Utility Infrastructure Master Plan
Crafton Hills College

P2S Project #0191

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P2S ENG

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Table of Contents

CHAPTER 1

Executive Summary

BACKGROUND AND SCOPE

Crafton Hills College is a community college in Yucaipa, California. It opened in 1972 and much of the college is built on land that Ruben and Lester Finkelstein donated through their foundation The Finkelstein Foundations. The original donation included 167 acres of land in 1966 with 76 more acres in 1970 and finally donating 251 acres of additional land. Crafton Hills College now serves approximately 6,200 students each semester with both evening and night classes. Crafton Hills offers 37-degree programs and 35 occupational certificate plans.

Crafton has a two-year Respiratory Care program, leading up to an RRT, a Radiology program operated cooperatively by Crafton and Arrowhead Regional Medical Center and is also the site of a California State Fire Training Academy.

The Crafton Hills College paramedic program is accredited by the Commission on Accreditation of Allied Health Education Programs upon the recommendation of the Committee on Accreditation of Educational Programs for the Emergency Medical Services Professions (CoAEMSP).

The proposed campus master plan adds approximately 65,000 square feet of space to the campus inventory excluding parking structures. A campus map showing the proposed near-term facilities that are being added at the campus is provided at the end of the chapter. The map also indicates buildings that are being replaced under the proposed plan.

Snipes Dye and P2S Inc. were contracted by the District to provide an aerial map and a topographical map of the campus and map and evaluate the existing utilities currently serving the campus. The scope also includes providing specific recommendations to alter/upgrade/ modify the existing utility infrastructure to support the facilities proposed as part of the near-term development and provide an updated utility master plan for the campus.

The utilities within the campus boundaries comprise of domestic and fire water, sewer, storm drain, irrigation water, chilled and hot water distribution, gas, electrical and telecommunications systems, and are all owned and operated by the campus. Southern California Gas Company and Southern California Edison Company provide gas and power to the campus respectively. AT&T is the local exchange carrier (LEC) for the telecommunication services.

The College has its own electrical distribution system which receives 4.16kV service from Southern California Edison and purchases its electric supply directly from SCE.

The College also has a central heating and cooling plant that provides heating and cooling to majority of the buildings on campus.

The campus has a combined electric and gas expenditures of nearly $500K. The University's total energy consumption is approximately 6,962,786kwh with a total energy usage of 86,000BTU's per sqft each year.

The total domestic water and sewer costs at the University total to about $ 180,616 per year.

OBJECTIVE

The objective of this utility master plan study is to evaluate the existing utilities currently serving the existing Campus and provide cost-effective and specific recommendations to alter/upgrade/modify the existing utility infrastructure to support new buildings, major renovations, and building replacements that form part of the proposed near-term development plan.

METHODOLOGY

The following methodology was adopted in formulating our utility infrastructure master plan.

- A critical aspect in the evaluation of the existing utility systems serving a facility is a detailed and accurate field investigation of the current systems. A detailed survey of the existing utility systems that currently serve the facilities at the campus was undertaken, and existing conditions, together with potential problems, were identified. The surveyed information was verified through available record drawings and meetings with the campus facilities staff.
- Each utility system was then evaluated for capacity, functionality, reliability, ease of maintenance, age, and its ability to serve the present and future needs of the campus.
- Alterations/upgrade/modifications necessary to support new buildings, major renovations, and building replacements that form part of the proposed near-term development plan were identified.
- Costs associated with each of the required utility upgrades were then developed based on our recommendations.

REPORT OVERVIEW

Our following Utility Infrastructure Master Plan update report provides maps of existing utilities, an analysis of the existing utilities currently serving the facilities, identifies alterations/upgrade/ modifications necessary to support new buildings, major renovations, and building replacements that form part of the proposed near term development plan and outlines recommended solutions and costs to implement the same. The utility systems that were evaluated and included in our report are: Domestic and Fire Water System, Sewer System, Storm Drain System, Irrigation Water, Natural Gas System, Chilled and Heating Hot Water Systems, Electrical Systems and Telecommunication Systems.

SUMMARY OF OUR ANALYSIS AND RECOMMENDATIONS

The following spreadsheet summarizes our analysis and our recommended solutions for each of the existing utility systems to support the near-term development. Estimated cost to upgrade each of these systems to support the near term development is also included following our recommendations.

EXISTING CAMPUS MAP

PROPOSED MASTER PLAN

FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
EIB	EAST INSTRUCTIONAL BUILDING
EVPSTC	EAST VALLEY PUBLIC SAFELY TRAINING CENTER
GYM	GYMNASIUM
IB	INSTRUCTIONAL BUILDING
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
M&O ADD	MAINTENANCE AND OPERATIONS ADDITION
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

BUILDING LEGEND

- EXISTING BUILDING
- UNDER CONSTRUCTION
- FUTURE BUILDING
- BUILDING RENOVATION/EXPANSION

NORTH

0 300'

SUMMARY OF COSTS

Priority 1	Critical - Need replacement in 0-3years	Priority 3	Fair Condition - Need Replacement in Next 5-10 years	Priority 5	New Building Impact - Based on project schedule
Priority 2	Moderately Critical - Need replacement in 3-5 years	Priority 4	Adds Value and Redundancy 5-10 years or as funding is available		

Utility	Description of Project	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5
Electrical						
1	Provision of new LED Lighting and Controls	$910,000				
2	Replacement of MV Cables		$585,000			
3	Replacement of MV Manholes		$1,500,000			
4	Replacement of Existing Meters		780,000			
5	Provision of new selector switches to offer primary selective system and duct banks				$2,600,000	
Civil						
1	Irrigation Backflow Replacements	$130,000				
2	Irrigation Control Replacements	$650,000				
3	Irrigation Sub Metering	$195,000				
4	Storm Drain Cleaning				$65,000	
5	Bio Swale Maintenance				$65,000	
6	BL 19 - Underground Storm water receptor				$65,000	
Natural Gas						
1	Replacement of Steel Gas Lines		$1,235,000			
2	Installation of Gas Submeters				$45,500	
Mechanical						
1	Central Plant Chiller 3 CH- 3 Replacement	$585,000				
2	Central Plant Controls Replacement	$585,000				
3	Central Plant Cooling Towers Rehabilitation		$585,000			
4	Central Plant Boiler and pump replacement		$390,000			
5	Central Plant Chillers (CH-1, 2and 4) Replacement		$1,380,600			
Telecom						
1	Provision of new duct banks and media to new buildings					$260,000
Total Costs		**$3,055,000**	**$6,455,600**		**$2,840,500**	**$260,000**

Project Categories

DM Deferred maintanance: systems or facilities that have not been maintained due to lack of staffing or funding. While operational, failure is imminent.

EM Emergency projects are systems or facilities that have failed or do not function as designed. Repair or replacement is required.

UF Projects or intiatives that would improve systems, facilities or operations on campus.

REG Projects related to Fire, Life, Safety; Code or OSHA compliance. Risk of harm and potential for fines or shutdown directives from regulating authorities.

NC New construction to support proposed buildings

[1]Refer to Appendix for breakdown of costs.

CHAPTER 2
Cooling and Heating Systems

CHILLED WATER SYSTEM

SYSTEM DESCRIPTION

The cooling needs of majority of the facilities at the campus are met by a central plant located with in Building '10' Central Complex 1 in the center of the campus. A few of the facilities are served by dedicated package systems. Table 1 provides a list of campus facilities connected to the central plant and facilities having dedicated package systems.

METHODOLOGY

The following methodology was adopted in formulatingour mechanical utility infrastructure master plan. The methodology presented below outlines the critical tasks that were performed in development of this master plan report.

- A critical aspect in the evaluation of the existing mechanical systems serving a facility is a detailed andaccurate feld investigation of the current system(s). A detailed survey of the existing mechanical system that currently serves the facilities at the campus was undertaken, and existing conditions, together with potential problems, were identifed. The surveyed information was verifed through available record drawings and meetings with the campus facilities staff.
- A load study of the existing and future facilties loads was developed and existing and proposed capacity requirements were developed. A sq. ft./Ton of proposed facilities was assumed in our load studies. For all existing buildings, existing installed capacities were taken to estimate the total loads.
- Options for meeting cooling and heating needs of existing and proposed facilities were evaluated to support newbuildings, major renovations, and building retrofts thatform part of the proposed campus facilities master plan
- Recommendations were then developed based on functionality, reliability, ease of maintenance, and its ability to serve the present and future needs of the campus
- Costs associated with each of the options were developed and the most cost-effective solution was recommended

TABLE 1 - CAMPUS BUILDING LIST

Building No.	Building Name	Cooling & Heating
1	Maintenance & Operations	DX/Gas
2	Child Development Center	DX/Gas
3	Crafton Hall	CHW/HHW (CP)
4	Clock Tower Building	CHW/HHW (CP)
5	West Complex	CHW/HHW (CP)
6	Crafton Center	CHW/HHW (CP)
7	Student Support Building	CHW/HHW (CP)
8	Learning Resource Center	CHW/HHW (CP)
9	Performing Arts Center	CHW/HHW (CP)
10	Central Complex 1	CHW/HHW (CP)
11	Central Complex 2	CHW/HHW (CP)
12	Canyon Hall	CHW/HHW (CP)
13	Visual Arts	CHW/HHW (CP)
14	East Complex 1	DX/Gas
15	East Complex 2	DX/Gas
16	Public Safety & Allied Health	CHW/HHW (CP)
17	Gymnasium	Decommissioned
18	North Complex	DX/Gas
19	Kinesiology, Health Ed & Aquatics	DX/Gas

The following sections provide a description of the central plant system and individual mechanical systems currently serving each of the facilities at the campus.

Central Cooling Plant at Central Complex 1

The central cooling plant consists of four (4) water cooled chillers. Of those, three (3) are centrifugal chillers with VFDs rated at 250 tons. The fourth is a rotary screw chiller rated at 90 tons. The water-cooled chillers are presently in good serviceable condition. CH-1, -2 and -4 are nearing the end of their useful life and should be considered for replacement over the next 5-10 years.CH-3 will require a rebuild over the next 0-2 years. The Central Plant is pumped primary-secondary with dedicated primary pumps for each of the four chillers. All of the chilled water primary and secondary pumps are on VFDs. The central plant also contains three (3) forced drafted cooling towers, which are presently in serviceable condition. CT-1 and CT-2 have galvanized basins and will need replacement within the next 0-5 years. CT-3 has stainless steel basins and is in good working condition. Condenser water pumps sit outside in the cooling tower yard. Condenser water pumps are constant speed. A side stream centrifugal separator also serves the condenser water system and is housed in the cooling tower yard. See Table 2 for a breakdown of the chillers, Table 3 for a breakdown of the pumps and Table 4 for a breakdown of the cooling towers. The control system at the central plant is of Siemens make and is old and needs to be upgraded.

CHW Distribution

This central plant serves the cooling needs of majority of facilities on campus. A set of 8" Chilled Water Supply and Return (CHWS&R) pipes originate from the south side of the central plant to serve Building 10 – Central Complex 1 and Building 11 – Central Complex 2. On the north side, 14" CHWS&R pipes split off in two directions to serve the rest of the campus.

The 14" CHWS&R mains continue west to serve the following buildings:

- Building 3 – Crafton Hall
- Building 4 – Clock Tower Building
- Building 5 – West Complex
- Building 6 – Crafton Center
- Building 7 – Student Support Building
- Building 8 – Learning Resource Center
- Building 9 – Performing Arts Center

On the north side of the central plant, a 8" CHWS&R branch heads towards the east side of campus to serve the following buildings:

- Building 12 – Canyon Hall
- Building 13 – Visual Arts
- Building 16 – Public Safety & Allied Health

The rest of the campus is not connected to the Central Plant and is cooled and heated with DX air conditioning and gas heating equipment. Refer to Table 1 for a campus building list and associated source of cooling and heating systems.

An exhibit of the existing chilled water distribution is provided at the end of the section for reference.

TABLE 2 - CHILLERS IN CENTRAL PLANT

Chiller Tag	Manufacturer	Type	Rated Tonnage	LWT (°F)	EWT (°F)	Year Installed	Age (Years)
CH-1	Trane	Centrifugal	250	42	55	1999	21
CH-2	Trane	Centrifugal	250	42	55	1999	21
CH-3	Trane	Centrifugal	250	42	55	2008	10
CH-4	Trane	Rotary Screw	90	-	-	-	19 - 24

TABLE 3 - CHW AND CW PUMPS IN CENTRAL PLANT

Pump Tag	Manufacturer	Service	Flow (GPM)	Head (FT)
CHWP-1	Armstrong	Primary	400	25
CHWP-2	Armstrong	Primary	400	25
CHWP-3	Bell & Gossett	Primary	430	70
CHWP-4	Bell & Gossett	Secondary	1230	200
CHWP-5	Armstrong	Secondary	665	200
CHWP-6	Armstrong	Secondary	540	200
CWP-1	Weinman	CT-1	520	45
CWP-2	Weinman	CT-2	520	45
CWP-3	Bell & Gossett	CT-3	500	80

TABLE 4 - COOLING TOWERS IN CENTRAL PLANT

Chiller Tag	Manufacturer	Rated Tonnage	LWT (°F)	EWT (°F)	Year Installed	Age (Years)
CT-1	BAC	250	42	55	1999	21
CT-2	BAC	250	42	55	1999	21
CT-3	BAC	250	42	55	2008	10

Chillers at Central Plant

Cooling Towers and CW Pumps at Central Plant

BUILDING 3 – CRAFTON HALL

Crafton Hall was originally constructed in 1970 and houses one (1) mechanical equipment room. There is one (1) large capacity multi-zone air handling unit serving the building which is original to the building and is approximately 50 years old.

According to ASHRAE, typical service life of this air handling units is in the range of 20-25 years. The equipment has well exceeded ASHRAE published life expectancy. These systems have also undergone an energy savings retrofit and DDC conversion through the addition of fan VFDs, motorized control dampers, valves etc. The building has an Onicon BTU meter at the HHW entrance measuring HHW building BTU consumption.

Multi-Zone unit at Crafton Hall

BUILDING 4 – CLOCK TOWER BUILDING

The Clock Tower Building was constructed in 1970 and houses two (2) mechanical equipment rooms. The building previously contained a small central plant in the basement which has been removed. There are two (2) Energy Labs variable speed air handling units with VAV reheat serving the building – located on the west end and the upper level of the south leg of the building. These air handling units contain both CHW and HHW coils. These air handling units were installed in 2017 during a renovation project to replace the original units and are approximately 2 years old. The air handling units are in good serviceable condition and need no replacement. The building has an Onicon BTU meter at the HHW entrance measuring HHW building BTU consumption.

AHU at Clock Tower Building

CHWS&R and HHWS&R lines at Clock Tower Building

BUILDING 5 – WEST COMPLEX

The West Complex building was originally constructed in 1970 and houses one (1) mechanical equipment room. There is one (1) large capacity multi-zone air handling unit serving the building which is original to the building and is approximately 50 years old.

According to ASHRAE, typical service life of this air handling units is in the range of 20-25 years. The equipment has well exceeded ASHRAE published life expectancy. These systems have also undergone an energy savings retrofit and DDC conversion through the addition of fan VFDs, motorized control dampers, valves etc.

Zone damper actuators on Multi-Zone at West Complex building

CHWS&R and HHWS&R lines at West Complex Building

BUILDING 6 – CRAFTON CENTER

Crafton Center was constructed in 2016. There are four (4) Energy Labs variable speed air handling units with VAV reheat serving the building – two (2) located on the west side low roof, and two (2) located on the east side high roof. These air handling units contain both CHW and HHW coils. Each unit has one supply fan and one return fan. The air handling units are in good serviceable condition and need no replacement. The building also has three Greenheck exhaust fans serving restrooms, food prep/grocery and janitor's closets on the roof. The two Telecom rooms are served by dedicated Carrier split systems with wall mounted fan coil units and roof mounted condensing units.

Air handling unit on Crafton Center roof

CHWS&R and HHWS&R connections to AHU at Crafton Center

BUILDING 7 – STUDENT SUPPORT BUILDING

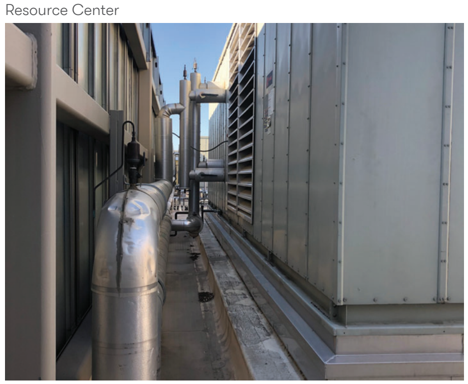
The Student Support Building was constructed in 1975 and houses five (5) 4-pipe fan-coil units. These fan-coil units were installed in 1998 and are approximately 22 years old. The cooling coils are designed for a 13 degree delta T (42F/55) and the heating coils are designed for a 40 degree delta T (160F/200F). According to ASHRAE, typical service life of these fan-coil units is 20 years. The equipment has gone past the ASHRAE published life expectancy and should be considered for replacement over the next 5-10 years. Two of the fan coils serve multiple rooms in different thermal zones and have downstream reheat coils serving the dissimilar rooms. The building also has five roof mounted exhaust fans serving restrooms and general ventilation exhaust for each floor.

CHW and HHW Valves

BUILDING 8 – LEARNING RESOURCE CENTER

The Learning Resource Center was constructed in 2009 and houses two (2) Trane air handling units on the roof. The air handling units contain cooling coils only. The coils are designed for a 14 degree delta T (42F/56F). The system employs VAV terminal air units with reheat coils for zone temperature control. This system is in good serviceable condition and needs no replacement. The building has a data center served by two 30-ton Liebert CRAC units. The associated condensing units are housed on the roof. The building also has six Carrier split systems serving electrical and telecom rooms. There are also six four pipe fan coil units throughout the building serving rooms that are not on the AHUs (auditorium, gallery, multipurpose room, pantry and control room).

Computer Room Air Conditioning (CRAC) units at Learning Resource Center



CHWS&R and HHWS&R connections AHU on Learning Resource Center Roof

BUILDING 9 – PERFORMING ARTS CENTER

The Performing Arts Center was constructed in 1975 and houses one (1) large mechanical room on the south side of the building. There are two (2) large capacity multi-zone air handling units serving the building. The air handling units are original to the building and are approximately 45 years old. According to ASHRAE, typical service life of this air handling unit is in the range of 20-25 years. The equipment has well exceeded the ASHRAE published life expectancy. These systems have undergone an energy savings retrofit and DDC conversion through the addition of fan VFDs, control dampers, valves etc.

Multi-Zone unit at Performing Arts Center

Multi-Zone unit at Performing Arts Center

BUILDING 10 – CENTRAL COMPLEX 1

Central Complex 1 was constructed in 1970 and houses six (6) mechanical equipment rooms. There are six (6) variable speed air handling units serving the building – one in each mechanical equipment room. The system employs VAV terminal air units with reheat coils for zone temperature control. One of the air handling units is California Cabinet Fan and is original to the building, making it approximately 50 years old. According to ASHRAE, typical service life of these air handling units is in the range of 20-25 years. This unit has well exceeded the ASHRAE published life expectancy. The other five (5) air handling units are Energy Labs. They are new (installed in 2018) and do not require replacement. All the air handling units contain CHW coils. Two of the Energy Labs air handling units contain HHW coils as well.

