existing Building P transformer to determine if it can accommodate the new Building N load.	\$9,000
	30	<b>BUILDING C: PANEL REPLACEMENTS</b> Panels that are original to the building will be at the end of their useful life by 2024 and should be replaced.	\$50,000
	31	<b>BUILDING XYZ (AVANTE): ELECTRICAL SERVICE EVALUATION</b> The electrical distribution system is 11 years old and should still be in good condition by 2024 with annual preventative maintenance. Complete replacement is not warranted as of this writing but an evaluation of the existing system should be done during renovation.	\$10,000
	32	<b>BUILDING XYZ (AVANTE): ELECTRICAL SERVICE EVALUATION</b> Evaluate existing Building X transformer to determine if it can accommodate the new Building Y1 and Y2 loads.	\$10,000
	33	<b>BUILDING LCC: SWITCHBOARD SES REPLACEMENT</b> Main switchboard SES is original to the building and will be at the end of its useful life by 2024. It has also been reported the existing switchboard is not adequately sized to run both chillers. This switchboard should be replaced and the capacity should be evaluated during design.	\$290,000
	34	<b>BUILDING LCC: PANEL CBP-1 EVALUATION</b> Panel CBP-1 is less than 20 years old and should still be in good condition by 2024 with annual preventative maintenance. Complete replacement is not warranted as of this writing but an evaluation of the existing switchboard should be done during renovation.	\$6,000
	35	<b>BUILDING HPC: ELECTRICAL SERVICE EVALUATION</b> The electrical distribution system is 10 years old and should still be in good condition by 2024 with annual preventative maintenance. Complete replacement is not warranted as of this writing but an evaluation of the existing system should be done during renovation.	\$10,000

### NORMAL AND EMERGENCY POWER SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
	36	<b>BUILDING HPC: ELECTRICAL METER PANEL REPLACEMENT</b> Meter Panels MBI-W and MBI-E appear to be original to the building and at the end of their useful life. Replacing these meter cabinets during renovation is recommended.	\$35,000
3	37	<b>BUILDING R: ELECTRICAL SERVICE EVALUATION</b> The electrical distribution system is 13 years old and should still be in good condition by 2029 with annual preventative maintenance. Complete replacement is not warranted as of this writing but an evaluation of the existing system should be done during renovation.	\$9,000
	38	<b>BUILDING R: ELECTRICAL SERVICE EVALUATION</b> Evaluate existing Building R transformer to determine if it can accommodate the new Building R1 load.	\$9,000
	39	<b>BUILDING C1: NEW ELECTRICAL SERVICE</b> New Building C1 should be served by the existing electrical service in building A. The existing transformer for Building A should be evaluated at the time of design to determine if it can accommodate the new Building C1 load.	\$9,000
	40	<b>BUILDING L: ELECTRICAL SERVICE EVALUATION</b> The electrical distribution system is 21 years old and should still be in fair condition by 2029 with annual preventative maintenance. Complete replacement is not warranted as of this writing but an evaluation of the existing system should be done during renovation.	\$10,000
	41	<b>BUILDING L: ELECTRICAL ROOM UPGRADE</b> This electrical room is not properly fire rated. Fire stopping material should be installed at all penetration points during renovation.	\$6,000
	42	<b>BUILDING XYZ (AVANTE): NEW EMERGENCY GENERATOR</b> Demolish existing Generator Z, Generator Y, and associated transfer switch and distribution equipment. Provide new 1000 kW Generator Z1 and new automatic transfer switch and distribution equipment.	\$2,200,000 Concurrently with Avante renovation
	43	<b>ATHLETIC FACILITIES INFRASTRUCTURE IMPROVEMENTS</b> Normal power service to the new athletic facilities. Emergency power service for the new athletic facilities.	\$1,000,000