CHW and HHW Valves

Central Complex 1 Building

BUILDING 11 – CENTRAL COMPLEX 2

Central Complex 2 was constructed in 1978 and houses one (1) mechanical equipment room. There are two (2) large capacity multi-zone air handling units serving the building. The air handling units are original to the building and are approximately 42 years old. According to ASHRAE, typical service life of these air handling units is in the range of 20-25 years. The equipment has well exceeded the ASHRAE published life expectancy. These systems have undergone an energy savings retrofit and DDC conversion through the addition of fan VFDs, control dampers, control valves etc.

BUILDING 12 – CANYON HALL

Canyon Hall was constructed in 2014. There are two (2) Energy Labs variable speed air handling units with VAV reheat serving the building – one on the lecture wing roof and one of the laboratory wing roof. The air handling units are new and do not require replacement. Both air handling units contain CHW coils. Only one air handling unit also has a HHW coil. There is also a large Energy Labs laboratory exhaust fan on the Lab Wing roof for exhausting laboratory spaces.

BUILDING 13 – VISUAL ARTS

Visual Arts was constructed in 1975. There are two (2) rooftop multi-zone air handling units which were installed in 1988. The air handling units are approximately 32 years old. According to ASHRAE, typical service life for this type of air handling unit is approximately 15 years. The air handling units have well exceeded the ASHRAE published life expectancy and should be considered for replacement over the next 5 years. These systems have undergone an energy savings retrofit and DDC conversion through the addition of fan VFDs, control dampers, control valves etc.

BUILDING 16 – PUBLIC SAFETY & ALLIED HEALTH

Public Safety & Allied Health was constructed in 2014 and houses one (1) mechanical equipment room. There are two (2) Energy Labs variable speed air handling units with VAV reheat serving the building – located in this mechanical equipment room. The air handling units have CHW coils and do not have any HHW coils. The air handling units are 5 years old and do not require replacement.

Multi-zone unit in Central Complex 2

Laboratory Exhaust Fans on Canyon Hall roof

Multi-zone unit on Visual Arts building roof

xxx

AHU on Canyon Hall Roof

ANALYSIS OF EXISTING SYSTEMS

Information on the existing equipment of the central plant was gathered through as built drawings as well as verification during a site visit. CH-1,2,4 are nearing end of useful life and should be considered for replacement in the next 5-10 years. CH-3 should be considered for rebuild in the next 0-2 years. The control system at the central plant however is old and needs to be upgraded to an Alerton system to effectively control and operate the central plant.

All Cooling Towers are in good condition.

CT-1,2 galvanized basins should be considered for replacement in the next 0-5 years. CT-3 has a stainless steel basin which is in good condition.

The size of the distribution piping mains and branches for the Crafton Hills College utility master plan were studied using the following methodologies.

- Information regarding the size, usage and chilled water demands of each building or complex which will utilize the campus chilled water system to meet their cooling needs was compiled through various sources. Much of the information regarding older campus buildings was provided by the campus in the form of historical documentation, as built drawings. Some information was obtained using documentation from previous retrofit projects. Several buildings were based on current proposed or actual construction documents. The balance was determined by applying accepted engineering practice rule of thumb factors based on individual building occupancy and usage type.
- When known, actual installed tonnage was used for the cooling design peak load (tons). Where this information was not known the building area was multiplied by an accepted square foot/ton factor. This factor was determined based on a combination of experience, good engineering design practice and referenced material from the most recent version of ASHRAE Fundamentals
- Having determined the diversified tonnage for each building or complex of buildings to be served by the central plant a diversified GPM was calculated. Diversified GPM is calculated using the formula;
    - $Q = Load / (500 * \Delta T)$
    - Where
        - Load = diversified tonnage x 12,000, Btu/h
        - Q=flow rate, GPM
        - ΔT=temperature increase or decrease, °F

TABLE 5 - CHILLED WATER EXISTING BUILDING ANALYSIS

Building No.	Building Name	Year Built	GSF	Installed Cooling (Tons)	Installed SF / Ton	Block SF / Ton	Block Load (Tons)	GPM
3	Crafton Hall	1970	8,560	93	93	400	21	40
4	Clock Tower Building	1970	9,970	51	195	300	33	61
5	West Complex	1970	6,800	29	240	400	17	31
6	Crafton Center	2016	46,542	179	260	400	116	215
7	Student Support Building	1975	5,575	26	220	400	14	26
8	Learning Resource Center	2009	59,100	169	350	400	148	273
9	Performing Arts Center	1975	29,851	172	180	400	75	138
10	Central Complex 1	1970	24,840	127	195	300	83	153
11	Central Complex 2	1978	17,238	57	310	300	57	106
12	Canyon Hall	2014	34,147	131	260	400	85	158
13	Visual Arts	1975	10,800	28	386	300	36	66
16	Public Safety & Allied Health	2014	31,035	78	400	400	78	143
Total							**764**	**1410**

TABLE 6 - CHILLED WATER FUTURE BUILDING ANALYSIS CONDITIONS

Building No.	Building Name	GSF	Installed Cooling (Tons)	Installed SF / Ton	Block SF / Ton	Block Load (Tons)	Block Cooling GPM
3	Crafton Hall	8,560	93	93	400	21	40
4	Clock Tower Building	9,970	51	195	300	33	61
5	West Complex	6,800	29	240	400	17	31
6	Crafton Center	46,542	179	260	400	116	215
7	Student Support Building	5,575	26	220	400	14	26
8	Learning Resource Center	59,100	169	350	400	148	273
9	Performing Arts Center	29,851	172	180	400	75	138
10	Central Complex 1	24,840	127	195	300	83	153
11	Central Complex 2	17,238	57	310	300	57	106
12	Canyon Hall	34,147	131	260	400	85	158
16	Public Safety & Allied Health	31,035	78	400	400	78	143
11 (Future)	East Instructional Building	40,000	N/A	N/A	400	100	171
23 (Future)	Instructional Building	30,000	N/A	N/A	400	75	138
Total						**902**	**1653**

- The design chilled water temperature difference, ΔT (°F), for the campus is 14°F. The calculated GPM shown on Table 5 - Chilled Water Building Analysis assumes all existing buildings and all buildings scheduled to be operational in the future will use at least a 13°F delta T in sizing the cooling coils for those buildings.
- The total estimated chilled water load and flow requirements to serve the campus are segregated into (2) phases. The first phase includes buildings currently connected to the campus chilled water system and buildings currently planned for construction under the proposed Master Plan. Size, usage and date of demolition for existing buildings or completed construction for proposed buildings are based on the proposed campus buildings list provided by the Campus.
- The model was constructed using known parameters with regards to location of the central plant in relationship to each building. The routing and material of the distribution piping to each building was based on information obtained using historical documentation and a site survey performed by us.

A hydraulic model of the campus' chilled water distribution system was created to form an understanding of how the existing chiller plant would operate under today's most demanding cooling conditions. This model was created using the PIPE-FLO Professional modeling software by using building performance information to analyze the combined chilled water performance of the system.

There are 12 buildings connected to the chilled water distribution system at the campus. The total cooling capacities of these buildings were estimated using record drawings from each building and summing the capacities of all the air conditioning equipment. This sum represents the total cooling demand of a building under the condition that the entire building is at its peak cooling load, which is an unrealistic scenario, however, it does give a better idea of the actual upper limit of the building's operation. To estimate a more realistic peak cooling demand, each building was assigned a block cooling load based on its age and occupancy type. This was then converted to a building flow rate under the assumption that the campus' central plant is producing a 13-degree temperature differential.

By modeling in each of the buildings, and the piping network that connects them, a complete model of the chilled water distribution system was created. A building pressure differential of 15 psid was assumed for each building. The secondary distribution pumps at the central plant were included in the model to gain a better understanding of the distribution pump's operation when at the expected peak load.

ANALYSIS OF FUTURE NEEDS

A review of the loads added as part of the proposed facilities revealed that the central cooling plant and associated pumps are adequately sized to support the future loads. Take advantage of simultaneous heating and cooling loads on the campus, Heat Recovery Chillers should be installed at the Central Plant. This will also reduce the campus dependency on natural gas.

The model showed that, under present day conditions, the total campus chilled water demand amounts to 1,410 GPM, which correlates to a required differential pressure of 92 ft hd to be supplied by the secondary distribution pumps. For campus distribution piping, the ideal upper limit of large distribution pipe on a variable flow system is 9.5 feet per second. The maximum velocity in any of the piping network between the buildings at the campus did not exceed 9.5 feet per second, indicating that the piping network has adequate capacity to support existing and future buildings at the campus.

The future building scenario includes a new instructional building to replace existing Performing Arts building and a new East Instructional Building to replace the existing Visual Arts Building. These buildings add another 210 GPM to the loop for a total of about 1620 GPM. THis increases the total required system pressure to 120 ft hd. The secondary distribution pumps are sized for a maximum pressure well above anticipated build out pressure.

The control system at the central plant however is old and does not effectively control and operate the central plant.

The existing cooling towers are old and are nearing the end of their useful life.

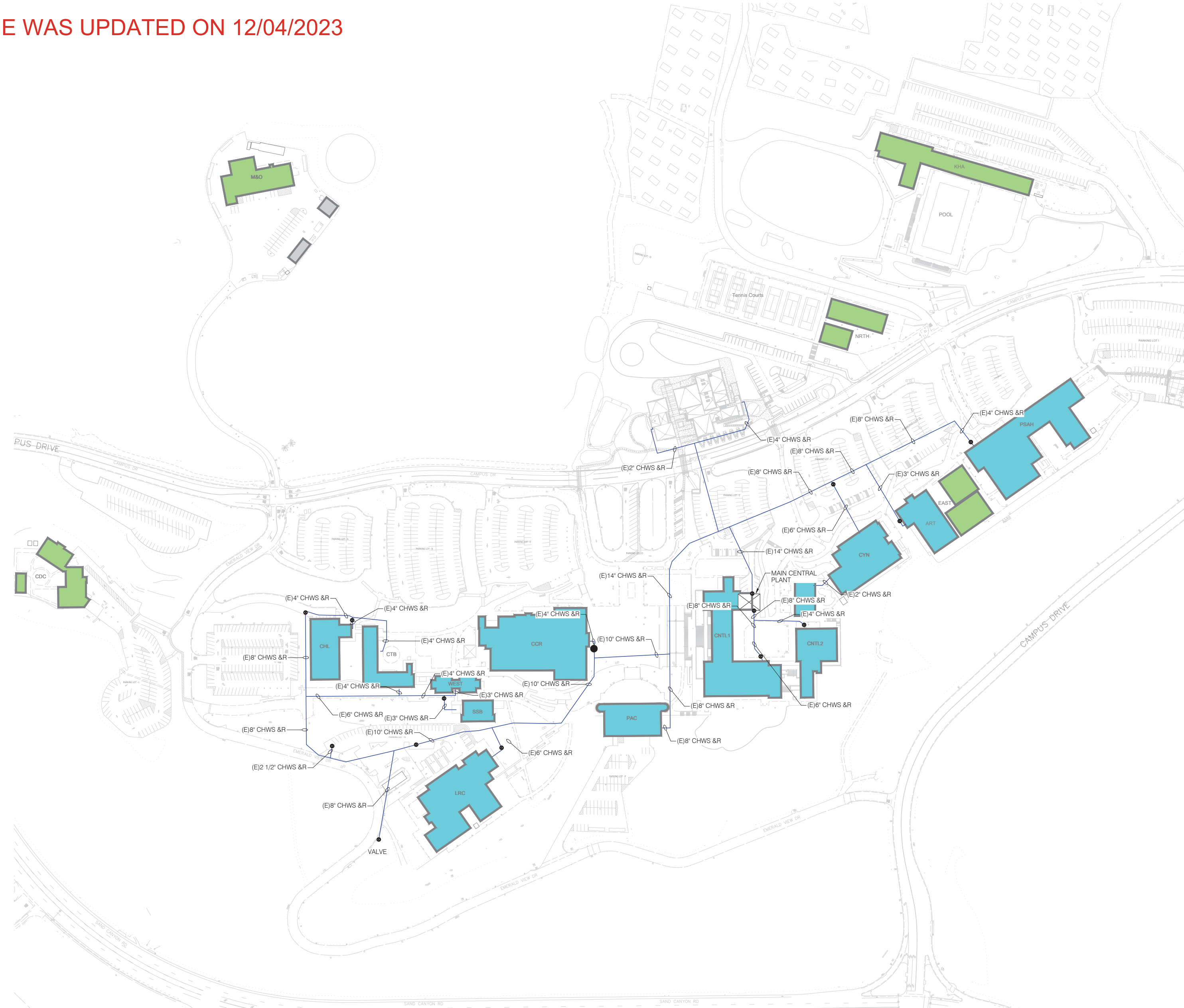
RECOMMENDATIONS

The existing cooling towers are old and need to be replaced. The existing control system is also old and needs to be upgraded to effectively control and operate the central plant. To take advantage of simultaneous heating and cooling loads on the campus, Heat Recovery Chillers should be installed at the Central Plant. This will also reduce the campus dependency on natural gas.

IMPLEMENTATION AND PHASING PLAN

The replacement of cooling towers and chillers/ control system should be phased and replaced either during the summer months when classes are not in session or during winter break to minimize disruption to the campus operations.

THIS PAGE WAS UPDATED ON 12/04/2023



FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

- EXISTING CHILLED WATER LINE
- ABANDONED LINE
- VALVE
- HANDHOLD
- VAULT
- EARTHQUAKE FAULT LINE

BUILDING LEGEND

- NO A/C SERVICE
- UNDER CONSTRUCTION
- CHILLED WATER SERVICED BY CENTRAL PLANT
- PACKAGED SYSTEMS

SCALE: 1" = 100'

0 100

CRAFTON HILLS COLLEGE

P2S ENG

Long Beach | Los Angeles
San Diego | San Jose
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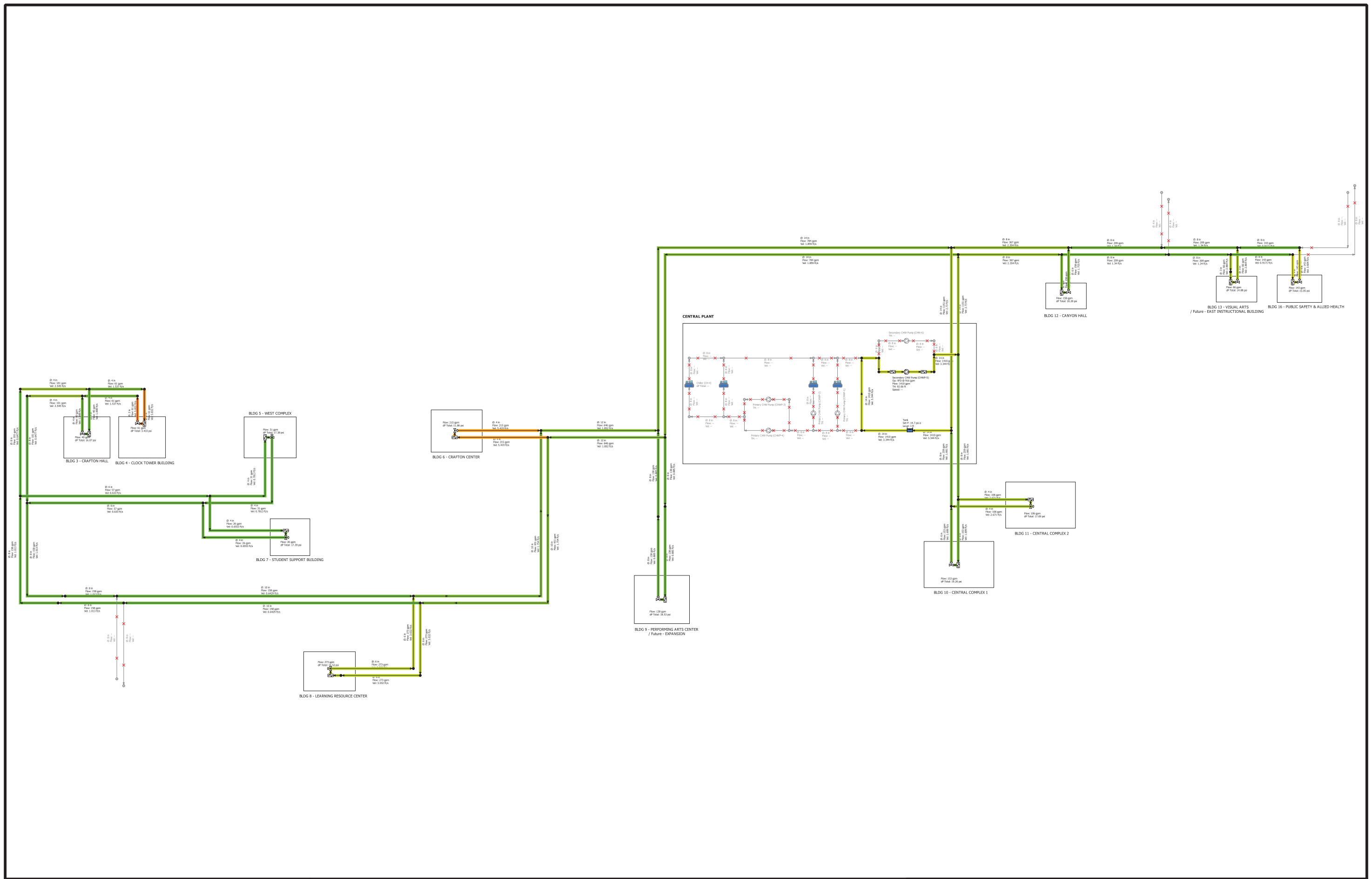
Existing Chilled Water Distribution System

Date: 12/04/2023

PROPOSED CHILLED WATER DISTRIBUTION SYSTEM



PIPE-FLO Professional

Program Version:	16.1.41643
Calculation Method:	Darcy-Weisbach
Maximum Iterations:	100
Percent Tolerance:	0.01 %
Laminar Cutoff Re:	2100
Allowable Deviation:	1 %

Units

Area:	ft²	**Flow rate:**	gpm	**Heat Transfer Rate:**	BTU/h
Length:	ft	**Pressure:**	psi	**Heat Transfer Coefficient:**	BTU/h*ft²°F
Elevation:	ft	**Power:**	hp	**Specific Heat Capacity:**	BTU/lb°F
Size:	in	**Temperature:**	°F	**Thermal Capacitance:**	BTU/h°F
Velocity:	ft/s	**Density:**	lb/ft³	**Thermal Insulance:**	h*ft²°F/BTU
		Viscosity:	cP	**Atmospheric Pressure:**	14.7 psi a

Project Information

Company:	P2S Engineering, Inc.
Project:	Crafton Hills College
Drawn by:	
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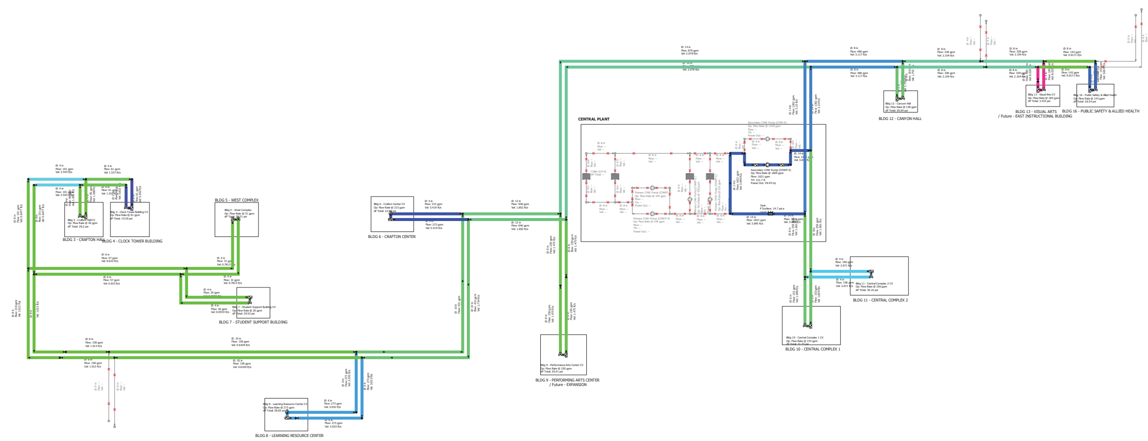

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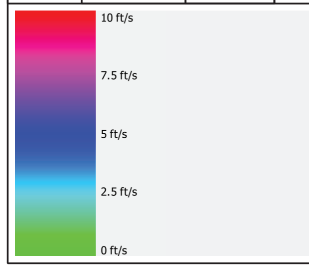


PIPE-FLO Professional	
Program Version:	17.0.50496
Calculation Method:	Darcy-Weisbach
Maximum Iterations:	100
Percent Tolerance:	0.01 %
Laminar Cutoff Re:	2100
Allowable Deviation:	1%

Units					
Area:	ft²	**Flow rate:**	gpm	**Heat Transfer Rate:**	BTU/h
Length:	ft	**Pressure:**	psi	**Heat Transfer Coefficient:**	BTU/h*ft²°F
Elevation:	ft	**Power:**	hp	**Specific Heat Capacity:**	BTU/lb°F
Size:	in	**Temperature:**	°F	**Thermal Capacitance:**	BTU/h°F
Velocity:	ft/s	**Density:**	lb/ft³	**Thermal Insulance:**	h*ft²°F/BTU
		Viscosity:	cP	**Atmospheric Pressure:**	14.7 psi a

Project Information	
Company:	P2S Engineering, Inc.
Project:	Crafton Hills College
Drawn by:	
File Name:	Crafton Hills - CHW Current and Future - Copy.pipe
Lineup:	Future Build Out
Print Date:	Thursday, April 16, 2020 09:21 AM

HEATING WATER SYSTEM

SYSTEM DESCRIPTION

The heating needs of majority of the facilities at the campus are met by a central plant located with in Building '10' Central Complex 1 in the center of the campus. A few of the facilities are served by dedicated package systems.

Central Heating Plant at Central Complex 1

The central heating plant consists of three (3) natural gas hot water boilers. Two (2) boilers were installed in 2005 and are each rated at 2,940 MBH output, while the third boiler was installed in 2009 and is rated at 7,200 MBH output. The boilers are in good serviceable condition. The boilers installed in 2005 should be considered for replacement over the next 10 years. The heating hot water plant is has a primary-secondary pumping arrangement. Each of the boilers has a dedicated constant speed primary pump. The large secondary distribution pumps are on wall mounted VFDs. There is a side stream filtration system for the HHW loop located within the boiler room. See Table 2 and Table 3 for a breakdown of the boilers and associated HHW pumps.

HHW Distribution

A set of 4" Heating Hot Water Supply and Return (HHWS&R) pipes originate from the south side of the central plant to serve Building 10 – Central Complex 1 and Building 11 – Central Complex 2. On the north side, 8" HHWS&R pipes splits off in two directions to serve the rest of the campus.

The 8" HHWS&R branch continues west to serve the following buildings:

- Building 3 – Crafton Hall
- Building 4 – Clock Tower Building
- Building 5 – West Complex
- Building 6 – Crafton Center
- Building 7 – Student Support Building
- Building 8 – Learning Resource Center
- Building 9 – Performing Arts Center

A 6" HHWS&R branch heads towards the east side of campus to serve the following buildings:

- Building 12 – Canyon Hall
- Building 13 – Visual Arts
- Building 16 – Public Safety & Allied Health

The rest of the campus facilities are heated with DX air conditioning and gas heating equipment. Table 1 provides a list of campus facilities connected to the central plant and facilities having dedicated package systems. An exhibit of the existing heating water distribution is provided at the end of the section for reference.

Boilers in Central Heating Plant at Central Complex 1

HHW Pumps in Central Heating Plant

TABLE 1 - CAMPUS BUILDING LIST

Building No.	Building Name	Cooling & Heating
1	Maintenance & Operations	DX/Gas
2	Child Development Center	DX/Gas
3	Crafton Hall	CHW/HHW (CP)
4	Clock Tower Building	CHW/HHW (CP)
5	West Complex	CHW/HHW (CP)
6	Crafton Center	CHW/HHW (CP)
7	Student Support Building	CHW/HHW (CP)
8	Learning Resource Center	CHW/HHW (CP)
9	Performing Arts Center	CHW/HHW (CP)
10	Central Complex 1	CHW/HHW (CP)
11	Central Complex 2	CHW/HHW (CP)
12	Canyon Hall	CHW/HHW (CP)
13	Visual Arts	CHW/HHW (CP)
14	East Complex 1	DX/Gas
15	East Complex 2	DX/Gas
16	Public Safety & Allied Health	CHW/HHW (CP)
17	Gymnasium	Decommissioned
18	North Complex	DX/Gas
19	Kinesiology, Health Ed & Aquatics	DX/Gas

TABLE 2 - BOILERS IN CENTRAL COMPLEX 1

Boiler Tag	Manufactuer	Output (MBH)	Year Installed	Age (Years)
B-1	Bryan Boiler	2,940	1999	20
B-2	Bryan Boiler	2,940	1999	20
B-3	Cleaver Brooks	7,200	2009	10

TABLE 3 - HHW PUMPS IN NORTH CENTRAL PLANT

Pump Tag	Manufacturer	Service	Flow (GPM)	Head (FT)
HHWP-1	-	Primary	-	-
HHWP-2	-	Primary	-	-
HHWP-3	Armstrong	Primary	365	40
HHWP-4	Armstrong	Secondary	665	200
HHWP-5	Armstrong	Secondary	665	200

ANALYSIS OF EXISTING SYSTEMS

Information on the existing equipment of the central plant was gathered through as built drawings as well as verification during a site visit. While all the boilers are in good condition, B-1,2 should be considered for replacement in the next 10 years as they will be approaching the end of their useful life in that time frame.

The size of the distribution piping mains and branches for the Crafton Hills College utility master plan were studied using the following methodologies.

- Information regarding the size, usage and heating hot water demands of each building or complex which will utilize the campus heating hot water system to meet their cooling needs was compiled through various sources. Much of the information regarding older campus buildings was provided by the campus in the form of historical documentation, as built drawings. Some information was obtained using documentation from previous retrofit projects. Several buildings were based on current proposed or actual construction documents. The balance was determined by applying accepted engineering practice rule of thumb factors based on individual building occupancy and usage type.
- When known, actual installed heating capacity was used for the design peak load. Where this information was not known the building area was multiplied by an accepted square foot factor. This factor was determined based on a combination of experience, good engineering design practice and referenced material from the most recent version of ASHRAE Fundamentals
- A diversity of 0.90 was used as a basis for determining the required equipment capacities and distribution piping sizes. This assumes a maximum 90% of the total connected load will require chilled water at any one time. Based on extensive experience in the design of campus central plant systems a 0.90% is a slightly conservative basis of design.

TABLE 4 - HEATING HOT WATER EXISTING BUILDING ANALYSIS

Building No.	Building Name	Year Built	GSF	Block BTU/SF	Block Load (MBH)	Block Heating GPM
3	Crafton Hall	1970	8,560	20	171	9
4	Clock Tower Building	1970	9,970	20	199	10
5	West Complex	1970	6,800	20	136	7
6	Crafton Center	2016	46,542	20	931	47
7	Student Support Building	1975	5,575	20	112	6
8	Learning Resource Center	2009	59,100	20	1,182	59
9	Performing Arts Center	1975	29,851	20	597	30
10	Central Complex 1	1970	24,840	20	497	25
11	Central Complex 2	1978	17,238	20	345	17
12	Canyon Hall	2014	34,147	20	683	34
13	Visual Arts	1975	10,800	20	216	11
16	Public Safety & Allied Health	2014	31,035	20	621	31
Total					**5689**	**284**

TABLE 5 - HEATING HOT WATER FUTURE BUILDING ANALYSIS

Building No.	Building Name	GSF	Block BTU/SF	Block Load (MBH)	Block Heating GPM
3	Crafton Hall	8,560	20	171	9
4	Clock Tower Building	9,970	20	199	10
5	West Complex	6,800	20	136	7
6	Crafton Center	46,542	20	931	47
7	Student Support Building	5,575	20	112	6
8	Learning Resource Center	59,100	20	1,182	59
9	Performing Arts Center	29,851	20	597	30
10	Central Complex 1	24,840	20	497	25
11	Central Complex 2	17,238	20	345	17
12	Canyon Hall	34,147	20	683	34
16	Public Safety & Allied Health	31,035	20	621	31
11 (Future)	East Instructional Building	40,000	20	800	40
23 (Future)	Instructional Building	30,000	20	600	30
Total				**6874**	**345**

- Having determined the diversified heat load for each building or complex of buildings to be served by the central plant a diversified GPM was calculated. Diversified GPM is calculated using the formula;
  - $Q = Load / (500 * \Delta T)$
  - Where
    - Load = diversified MBH x 12,000, Btu/h
    - Q=flow rate, GPM
    - ΔT=temperature increase or decrease, °F
- The design heating hot water temperature difference, ΔT (°F), for the campus is 40°F. The calculated GPM shown on Table 3 assumes all existing buildings and all buildings scheduled to be operational in the future will use at least a 40°F ΔT in sizing the cooling coils for those buildings.
- The total estimated heating hot water load and flow requirements to serve the campus are segregated into (2) phases. The first phase includes buildings currently connected to the campus heating hot water system and buildings currently planned for construction under the proposed Master Plan. Size, usage and date of demolition for existing buildings or completed construction for proposed buildings are based on the proposed campus buildings list provided by the Campus.
- The model was constructed using known parameters with regards to location of the central plant in relationship to each building. The routing and material of the distribution piping to each building was based on information obtained using historical documentation and a site survey performed by us.

A hydraulic model of the campus' heating hot water distribution system was created to form an understanding of how the existing hot water plant would operate under today's most demanding heating conditions. This model was created using the PIPE-FLO Professional modeling software by using building performance information to analyze the combined heating hot water performance of the system.

There are 12 buildings connected to the heating hot water distribution system at the campus. The total heating capacities of these buildings were estimated using record drawings from each building and summing the capacities of all the air conditioning equipment which provides heating. This sum represents the total heating demand of a building. However, the total of all heating coil capacities is not representative of a given building's true block heating load, however, it does give an idea of the upper limit of the buildings' heating operations. To find a more realistic peak heating demand, each building was assigned a block heating load based on its age and occupancy type. This was then converted to a building flow rate under the assumption that the campus' boiler plant is producing a 40-degree temperature differential.

By modeling in each of the buildings, and the piping network that connects them, a complete model of the heating hot water distribution system was created. A building pressure differential of 15 psid was assumed for each building. The secondary distribution pumps at the hot water plant were included in the model to gain a better understanding of the distribution pump's operation when at the expected peak load.

ANALYSIS OF FUTURE NEEDS

A review of the loads added as part of the proposed facilities revealed that the central heating plant and associated pumps are adequately sized to support the future loads.

The model showed that, under present day conditions, the total campus heating hot water demand amounts to 284 GPM, which correlates to a required differential pressure of 75 ft hd to be supplied by the secondary distribution pumps. For campus distribution piping, the ideal upper limit of distribution pipe is 8 feet per second. The max velocity in any of the piping network between the buildings at Crafton Hills did not exceed 4.5 feet per second, indicating that the piping network has adequate capacity to support existing and future buildings at the campus.

The future building scenario includes a new Instructional building to replace existing Performing Arts building and a new East Instructional building to replace the existing Visual Arts building. These buildings add another 52 GPM to the loop for a total of about 335 GPM. This increases the total requires system pressure to 78 ft hd. The secondary distribution pumps are sized for a maximum pressure well above anticipated build out pressure. The main distribution pipe leaving the plant is an 8-inch pipe, which is capable of handling about 1,400 GPM of water before reaching its recommended upper limit. As a result, the campus central heating hot water distribution system has plenty of spare capacity for its planned future buildings and expansions. The boilers should also be scheduled for replacement in the next 5-10 years. The control system at the central plant however is old and does not effectively control and operate the central plant. An exhibit of the proposed heating hot water distribution and proposed heat recovery chillers is provided at the end of the section for reference.

RECOMMENDATIONS

The boilers should be replaced in conjunction with the provision of heat recovery chillers in the next 5-10years as they near the end of their life. The control system at the central plant however is old and does not effectively control and operate the central plant and should be replaced with a new ALC system.

IMPLEMENTATION AND PHASING PLAN

The replacement of boilers should be phased and replaced either during the summer months when classes are not in session or during winter break to minimize disruption to the campus operations.

ROUGH ORDER COST ESTIMATES

Priority 1	Critical - Need replacement in 0-3years	Priority 3	Fair Condition - Need Replacement in Next 5-10 years	Priority 5	New Building Impact - Based on project schedule
Priority 2	Moderately Critical - Need replacement in 3-5 years	Priority 4	Adds Value and Redundancy 5-10 years or as funding is available		

Sequential Tracking #	Campus	Infrastructure Scope	Utility	Installed Year(s)	Brief Description of the Need	Priority Level (1..4)	Project Name	Brief Scope of Project	Project Category	Can the Project be Phased - Y/N	Total Construction Costs ($)[1]	Total Project Costs - Including Soft Costs ($)	Study by (Prime Consultant)
CHC-M1	Crafton Hills College	Central Plant - Replacement of CH-3	Mechanical Chilled Water	2008	The existing CH-3 is 12+ years old and will reach the end of their useful life over the next 5-10 years.	1	Central Plant Chiller Replacement	Replacement of CH-3	DM	Y	$450,000	$585,000	P2S Inc
CHC-M2	Crafton Hills College	Central Plant - Control System Upgrades	Mechanical Control System	1999	Replacement of existing Control System.	1	Central Plant - Control System Upgrades	Central Plant - Control System Upgrades	DM	Y	$450,000	$585,000	P2S Inc
Total Priority 2 Costs											**$900,000**	**$1,170,000**	
CHC-M3	Crafton Hills College	Central Plant - Cooling Tower Rehabilitation	Mechanical Condenser Water	1999	Replacement of CT-1 and 2 and condenser water pumps.	2	Central Plant Cooling Tower Replacement	Replacement of CT-1 and -2 and condenser water pumps.	DM	Y	$450,000	$585,000	P2S Inc
CHC-M4	Crafton Hills College	Central Plant - B-1 and B-2 Replacement	Mechanical Heating Hot Water	-	The (2) Bryan Boilers are 15 years old and should be considered for replacement in the next 5-10 years	2	Central Plant Boiler and Pump Replacement	Boiler and pump replacement.	DM	Y	$300,000	$390,000	P2S Inc
CHC-M5	Crafton Hills College	Central Plant - Replacement of CH-1, -2, -4	Mechanical Chilled Water	1999	The existing CH-1, -2, and -4 are 20+ years old and will reach the end of their useful life over the next 5-10 years.	2	Central Plant Chiller Replacement	Replacement of CH-1, -2 and -4 in the Central Plant. Replace associated primary CHW pumps. Heat Recovery Chillers should be considered to minimize gas consumption and utlize the waste heat to heat the buildings.	DM	Y	$1,062,000	$1,380,600	P2S Inc
Total Priority 3 Costs											**$1,812,000**	**$2,355,600**	
Total Costs											**$2,712,000**	**$3,525,600**	

Project Categories

DM Deferred maintanance: systems or facilities that have not been maintained due to lack of staffing or funding. While operational, failure is imminent.

EM Emergency projects are systems or facilities that have failed or do not function as designed. Repair or replacement is required.

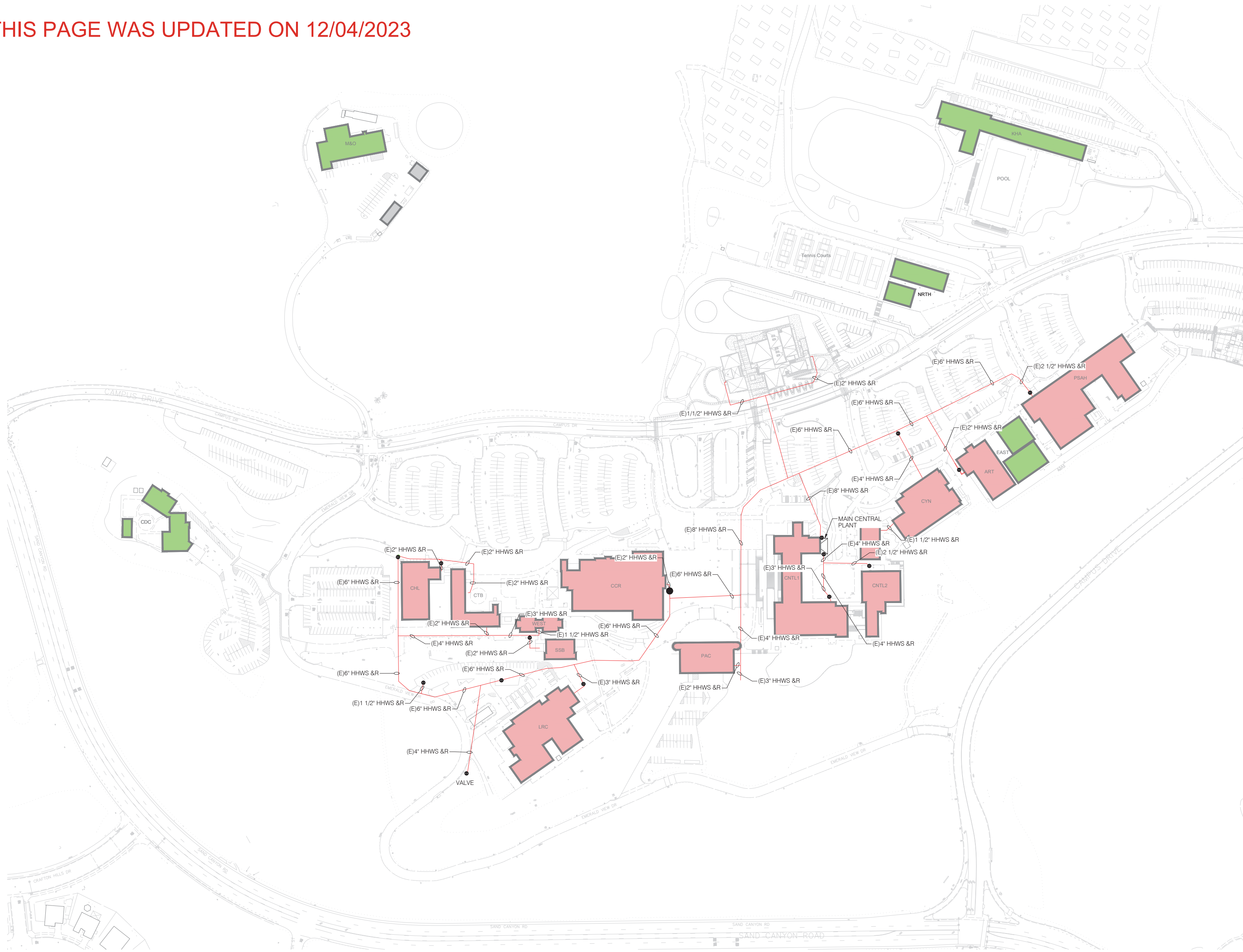
UF Projects or intiatives that would improve systems, facilities or operations on campus.