**TELECOMMUNICATION SYSTEM: IMPLEMENTATION MATRIX**

Phase	No	Project / Scope	Budget
0	1	<b>ELIMINATION OF MAIN TELE/COM ROOM #D132d</b> The existing tele/com room is being eliminated when the remodeling is occurring in Building D. This is a main hub for the campus tele/com system. All fiber optic connections will have to be replaced and rerouted to either Building A or Building Y, before the room can be taken out of service. <ul style="list-style-type: none"> <li>a. Provide (36) multi-mode fiber and (72) single mode fibers from closet M238 to closet A102.</li> <li>b. Provide (12) multi-mode fiber and (24) single mode fibers from closet D132 to closet A102.</li> <li>c. Provide (12) multi-mode fiber and (24) single mode fibers from closet D132 to closet Y211.</li> </ul>	Budgeted/ In construction
	2	<b>NEW CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new building Y1 to closet Y211.	Budgeted/ In construction
	3	<b>CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (24) multi-mode fiber and (48) single mode fibers from new closet A2 to closet A102d.	Budgeted/ On hold \$180,000
	4	<b>CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new closet M1 to closet M238.	Budgeted/ In construction
1	5	<b>ELIMINATION OF MAIN TELE/COM ROOM #D132d</b> The existing tele/com room is being eliminated when the remodeling is occurring in Building D. This is a main hub for the campus tele/com system. All fiber optic connections will have to be replaced and rerouted to either Building A or Building Y, before the room can be taken out of service. <ul style="list-style-type: none"> <li>a. Provide (48) multi-mode fiber and (96) single mode fibers from closet I205a to closet Y211.</li> <li>b. Provide (48) multi-mode fiber and (96) single mode fibers from closet J245b to closet Y211.</li> </ul>	a. \$202,000  b. \$146,000

**TELECOMMUNICATION SYSTEM: IMPLEMENTATION MATRIX**

Phase	No	Project / Scope	Budget
	<b>6</b>	<b>ELIMINATION OF MAIN TELE/COM ROOM #D132d</b> The existing tele/com room is being eliminated when the remodeling is occurring in Building D. All abandoned communications cabling must be removed. This can occur only after the new cabling installed is operational.	
	a.	Remove all abandoned cabling from A102 closet to M238closet.	a. \$5,000
	b.	Remove all abandoned cabling from A102 closet to D132d closet.	b. \$20,000
	c.	Remove all abandoned cabling from parking Lot Connections to D132d closet.	c. \$6,000
	d.	Remove all abandoned cabling from H128d closet to D132d closet.	d. \$7,000
	e.	Remove all abandoned cabling from I205a closet to D132d closet.	e. \$10,000
	f.	Remove all abandoned cabling from F258 closet to D132d closet.	f. \$6,000
	g.	Remove all abandoned cabling from H128d closet to Y211 closet.	g. \$24,000
	h.	Remove all abandoned cabling from I205a closet to Y211 closet.	h. \$20,000
	i.	Remove all abandoned cabling from J245b closet to Y211 closet.	i. \$13,000
	j.	Remove all abandoned cabling from F245 closet to Y211 closet.	j. \$20,000
	k.	Remove all abandoned cabling from D132d closet to Y211 closet.	k. \$20,000
	<b>7</b>	<b>CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new closet J1 to closet J245b.	\$44,000

**TELECOMMUNICATION SYSTEM: IMPLEMENTATION MATRIX**

<b>Phase</b>	<b>No</b>	<b>Project / Scope</b>	<b>Budget</b>
	<b>8</b>	<b>NEW CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (24) multi-mode fiber and (48) single mode fibers from new building K to closet A102.	\$142,000
	<b>9</b>	<b>NEW CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (24) multi-mode fiber and (48) single mode fibers from new building K to closet Y211.	\$145,000
<b>2</b>	<b>10</b>	<b>NEW CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new building C1 to closet A238.	\$61,000
	<b>11</b>	<b>NEW CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new building Y2 to closet Y211.	\$44,000
<b>3</b>	<b>12</b>	<b>CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new closet R1 to closet R127.	\$44,000
	<b>13</b>	<b>NEW CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new Building P3 to closet M238.	\$71,000
	<b>14</b>	<b>NEW CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new building Y1 to closet Y211.	\$44,000
	<b>15</b>	<b>NEW CONNECTIONS TO NEW BUILDING</b> All new buildings and additions will require new fiber optic connections. Provide (12) multi-mode fiber and (24) single mode fibers from new building U to closet A102.	\$64,000

### TELECOMMUNICATION SYSTEM: IMPLEMENTATION MATRIX

Phase	No	Project / Scope	Budget
		<i>Note: New Tele/Com installation costs are based upon furnishing and installing all new fiber optic cables in plenum rated innerduct for all interior installations and communications type 4" PVC conduits for all exterior installations. Installation costs also include new communication racks, terminal panels, patch panels, and fiber terminations.</i>	

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