REG Projects related to Fire, Life, Safety; Code or OSHA compliance. Risk of harm and potential for fines or shutdown directives from regulating authorities.

NC New construction to support proposed buildings

[1]Refer to Appendix for breakdown of costs.

THIS PAGE WAS UPDATED ON 12/04/2023



FACILITY LEGEND

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CNTL2	CENTRAL COMPLEX 2
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CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
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KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

- EXISTING HOT WATER LINE
- VALVE
- HANDHOLD
- VAULT
- EARTHQUAKE FAULT LINE

BUILDING LEGEND

- NO HEATING HOT WATER SERVICE
- UNDER CONSTRUCTION
- HEATING HOT WATER SERVICED
- HEATING HOT WATER SERVICED LOCALLY
- PACKAGED SYSTEMS

SCALE: 1" = 100'

CRAFTON HILLS COLLEGE

P2S ENG

Long Beach | Los Angeles
San Diego | San Jose
p2sinc.com

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(562)497-2999
mohammad.wasif@p2sinc.com

Existing Hot Heating Water Distribution System

Date: 12/04/2023

PROPOSED HEATING HOT WATER DISTRIBUTION SYSTEM

FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
EIB	EAST INSTRUCTIONAL BUILDING
EVPSTC	EAST VALLEY PUBLIC SAFELY TRAINING CENTER
GYM	GYMNASIUM
IB	INSTRUCTIONAL BUILDING
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
M&O ADD	MAINTENANCE AND OPERATIONS ADDITION
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

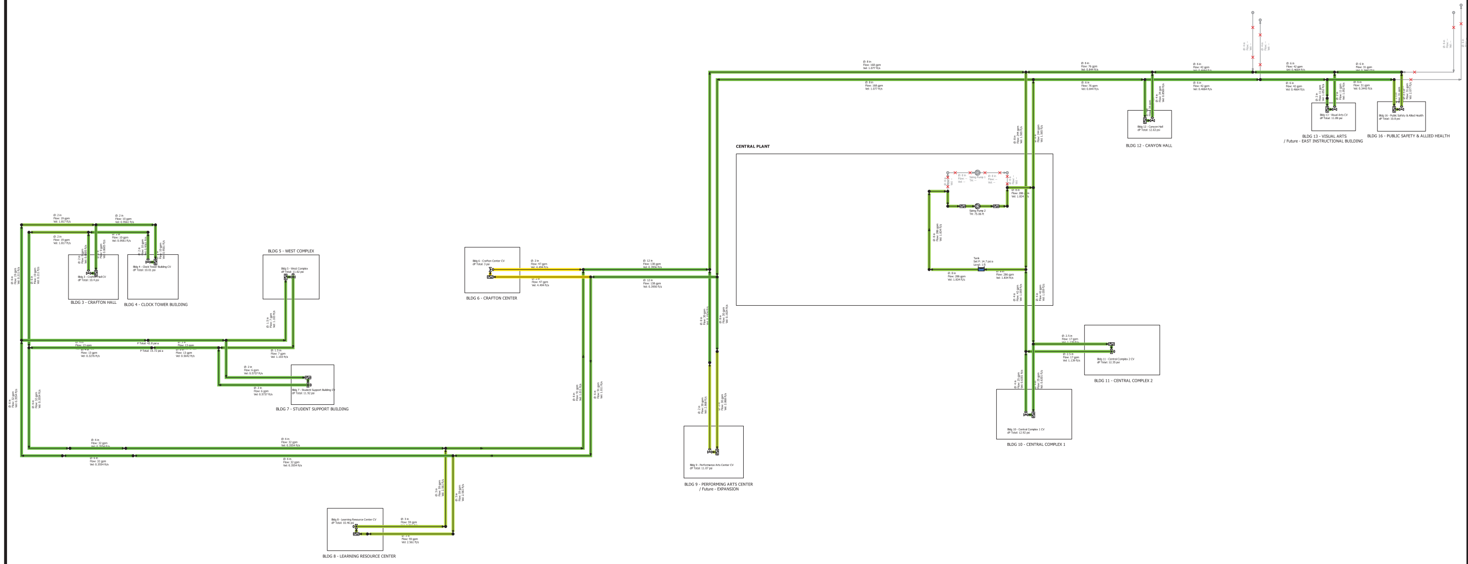
- PROPOSED HOT WATER LINE
- EXISTING HOT WATER LINE
- VALVE
- HANDHOLD
- VAULT

BUILDING LEGEND

- NO HEATING HOT WATER SERVICE
- UNDER CONSTRUCTION
- HEATING HOT WATER SERVICED
- PACKAGED SYSTEMS
- EXISTING BUILDING
- FUTURE BUILDING
- BUILDING RENOVATION/EXPANSION

NORTH

0 300'



PIPE-FLO Professional	
Program Version:	16.1.41643
Calculation Method:	Darcy-Weisbach
Maximum Iterations:	100
Percent Tolerance:	0.01 %
Laminar Cutoff Re:	2100
Allowable Deviation:	1 %

Units					
Area:	ft²	**Flow rate:**	gpm	**Heat Transfer Rate:**	BTU/h
Length:	ft	**Pressure:**	psi	**Heat Transfer Coefficient:**	BTU/h*ft²°F
Elevation:	ft	**Power:**	hp	**Specific Heat Capacity:**	BTU/lb°F
Size:	in	**Temperature:**	°F	**Thermal Capacitance:**	BTU/h°F
Velocity:	ft/s	**Density:**	lb/ft³	**Thermal Insulance:**	h*ft²°F/BTU
		Viscosity:	cP	**Atmospheric Pressure:**	14.7 psi a

Project Information	
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Project:	Crafton Hills College
Drawn by:	
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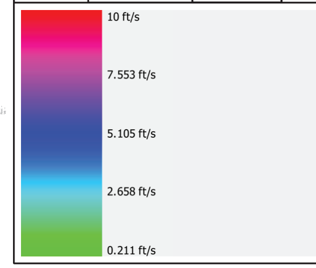
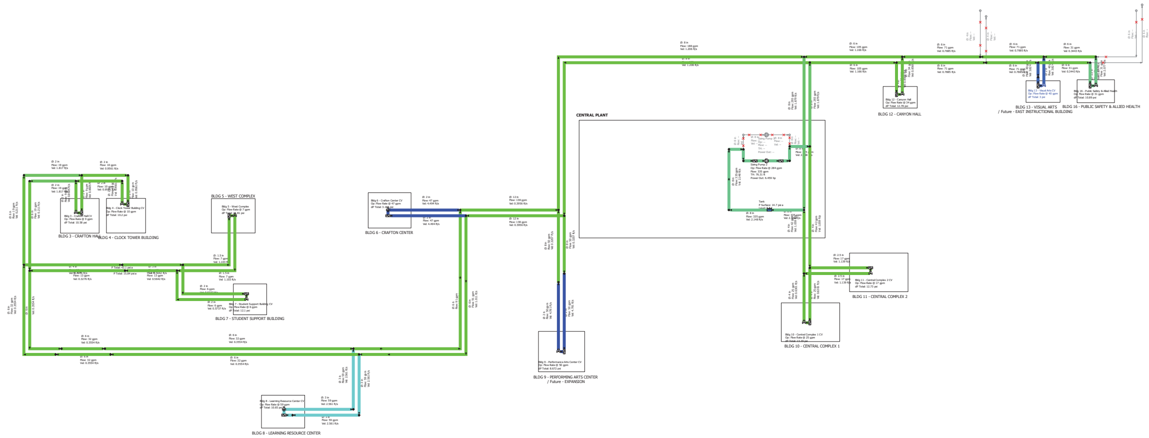




PIPE-FLO Professional	
Program Version:	17.0.50496
Calculation Method:	Darcy-Weisbach
Maximum Iterations:	100
Percent Tolerance:	0.01 %
Laminar Cutoff Re:	2100
Allowable Deviation:	1%

Units					
Area:	ft²	**Flow rate:**	gpm	**Heat Transfer Rate:**	BTU/h
Length:	ft	**Pressure:**	psi	**Heat Transfer Coefficient:**	BTU/h*ft²°F
Elevation:	ft	**Power:**	hp	**Specific Heat Capacity:**	BTU/lb°F
Size:	in	**Temperature:**	°F	**Thermal Capacitance:**	BTU/h°F
Velocity:	ft/s	**Density:**	lb/ft³	**Thermal Insulance:**	h*ft²°F/BTU
		Viscosity:	cP	**Atmospheric Pressure:**	14.7 psi a

Project Information	
Company:	P2S Engineering, Inc.
Project:	Crafton Hills College
Drawn by:	
File Name:	Crafton Hills - HHW Current and Future.pipe
Lineup:	Future Build Out
Print Date:	Thursday, April 16, 2020 09:42 AM

CHAPTER 3
Electrical System

SYSTEM DESCRIPTION

Crafton Hills College campus is currently served from a 4.16kV, 2000A 3phase, 3wire switchgear that derives its service from a 4.16kV SCE service feed. The switchgear comprises of a main 5kV, 2000A, 3P breaker with a SCE main meter section and eight 5kV, 600A breakers housed in a seven sectional indoor switchgear. The service is metered at 4.16kV and distributes power to substations in each building on campus through a series of manholes and medium voltage duct banks. The main switchgear was installed in 2008 with a main 5kV breaker and eight 5kV feeder breakers equipped with modern microprocessor relays and Eaton IQDP-4000 digital meters for monitoring energy usage and is in fairly good condition.

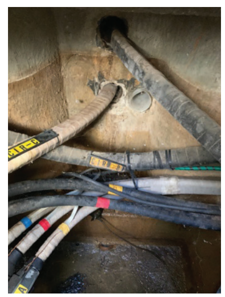
Main Switchgear

Main Switchgear Meter and Switches

Power to each building on campus is served through a series of manholes and concrete encased medium voltage ductbank originating from the main switchgear. The medium voltage feeders are routed primarily through modular splice connectors located in individual manholes and provide limited redundancy for isolating power to the building without affecting all the other building being served from the same feeder. 15kV, 600A selector switches(4) are installed at certain locations on the campus as part of of the recently completed projects that enableto facilitate disconnection of few individual buildings.

Feeders 'A', 'B', 'C' 'D' 'E' 'F' and 'G' originate from the main switchgear and are protected through 600A breaker housed in the main 5kV switchgear. The feeders are routed through ductbank and manholes to form radial feeds at the campus. Each of the radial feeders traverse through 5kV, 200A modular splice connectors in manholes and radially serve each building substation on campus. Majority of the feeders are rated at 5kV, 350kcmil with 133% EPR insulation, with some portion of feeders rated at 5kV, 250kcmil and 5kV, 4/0 AWG.

T-body Splice in Manhole



Manhole

Manhole

T-body Splice in Manhole

The electrical power distribution system at the campus was installed in 1990's and is approximately 30 years old. Majority of the underground cables were installed in 1970, at the inception of the campus. The cables are approximately 35-40 years old and at the end of their useful life. Portion of feeders 'A' and 'C' were replaced and upgraded in 2013, with the above-mentioned project being the only notable improvements to be undertaken to upgrade the existing power distribution system.

While majority of the buildings have new transformer substations and distribution switchboards. A few building still have the original transformer substations and switchboards, installed at the time of building inception. The individual buildings have transformers with 4.16kV primary and 277/480V and 120/208V secondary voltages.

The following is a brief description of each of the feeders and their routing to serve each building on campus.

Feeder 'A' originates from the main switchgear traverses north to manhole EMH-1 located outside the main switchgear, where it is capped and abandoned inside the manhole. All building loads originally served from feeder 'A' were transferred to feeder 'G' as part of the 2013 feeder replacement project.

Feeder 'B' and 'C' originating from the main switchgear traverse parallelly through a series of ductbank and manholes towards the east side of the campus and radial feeders originating from modular splice connectors located in manholes serve facilities located on the north and east side of the campus including the solar fields.

Feeder 'D' 'F' and 'G' originating from the main switchgear traverse parallelly through a series of ductbank and manholes towards the west side of the campus and radial feeders originating from modular splice connectors located in manholes serve facilities located on the south and west side of the campus.

Feeder 'E' is a dedicated feeder that serves the existing central plant facility located adjacent to the main switchgear building.

The radial configuration currently existing at the campus allows limited flexibility and redundancy of the individual buildings without affecting power to the rest of the buildings connected to the feeder.

Pullbox

Manhole

Manhole

Pole mounted PV arrays installed in the solar field on north side of campus, provide 1.25MW alternative renewable source of energy and help offset the electricity cost incurred by the campus throughout the year.

Solar Farm

Solar Farm Inverters

A map of existing site electrical distribution system and overall campus single line diagram is provided at the end of the section for reference.

The following table provides feeder and the corresponding buildings served from the feeder.

TABLE - BUILDING DEMAND LOADS BY FEEDERS

Feeder	Buildings	Transformer Size	Demand KVA(15% of transformer size)
A	Spare		
B	Liberal Arts	500	75
	Gymnasium	975	150
	Comm Tower	50	10
	Solar Field	1,250	
C	Chemical health Science Building	500	75
	Science Building	750	112.5
D	LRC	1500	225
	Performing Arts	500	75
E	Central plant	1000	150
F	Aquatics	300	45
	Lot E, F, G, H, I, J	1000	150
	Gym	725	110
	Bookstore	300	45
G	SSA	500	75
	Child Development Center	300	45
	Crafton center	500	75
	Site lighting lots A, B, C	500	75
	M&O	1050	1050
Total			**1642.5kVA**

METHODOLOGY

The following methodology was adopted in formulating our electrical utility infrastructure master plan. The methodology presented below outlines the critical tasks that were performed in development of this master plan report.

- A critical aspect in the evaluation of the existing electrical system serving a facility is a detailed and accurate field investigation of the current system. A detailed survey of the existing electrical system that currently serve the facilities at the campus was undertaken, and existing conditions, together with potential problems, were identified. The surveyed information was verified through available record drawings and meetings with the campus facilities staff.
- A load flow study of the existing loads was developed and existing capacity requirements were developed. For all existing buildings, existing installed capacities of the substations/transformers were taken to estimate the total loads.
- The Electrical system was then evaluated for capacity, functionality, reliability, ease of maintenance, age, and its ability to serve the present and future needs of the campus.

ANALYSIS OF EXISTING SYSTEMS

Crafton Hills College campus is currently served from a 4.16kV, 2000A 3phase, 3wire switchgear that derives its service from a 4.16kV SCE service. Incoming 5kV SCE feeders traverse in underground ductbank and dedicated manholes from the northwest side of the campus to serve the SCE switchgear located at the switchgear building. The switchgear comprises of a main 5kV, 2000A, 3P breaker with a SCE main meter section and eight 5kV, 600A vacuum circuit breakers. The service is metered at 4.16kV and distributes power to substations in each building on campus through a series of manholes and medium voltage duct banks. The main switchgear was installed in 2008 with a main 5kV breaker and eight 5kV feeder breakers. The main switchgear and the main breakers are 12 years old and in fairly good condition.

While few of the buildings still have the original transformer substations and switchboards, a number of facilities have new transformer substations and distribution switchboards. The individual buildings have transformers with 4.16kV primary and 277/480V and 120/208V secondary voltages.


Central Plant


Main Switchgear

Majority of the Campus Facilities are served by a radial feeder system, fed from the main 5kV switchgear. Few buildings are served through radial feeders originating from selector switches that enable to facilitate disconnection of the individual buildings.

Selector Switches

HVS-A

15kV, 600A, 5 position Selector switch HVS-A has been recently installed as part of the Feeder A upgrade project in parking lot A adjacent to manhole EMH-6 that enables to isolate the power to Child development center facility, M&O Building, Student Services Administration and College Center Building


Selector Switch HVS-A

HVS-CC

15kV, 600A, 4 position Selector switch HVS-CC has been recently installed as part of the Crafton center project on the north side of Crafton Center that enables to isolate the power to Crafton Center facility without affecting power to other buildings being served from Feeder 'G'.


Selector Switch HVS-CC

HVS-LADM

15kV, 600A, 3 position Selector switch HVS-LADM has been recently installed as part of the renovation project to serve the LADM facility that enables to isolate the power to LADM facility without affecting power to other buildings being served from Feeder 'B'.

LADM Building Outdoor Padmount Transformer and Selector Switch HVS-A

HVS-I

15kV, 600A, 4 position Selector switch HVS-I installed in parking lot I serves the parking lot I and east complex and enables to isolate the power to the above mentioned facilities without affecting power to other buildings being served from Feeder 'F'.

Parking Lot I Selector Switch HVS-I

Building Evaluation

M&O BUILDING

M&O building located on the north west side of the campus is presently served from feeder 'G' and has redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'G'. Radial feeder originating from selector switch 'HVS-A' traverses through a series of manholes to serve a 750kVA, 4.16kV-480Y/277V padmount liquid filled transformer. Radial feeder originating from primary lug of padmount transformer serves a 5kV Load Interrupter Switch and a 225kVA, 4.16kV-480Y/277V dry type transformer located outdoor in a fenced enclosure on the east side the facility.

M&O Facility Outdoor Dry type Transformer and Load Interrupter Switch

225 KVA dry type Transformer and switchboard were installed as part of original building construction and are approximately 20 years old and at the end of their useful life. 750kVA padmount transformer was installed in 2000's and is in fairly good condition.

750kVA pad mount transformer and switchboard were recently installed in 2014 and are in excellent condition.

M&O Facility Outdoor Padmount Transformer and Main Switchboard

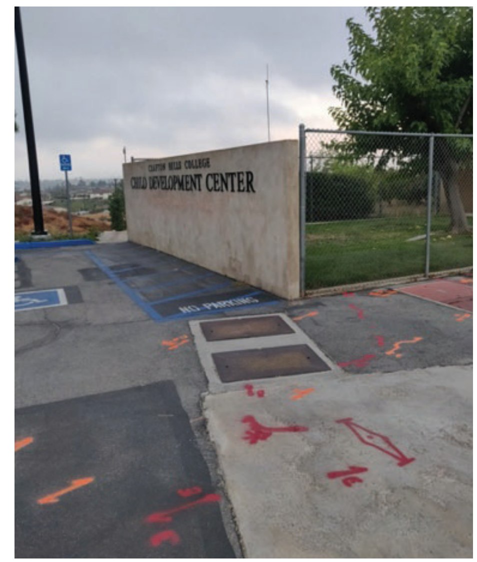
BUILDING 2

Child Development Center building located on the west side of the campus is presently served from feeder 'G' and has redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'G'. Radial feeder originating from selector switch 'HVS-A' traverses through a series of manholes and pullboxes to serve a 5kV Load interrupter Switch, 300kVA, 4.16kV-208Y/120V dry type transformer and 600A, 208Y/120V Switchboard.

5kV Load interrupter Switch, 300KVA dry type Transformer and switchboard were installed as part of original building construction and are approximately 23 years old and at the end of their useful life.

CDC Outdoor Substation

CDC Main Switchboard



CDC Electrical Pullbox

BUILDING 3

College Center building located on the north west side of the campus is presently served from feeder 'G' and has redundancy of isolating the service to the building with shutdown only affecting service to Student Services Administration Building and not interrupting service to the other buildings being served from feeder 'G'. Radial feeder originating from selector switch 'HVS-A' traverses through a series of manholes to serve College Center and Student Services Administration Building. College Center presently has a 5kV Load interrupter Switch, 225kVA, 4.16kV-208Y/120V dry type transformer and 5kV Load interrupter Switch, 30kVA, 4.16kV-208Y/120V transformer installed at the facility.

5kV Load interrupter Switches and transformers were recently installed in 2012 and are in excellent working condition.

Crafton Center Load Interrupter Switch

BUILDING 4,5

Student Services Administration building located along the central quad of the campus is presently served from feeder 'G' and has redundancy of isolating the service to the building with shutdown only affecting service to College Center Building and not interrupting service to the other buildings being served from feeder 'G'. Radial feeder originating from selector switch 'HVS-A' traverses through a series of manholes to serve College Center and Student Services Administration Building. Student services administration building presently has a 5kV Load interrupter Switch, 500kVA, 4.16kV-208Y/120V dry type transformer and 800A, 480Y/277V unit substation installed at the facility.

5kV unit substation was recently installed in 2013 and is in excellent working condition.

Student Services Administration Indoor Unit Substation

Student Services Administration Electrical Room

BUILDING 6

Crafton Center building located along the central quad of the campus is presently served from feeder 'G' and has redundancy of isolating the service to the building without interrupting service to the other buildings being served from feeder 'G'. Radial feeder originating from selector switch 'HVS-CC' serves a 500kVA, 4.16kV-480Y/277V padmount transformer installed in the outdoor yard at the facility. 500kVA padmount transformer inturn serves an 800A, 480Y/277V switchboard located in the first floor electrical room.

Crafton Center Building was recently constructed in 2014 and the electrical distribution system is new and in excellent working condition.

Crafton Center Outdoor Padmount Transformer and Selector Switch

Crafton Center Main Switchboard

BUILDING 7

LRC located on the south side of the campus is presently served from feeder 'D' and has no redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'D'. Radial feeder originating from manhole EMH-25 traverses south to serve a 5kV Load interrupter Switch, 1500/1995kVA, 4.16kV-480Y/277V substation transformer and 2000A, 480Y/277V Switchboard. 250kW, 480V diesel fired genberator presently provide backup power requirements to the facility. Electrical distribution system at the building is approximately 10 years old and is in excellent working condition.

LRC Generator

LRC Electrical Yard

LRC Unit Substation

BUILDING 8

Central Plant on the central quad on the campus is located adjacent to the main switchgear campus and presently has a dedicated feeder 'E' that serves the facility. Radial feeder 'E' originating from switchgear to serve a 5kV Load interrupter Switch, 1000kVA, 4.16kV-480Y/277V substation transformer.

Central Plant Chiller

Central Plant Unit Substation

Central Plant Electrical Room

Electrical distribution system at the building is approximately 10 years old and is in excellent working condition.

BUILDING 9

Performing arts facility located on the south side of the campus is presently served from feeder 'D' and has no redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'D'. Radial feeder originating from manhole PB-2 traverses east to serve a 5kV Load interrupter Switch, 500kVA, 4.16kV-480Y/277V dry type transformer and 800A, 480Y/277V Switchboard.

5kV load interrupter switch was recenty installed in 2012 and is in excellent working condition. Majority of the electrical distribution system including 500kVA transformer and 600A switchboard were installed as part of original building construction and are at the end of their useful life.

Performing Arts Uninterruptible Power Supply

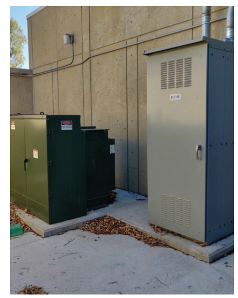
Performing Arts Main Switchboard

Performing Arts Dry Type Transformer and Load Interrupter Switch

BUILDING 10

Central Complex facility located along the central quad of the campus is presently served from feeder 'B' and has redundancy of isolating the service to the building without interrupting service to the other buildings being served from feeder 'G'. Radial feeder originating from selector switch 'HVS-LADM' serves a 500kVA, 4.16kV-480Y/277V padmount transformer and 800A, 480Y/277V switchboard installed in the outdoor yard at the facility.

Central complex Building was recently renovated in 2014 with majority of the electrical distribution system being new and in excellent working condition.



LADM Electrical Yard

LADM Electrical Room

LADM Electrical Room

LADM Electrical Room

BUILDING 11

Chemical Health Sciences Building located on the south side of the campus is presently served from feeder 'C' and has no redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'C. Radial feeder originating from manhole EMH-11 traverses east and south to serve a 5kV Load interrupter Switch, 500kVA, 4.16kV-480Y/277V transformer and 800A, 480Y/277V Switchboard.. 5kV load interrupter switch was recently installed in 2012 and is in excellent working condition. Majority of the electrical distribution system including 500kVA transformer and 600A switchboard were installed as part of original building construction and are at the end of their useful life.

Chemical Health Sciences Electrical Room

Chemical Health Sciences Load Interrupter Switch

Chemical Health Sciences Electrical Room

BUILDING 12

Canyon Hall located along the east side of the campus is presently served from feeder 'C' and has no redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'C. Radial feeder originating from manhole EMH-12 traverses south to serve a 5kV duplex Load interrupter Switch, 750/1000kVA, 4.16kV-480Y/277V transformer and 1200A, 480Y/277V Switchboard.

Canyon Hall was recently constructed in 2013 and the electrical distribution system is new and in excellent working condition.


Canyon Hall Electrical Yard


Canyon Hall Unit Substation


Canyon Hall Unit Electrical Yard

BUILDING 13-15

Visual Arts and East Complex Facility located on the east side of the campus is presently served from feeder 'F' and has redundancy of isolating the service to the building without interrupting service to the other buildings being served from feeder 'F'. Radial feeder originating from selector switch 'HVS-I' serves a 225kVA, 4.16kV-208Y120V padmount transformer and 800A, 208Y/120 switchboard located in the outdoor enclosure.

225kVA pad mount transformer and switchboard are approximately 10 years old and are in good working condition.


Visual Arts Electrical Yard


Visual Arts Main Switchboard

BUILDING 16

Public Safety and Allied Health Facility located on the east side of the campus is presently served from feeder 'F' and has no redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'C. Radial feeder originating from manhole EMH-31 traverses south to serve a 5kV duplex Load interrupter Switch, 500kVA, 4.16kV-480Y/277V transformer and 800A, 480Y/277V Switchboard.

Public Safety and Allied Health Facility was recently constructed in 2016 and the electrical distribution system is new and in excellent working condition.


Public Safety and Health Sciences Unit Substation


Public Safety and Health Sciences Uninterruptible Power Supply

BUILDING 17

Gymnasium complex located on the north side of the campus drive is presently served from feeder 'B' and has no redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'B. Radial feeder originating from manhole EMH-15 traverses south to serve a 5kV oil fused cutout Switch, 750kVA, 4.16kV-480Y/277V dry type transformer, 1000A, 480Y/277V Switchboard and a 225kVA, 4.16kV-208Y/120V dry type transformer and 800A, 208Y/120V Switchboard.

Electrical distribution system at the facility were installed as part of original building construction and are at the end of their useful life.


Gymnasium Complex Oil Switch


Gymnasium Complex Dry Type Transformer


Gymnasium Complex Oil Switch


Gymnasium Complex Dry Type Transformer

BUILDING 18

North complex located on the north side of the campus drive is presently served from gymnasium complex and does not have a dedicated 4.16kV service to the building and derives its service from the gymnasium building. 480V feeder originating from the gymnasium complex serves a 400A disconnect switch, 225kVA, 480-208Y/120V dry type transformer and 800A, 208Y/120V switchboard. Electrical distribution system at the facility is approximately 10 years old and in good working condition.

BUILDING 19-21

Aquatics complex located on the north side of the campus is presently served from feeder 'B' and has no redundancy of isolating the service to the building without affecting the other buildings being served from feeder 'B. Radial feeder originating from manhole EMH-LS traverses south to serve a 225kVA, 4.16kV-208Y/120V padmount transformer and 800A, 208Y/120V Switchboard.

Electrical distribution system at the facility was installed in 2009 and is in good working condition.

SOLAR FIELD

PV arrays located in the solar field of the north side of the campus provide approximately 1.25MW of solar energy to the campus. Radial 5kV, 350kcmil aluminum Feeder traverse radially south from the solar field to serve a 5KV Load interrupter switch installed adjacent to gymnasium complex. 5KV load interrupter switch is equipped with SCE utility meter and serves as a disconnection point to isolate the PV system with the campus system. Radial feeder 'B' originating from the load interrupter switch interconnects with the campus distribution system through t-body modular connections inside manhole EMH-15.

PV arrays and the associated feeders were installed in 2012 and are in excellent working condition.


North Complex Electrical Room


North Complex Electrical Room


Aquatics Complex Outdoor Padmount Transformer


Aquatics Complex Uninterruptible Power Supply


Solar Field PV Panels


Solar Field Electrical Yard

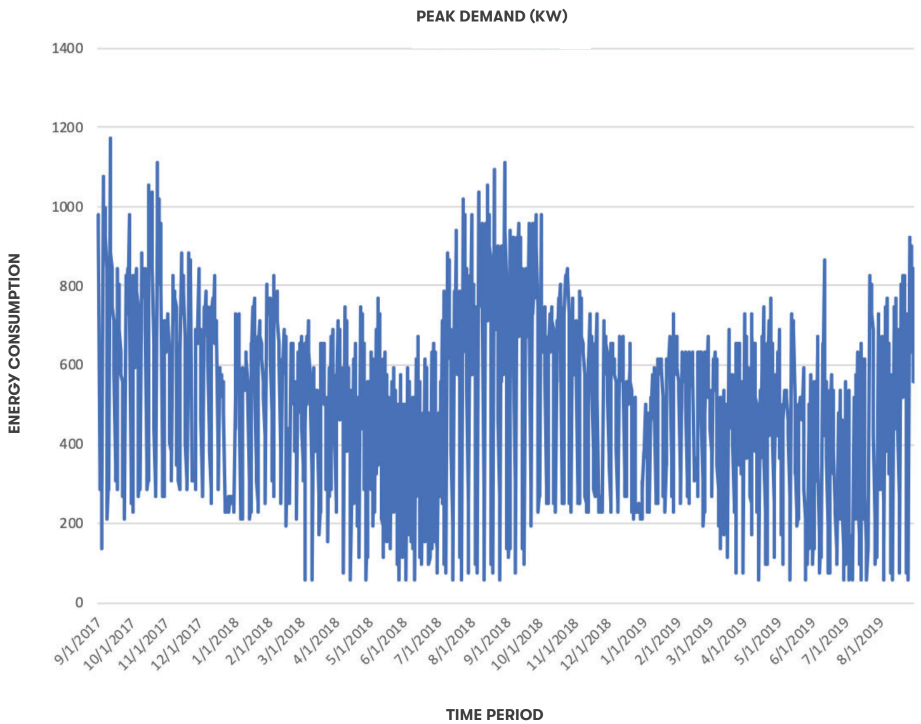

Solar Field Electrical Yard


Solar Field PV Panels

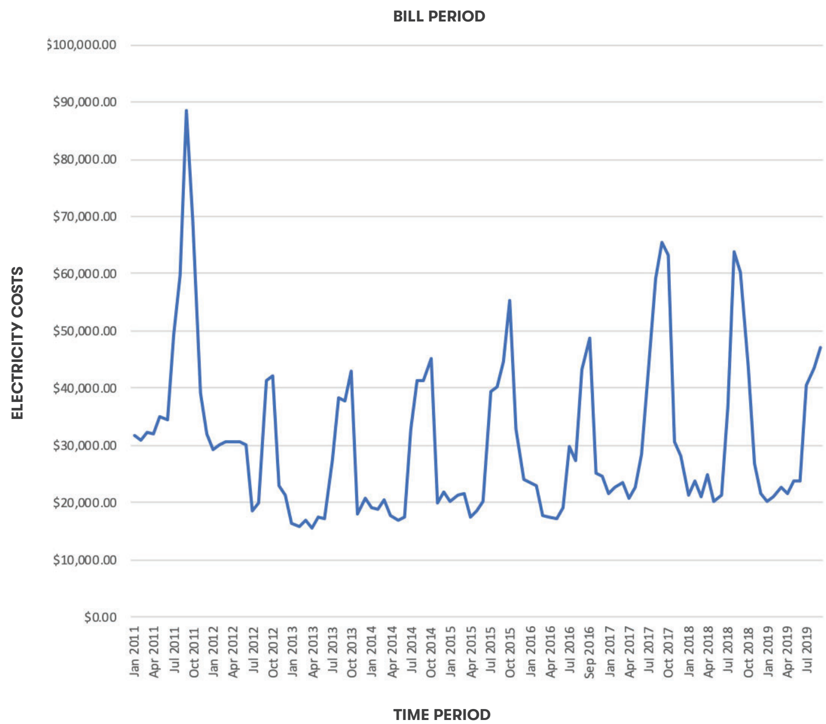

Solar Field PV Panels

SYSTEM EVALUATION

The peak demand seen by the campus varies between 1.17MW to 1.291MW. The mains switchgear can accommodate an overall capacity of 8,600KVA. Thus the main switchgear has adequate capacity to not only support existing loads but also has adequate spare capacity to support future loads. Graph below provides the total kW peak demand for the period September 2017 through August 2019:



Addition of 1250kw Solar farm on the north side of the campus has greatly offset the current electricity cost incurred by the campus, with a maximum bill of $65k monthly incurred in the summer months in the recent years. Below is a graph depicting the net electricity cost incurred by the college for the period January 2011-September 2019:



ANALYSIS OF FUTURE NEEDS

An analysis of the current 5kV distribution system was conducted to evaluate a) existing spare capacities available in each substations/feeders b) the impact of the proposed facilities on the existing electrical distribution system and c) modifications required to support the future build out of the campus. The current electrical distribution was also analyzed for electrical duct-banks/manholes that will be in conflict with the proposed facilities and will require relocation. A campus site plan identifying electrical duct-banks/manholes that require demolition/relocation and extension of feeders to new facilities to serve the planned facilities is provided at the end of the section for reference.

An evaluation of the existing electrical system currently serving the campus revealed that majority of the existing electrical infrastructure is old and at the end of their useful life. An evaluation of the existing loads revealed that feeders 'A' through 'G' capacities are of adequate capacities to support existing and future planned facilities. Based on load calculations, an estimated overall demand of approximately 1900kVA is anticipated for the campus. The existing switchgear and 5kV distribution system is sized adequately to serve the present demands and meet the future growth of the campus. In addition, an evaluation of the existing system revealed that the existing system provides no redundancy because of its open loop configuration. Since the campus operates and maintains the 5kV switchgear and the electrical distribution system, the campus requires an electrical system that must provide (a) Improved system reliability (b) ease of maintenance and isolation of circuits either during a fault or during a regular maintenance without interrupting power to every building on campus (c) be sized to accommodate existing loads and planned future loads resulting from new buildings addition as well as additions to existing buildings (d) be well coordinated to eliminate nuisance tripping of upstream protective devices (e) have all equipment listed for the short circuit availability at the point of installation.

FINDINGS AND RECOMMENDATIONS

A critical aspect in evaluating the reliability of a system is to study the failure rates from the utility and failure rates internal to the campus in the past. Discussions with the campus maintenance staff revealed that there have been minimum failures in the campus owned 5kV distribution system.

TABLE - BUILDING DEMAND LOADS BY FEEDERS

Feeder	Buildings	Transformer Size	Demand KVA(15% of transformer size)
A	**Child Development Center**	**300**	**45**
	Crafton Hall	**500**	**75**
	Site lighting lots A, B, C	500	75
	M&O/ **M&O Addition**	**1000**	**150**
	College Center	500	75
B	Liberal Arts	500	75
	Gymnasium	975	150
	Comm Tower	50	10
	Solar Field	1,250	
	Chemical health Science Building	500	75
	Canyon Hall	750	112.5
	Performing Arts Center	**500**	**75**
C	Spare	-	-
D	Spare	-	-
E	Central plant	1000	150
F	Aquatics	300	45
	Lot E, F, G, H, I, J	1000	150
	Gym	**750**	**110**
	Bookstore	300	45
	East Instructional Building	**500**	**75**
G	Clock Tower	500	75
	LRC	**1500**	**225**
	Instructional Building	**500**	**75**
Total			**1912.5kVA**

An evaluation of the existing loads revealed that feeders 'A' through 'G' capacities are of adequate capacities to support existing and future planned facilities. Based on load calculations, an estimated overall demand of approximately 1800kVA is anticipated for the campus.

An evaluation of both the above systems and the current layout of the electrical distribution at the campus revealed that a combination of a primary loop system would be economical and will provide the campus with the ability to isolate faults easily without interrupting power to the entire campus as well as provide a reliable service.

An evaluation of the capacities of the existing feeders revealed that the feeder are adequately sized to support the future planned facilities at the campus.

Following are thus our recommendations to upgrade the existing electrical infrastructure at the campus to (a) Improve system reliability (b) provide ease of maintenance and isolation of circuits either during a fault or during a regular maintenance without interrupting power to every building on campus (c) to provide adequate capacity of feeders to accommodate existing loads and planned future loads resulting from new buildings addition as well as additions to existing buildings (d) be well coordinated to eliminate nuisance tripping of upstream protective devices (e) have all equipment listed for the short circuit availability at the point of installation.

- Provide new 5kV switches close to each proposed building to enable isolation of feeders during a fault condition and for ease in undertaking maintenance work.
- Replace ageing existing 5kV medium voltage feeders routed as part of the underground distribution system.
- Replace existing manholes and pull boxes which have aged and are at the end of their useful life. Majority of the manholes, pull boxes and underground structures are not adequately sized to meet current code requirements and provide limited ease in maintenance.
- Replace existing substations at buildings that have electrical distribution installed since the inception of the building.
- Provide sub metering at each building to monitor demand at each building.
- Replace existing digital energy meter presently being utilized at the campus to avoid nuisance and maintenance issues of gathering information and remote monitoring. Provide meters with open protocol to avoid sole sourcing the meters for all future projects.

The campus however needs to have a complete redundant system to help isolate each building on campus and also be able to conduct maintenance on a feeder without affecting power service to each building on campus.

In order to provide the campus with redundancy and capability of scheduling maintenance on high voltage equipment without interrupting power to the campus, a closed loop configuration and system is recommended.

Primary loop system would provide the campus with the ease of isolating faults within the campus distribution system and minimize power interruptions to the buildings during maintenance on the medium voltage distribution system.

Below is a brief description of the two systems that were evaluated as part of our study.

- Primary loop system with isolating switches at each building.
- Primary selective system with isolating switches at each building.

Primary Loop System

A primary closed loop system with isolating switches at each building offers improved system reliability and service continuity in comparison to a radial distribution system. In this system, power is supplied continuously from two sources at the ends of the loop. A properly designed loop quickly recovers from a single cable fault with no continuous loss of power to utilization equipment.

A second important feature of the loop system is that a section of the cable may be isolated from the loop for repair or maintenance while other parts of the system are still functioning.

Primary Selective System

The primary selective system is comprised of two separate feeders that originate from the main switchgear and run to each isolating switch located at each building thereby providing a source of normal and alternate source of power. Upon failure of the normal source, the building is switched to the alternate source. Switching can be either automatic or manual, but there will be an interruption until load is transferred to the alternate source. Cost is higher for these systems as compared to a loop system because of the duplication of the primary cable and switchgear.

An evaluation of both the above systems and the current layout of the electrical distribution at the campus revealed that a primary loop system would be economical and will provide the campus with the ability to isolate faults easily without interrupting power to the entire campus as well as provide a reliable service. Relay settings associated with 5kV main breaker and branch breaker at the main switchgear shall be adjusted and programmed to accommodate the primary loop system and avoid any nuisance tripping of the breakers in future.

IMPLEMENTATION AND PHASING PLAN

The installation for new selector switches should be implemented at a time when class is not in session. This will minimize interruption of service to campus buildings.

Installation of medium voltage feeders and ductbanks shall be planned and implemented in a phased manner to minimize shutdown of service to campus buildings. Establishment of primary selective loop system is essential prior to upgrading existing underground structures including manholes and pullboxes to minimize longer shutdown of service to campus buildings.

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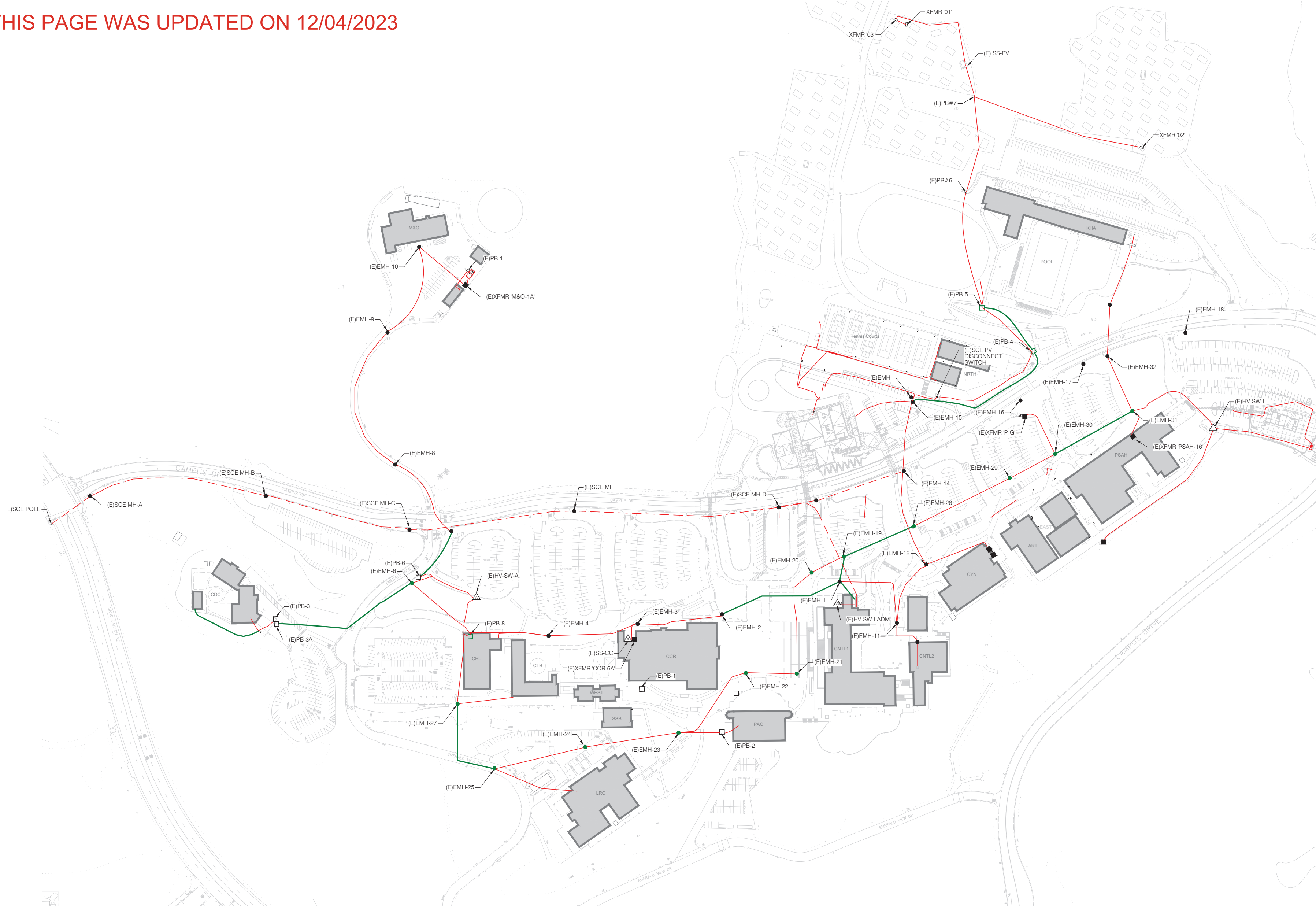

FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

EXISTING ELECTRICAL
ABANDONED ELECTRICAL
MANHOLE
TRANSFER SWITCH
PULLBOX
TRANSFORMER
SELECTOR SWITCH
DAMAGED/UNDERSIZED MANHOLE
OLD/AGING FEEDERS

BUILDING LEGEND

EXISTING BUILDING..............................
UNDER CONSTRUCTION.......................

SCALE: 1" = 100'
0 100

CRAFTON HILLS COLLEGE

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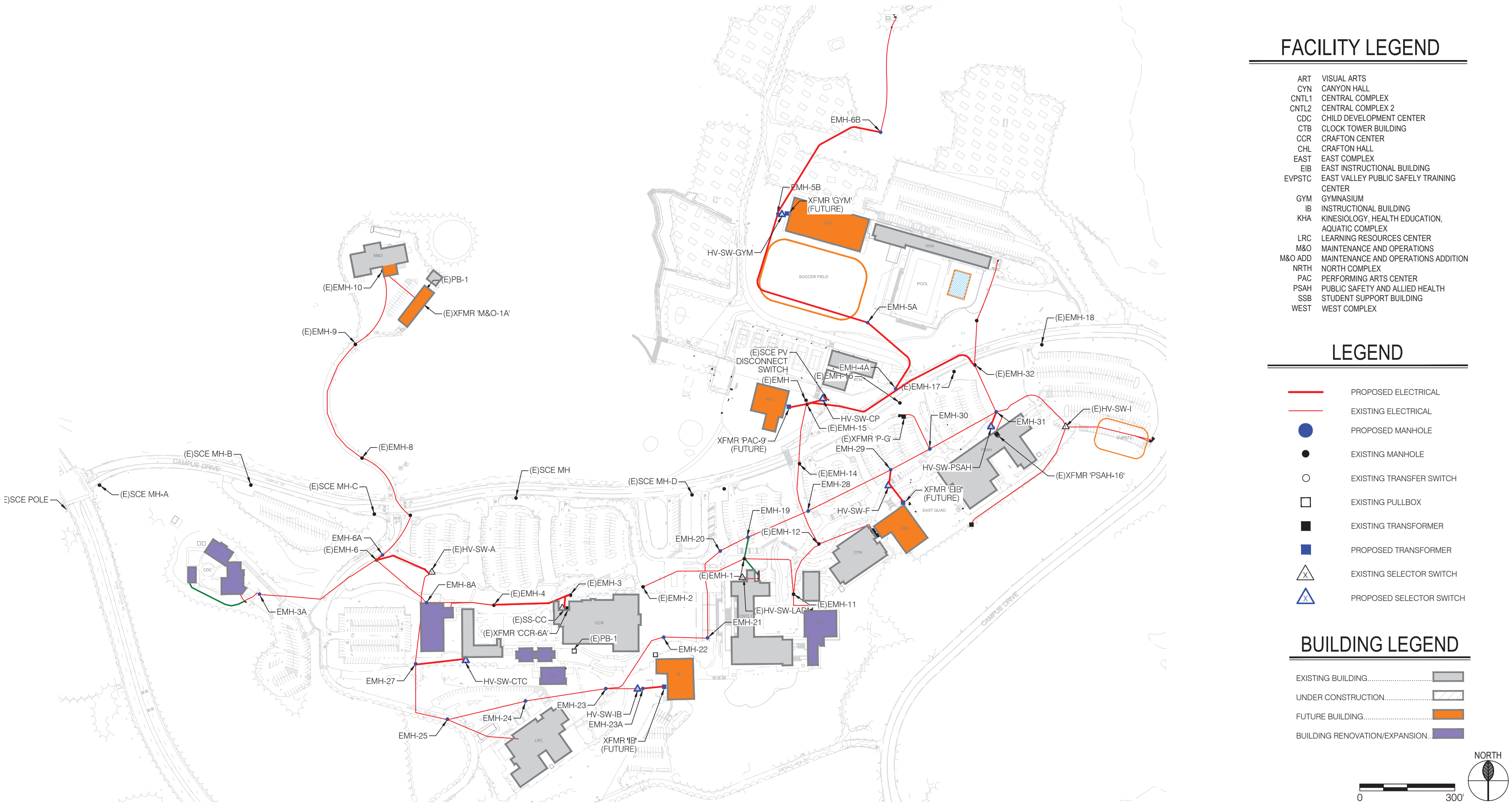
Existing Electrical Distribution System

Date: 12/04/2023

PROPOSED ELECTRICAL DISTRIBUTION SYSTEM



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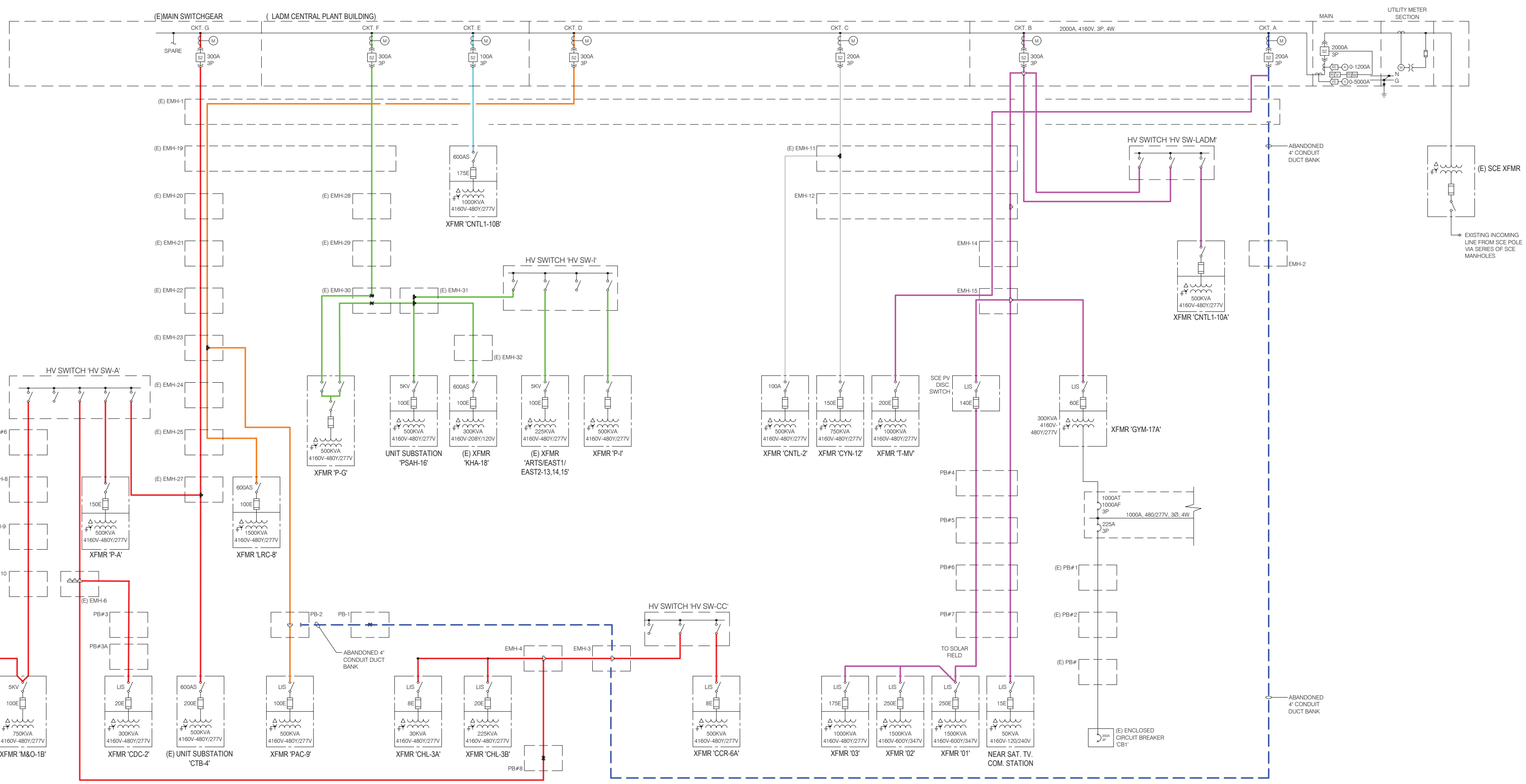

Crafton Hills College

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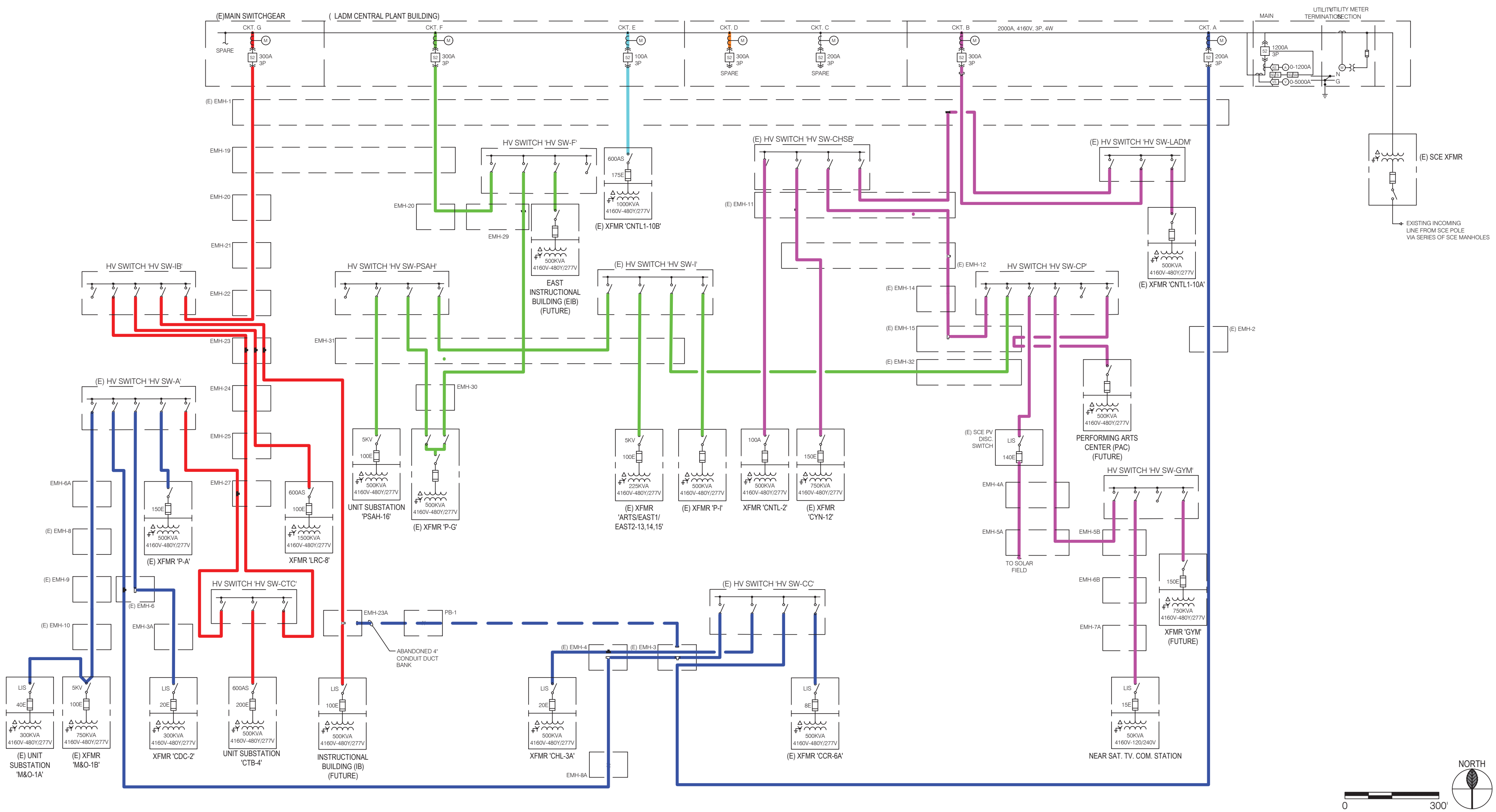
(562)497-2999
mohammad.wasif@p2sinc.com

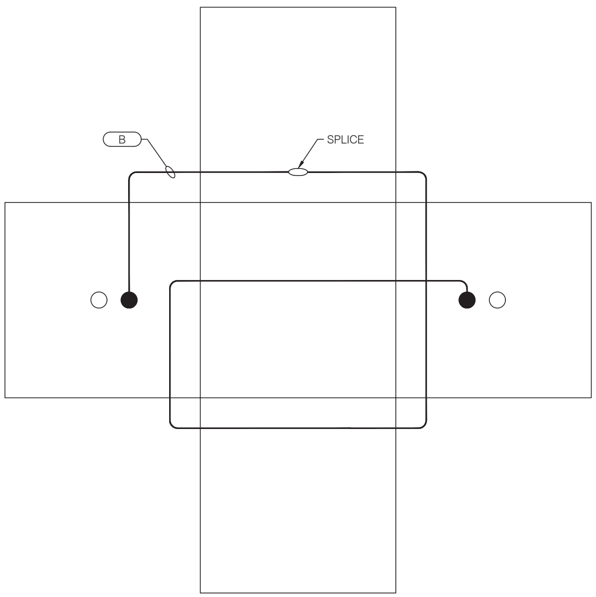
Existing Single Line Diagram

Date: 12/04/2023

PROPOSED SINGLE LINE DIAGRAM



EXISTING ELECTRICAL PULLBOX PROFILES



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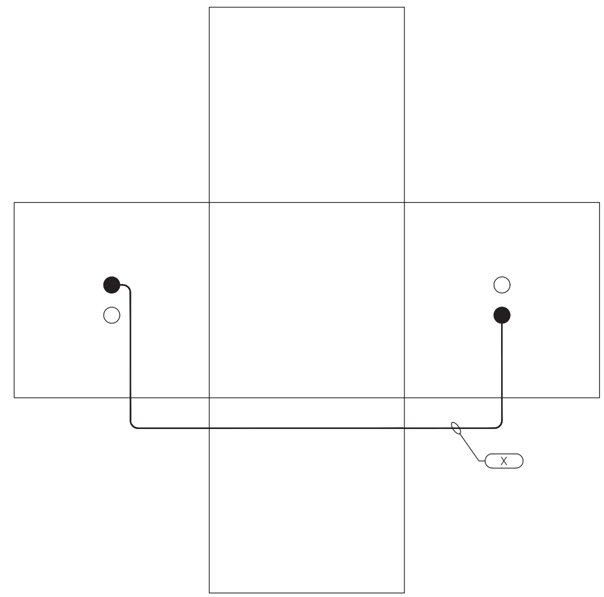

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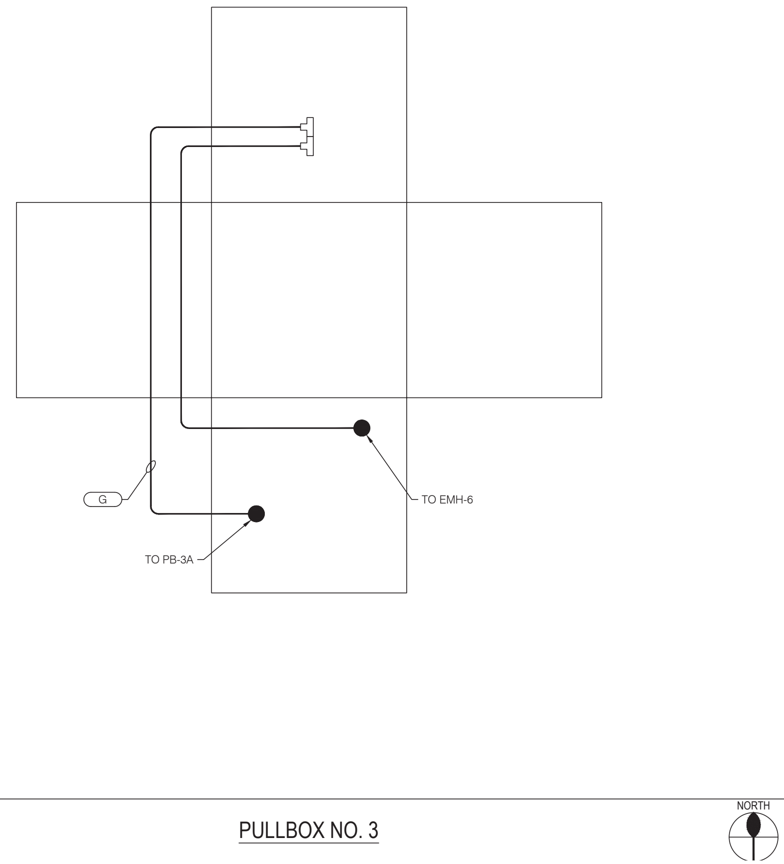

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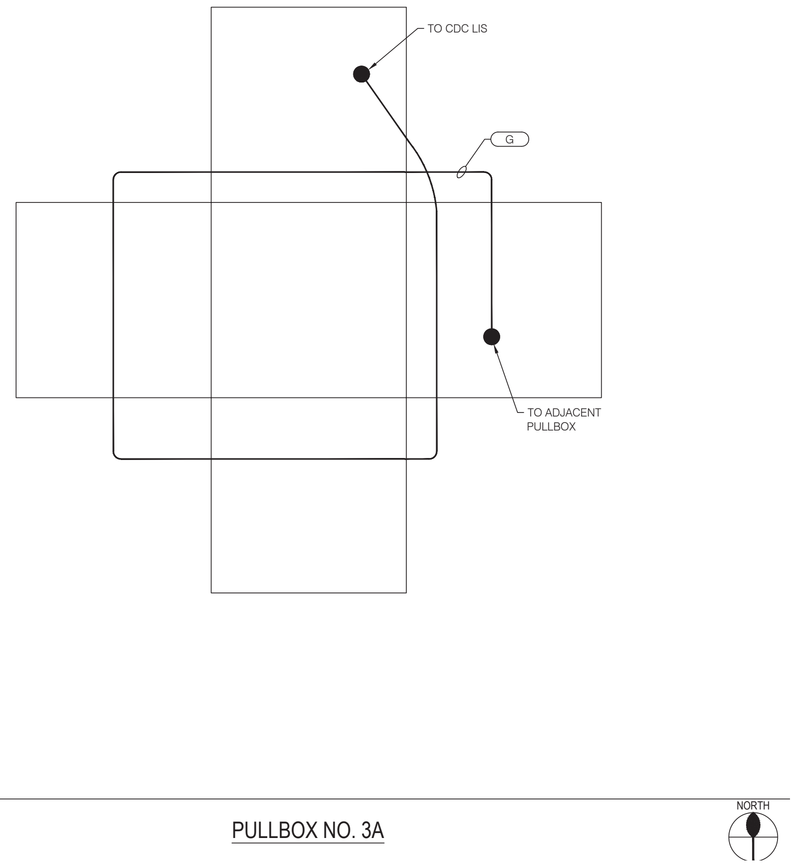
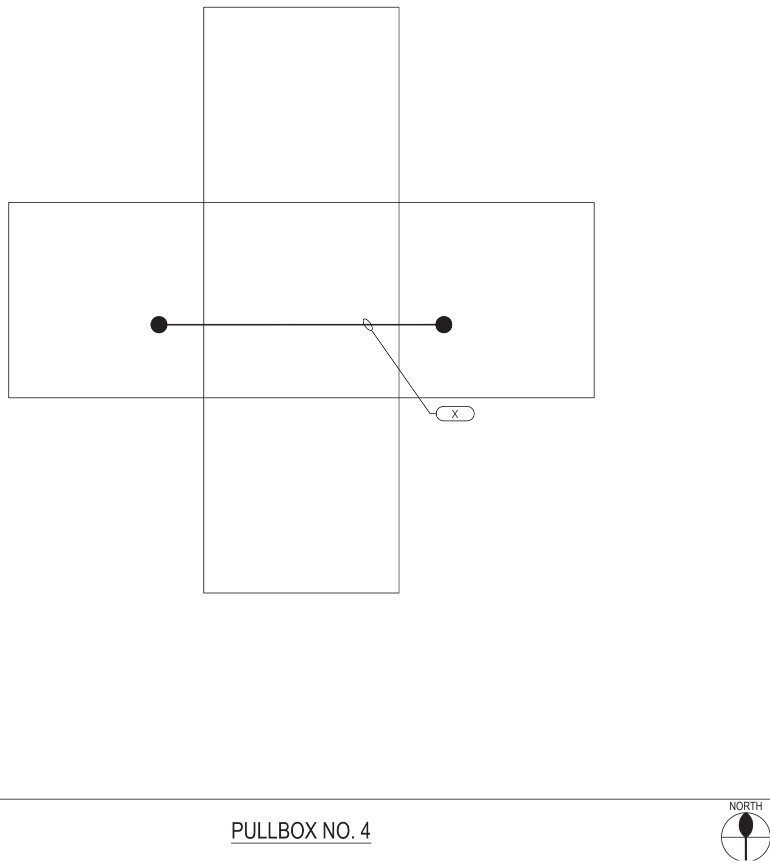


PULLBOX NO. 3A

EXISTING ELECTRICAL PULLBOX PROFILES



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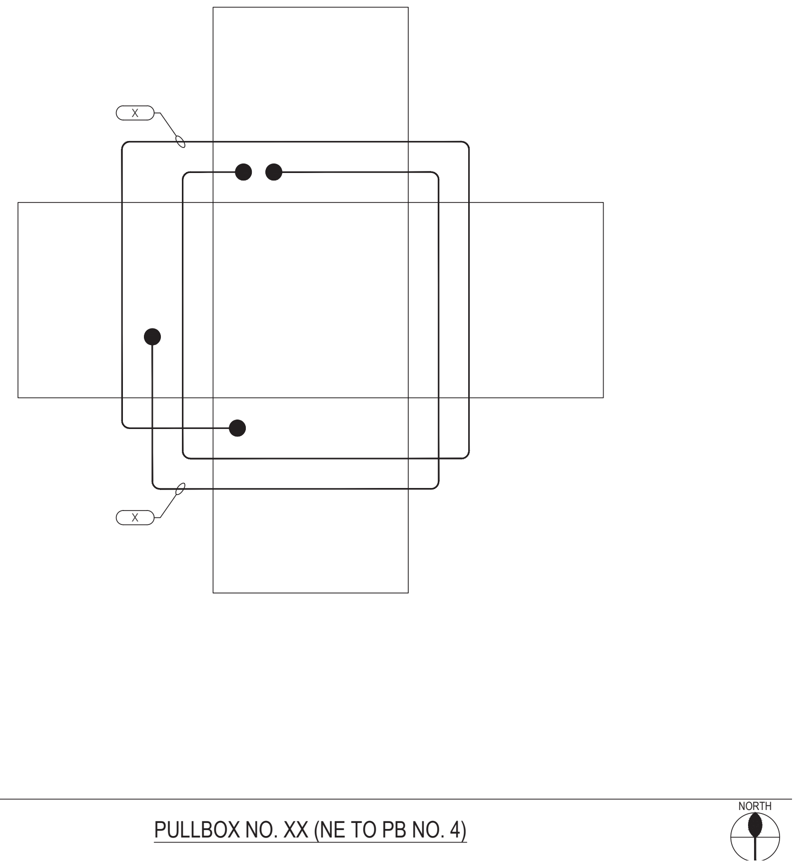
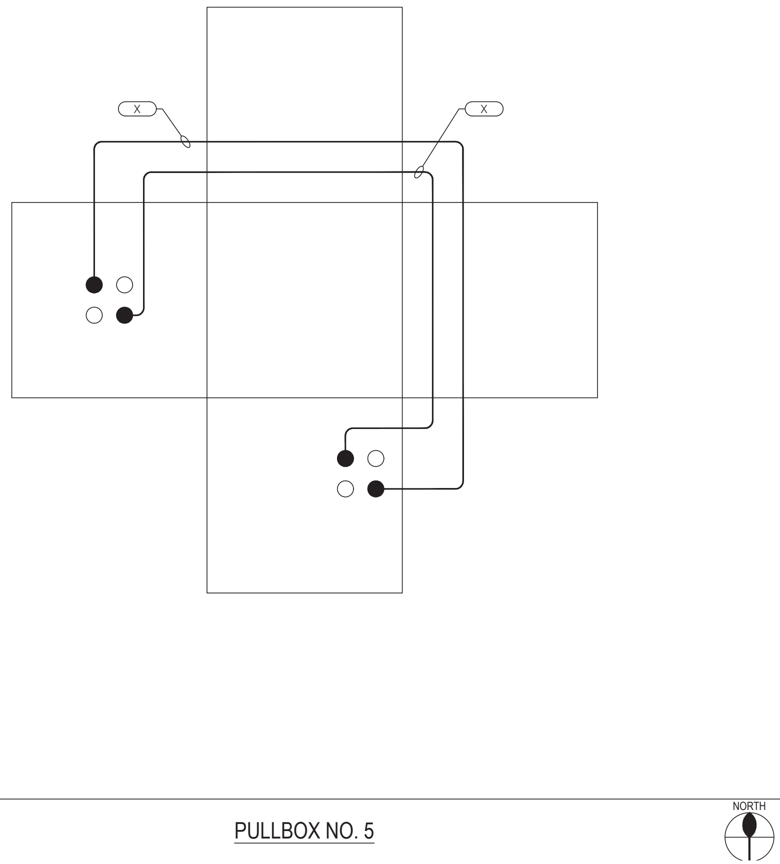


PULLBOX NO. XX (NE TO PB NO. 4)

EXISTING ELECTRICAL PULLBOX PROFILES



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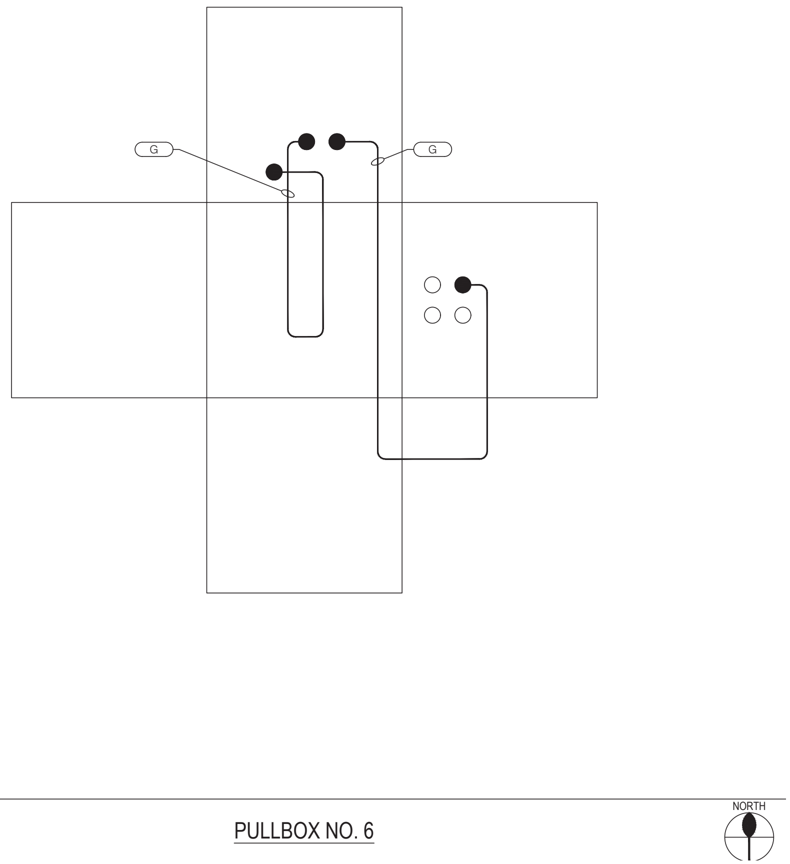

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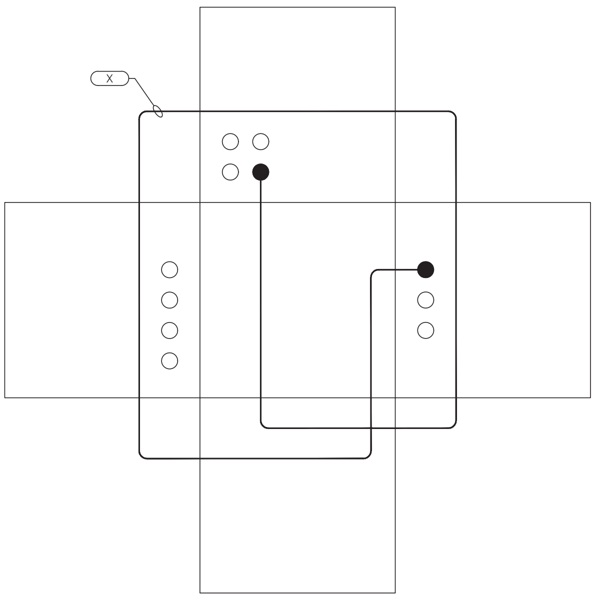
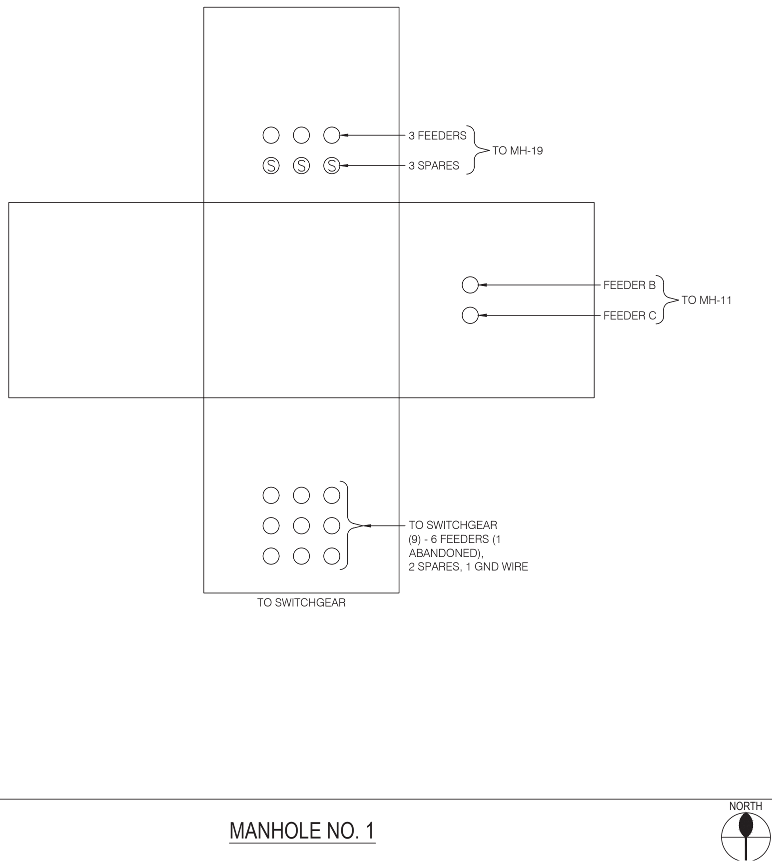
EXISTING ELECTRICAL PULLBOX PROFILES

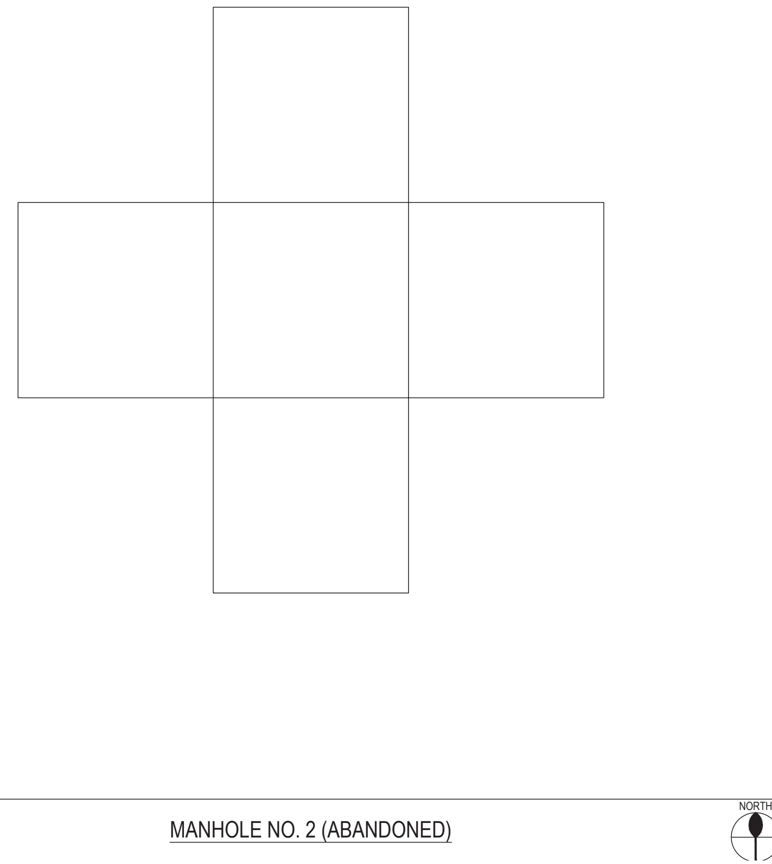


PULLBOX NO. 8

EXISTING MANHOLE PROFILES



MANHOLE NO. 1



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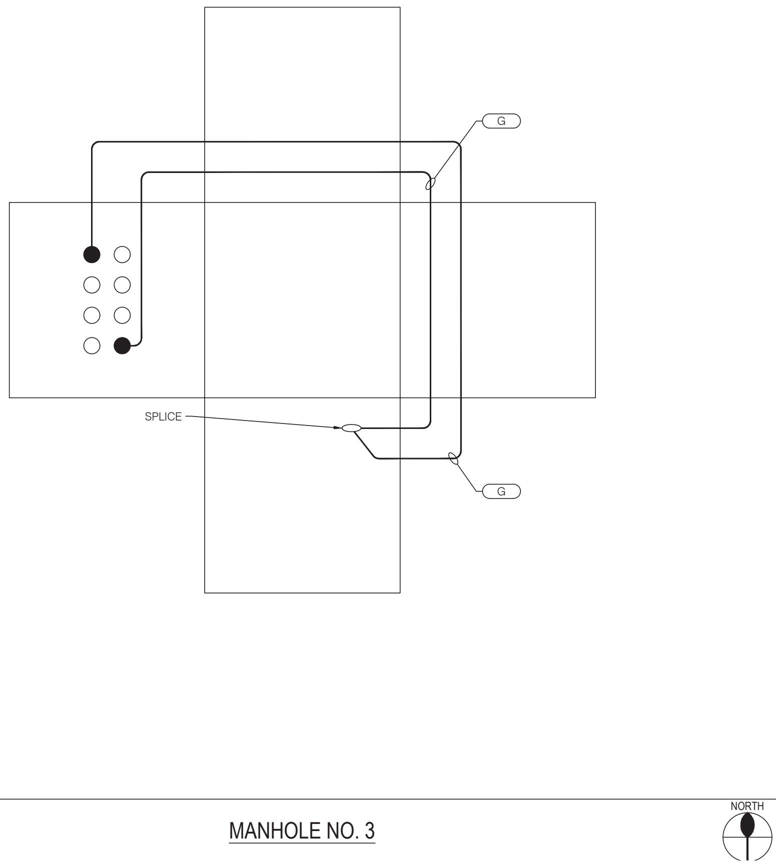

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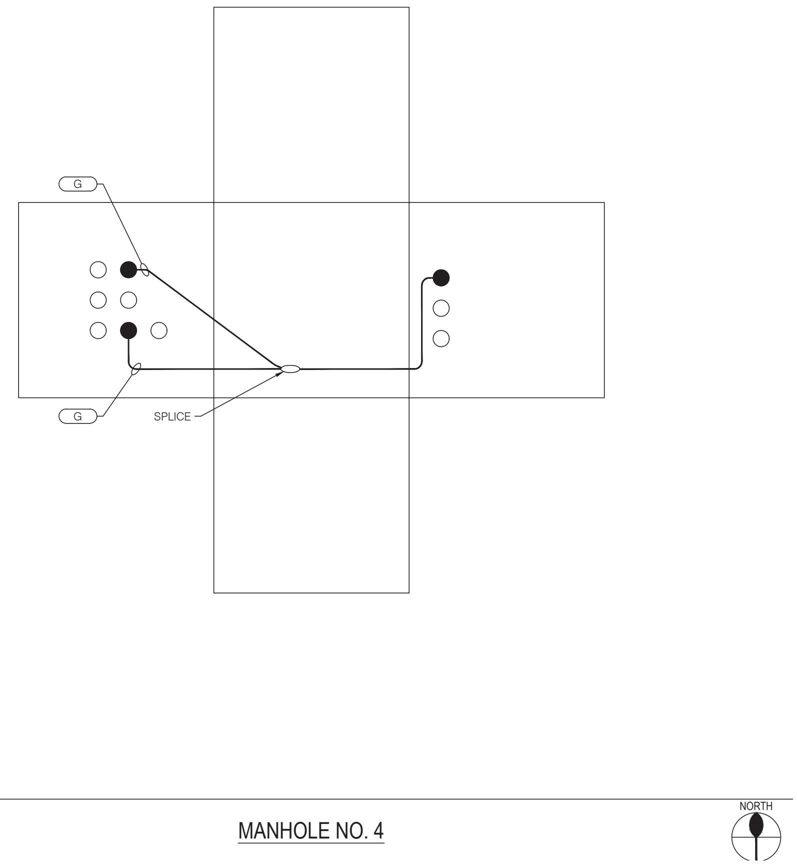

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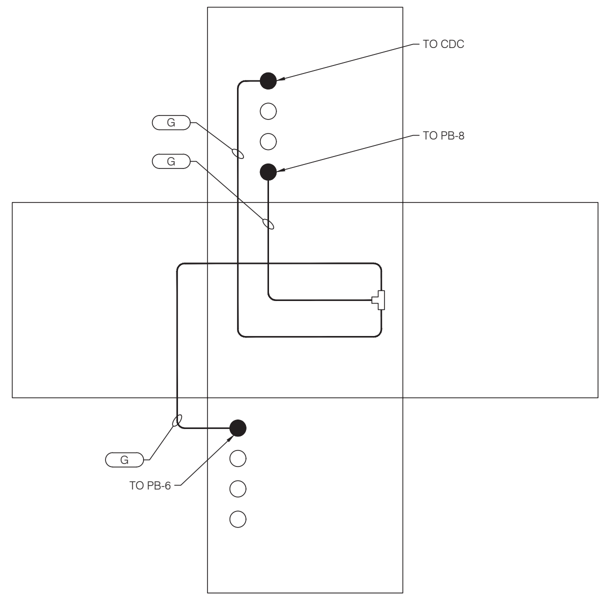
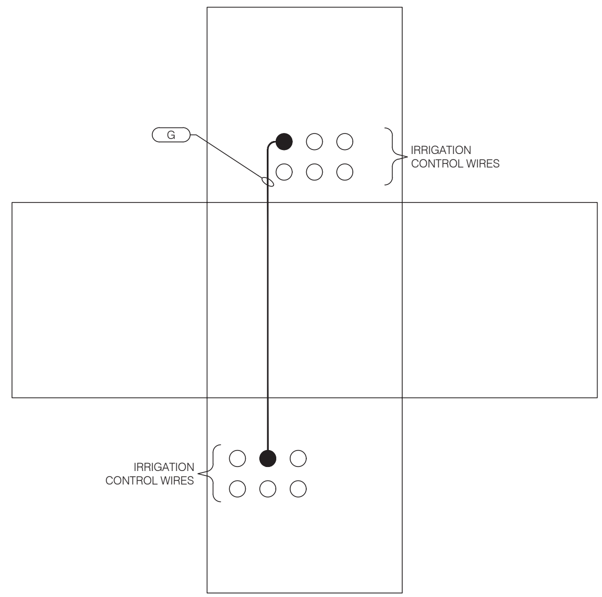
EXISTING MANHOLE PROFILES



MANHOLE NO. 6

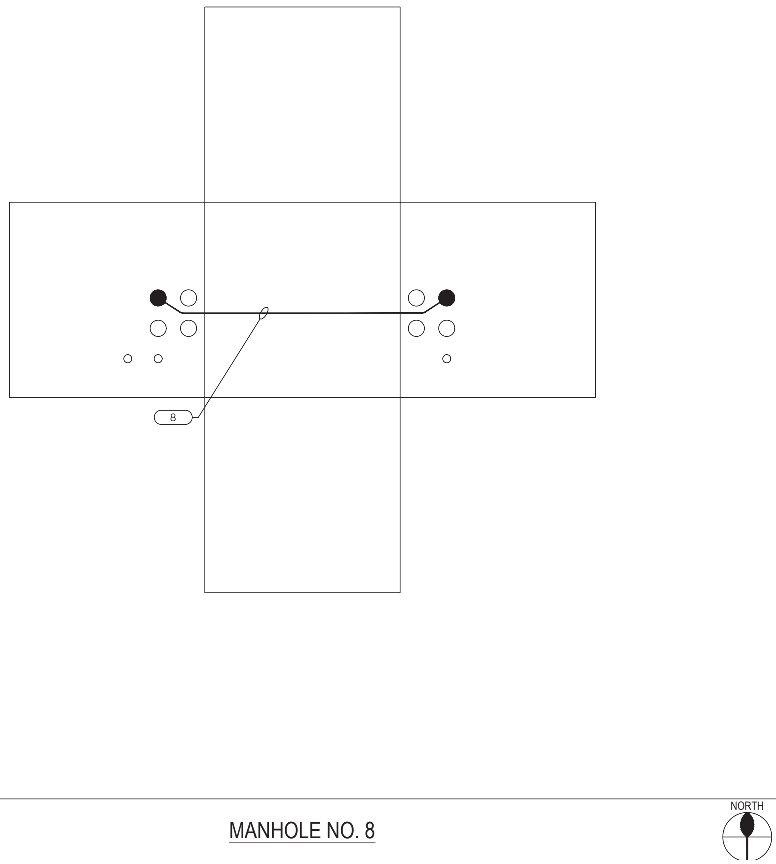
NORTH



MANHOLE NO. 7

NORTH

EXISTING MANHOLE PROFILES



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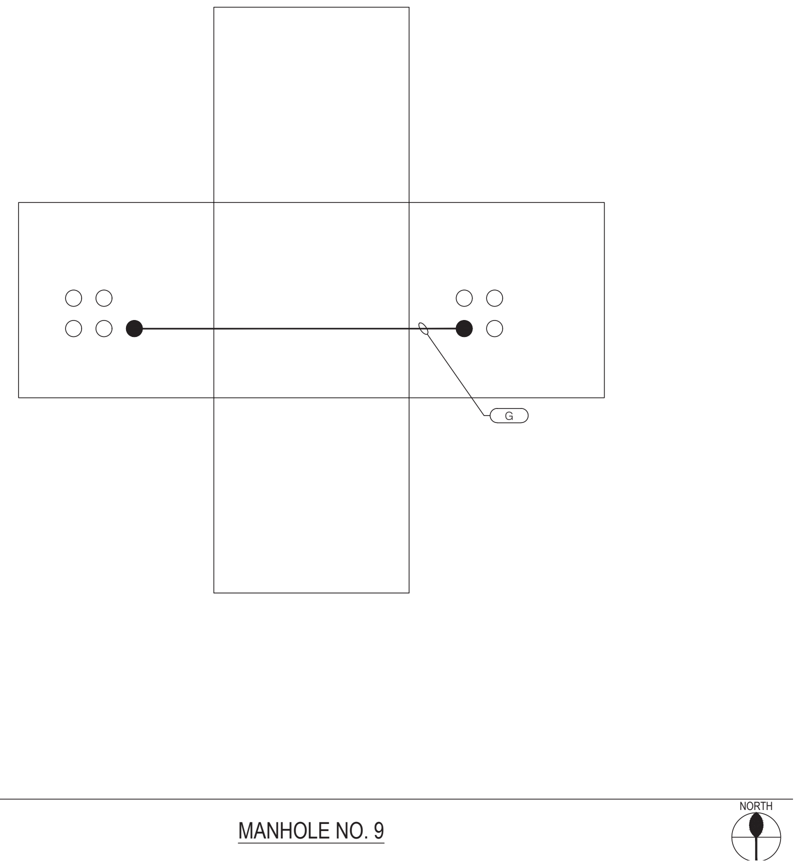

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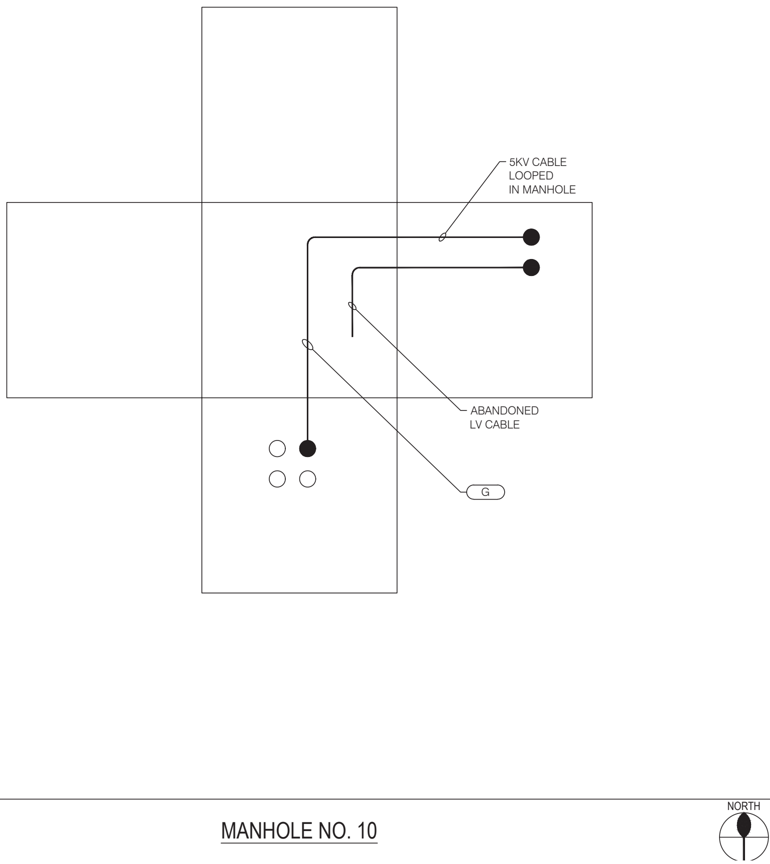
EXISTING MANHOLE PROFILES



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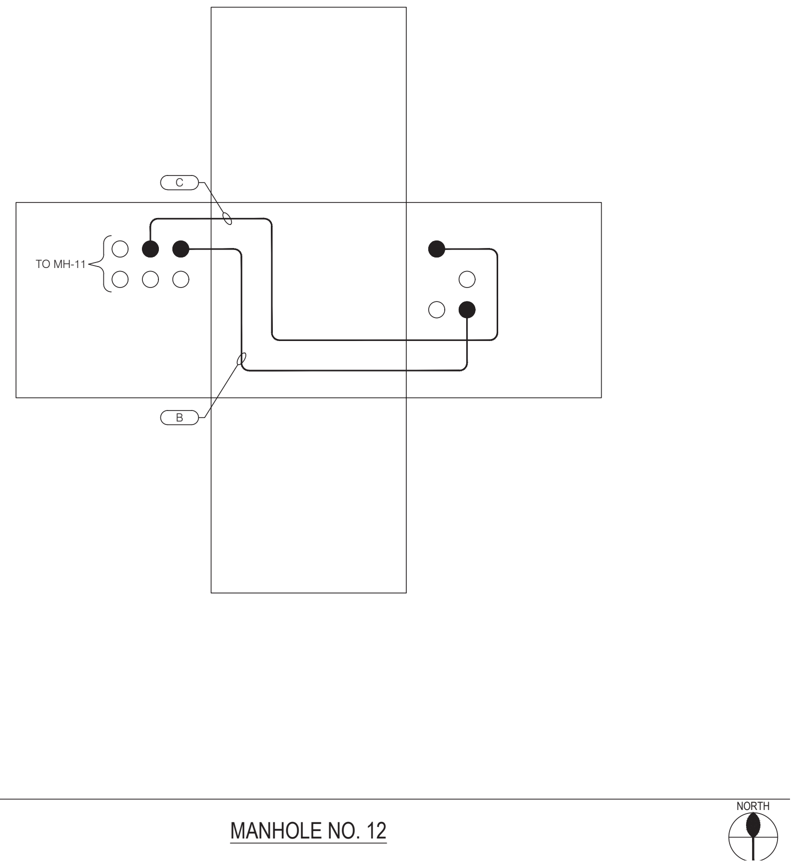
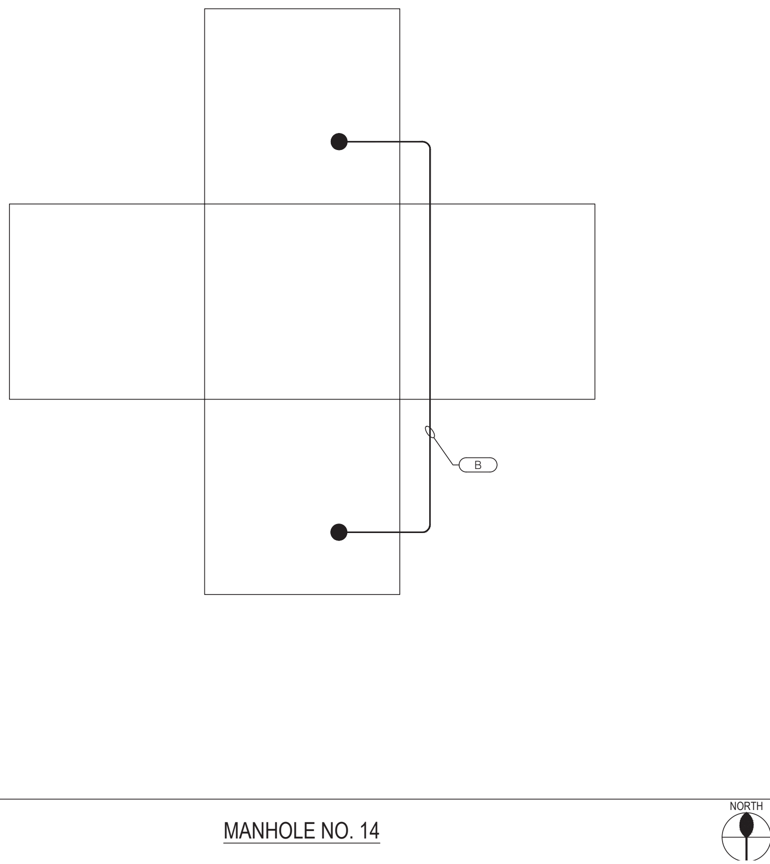


MANHOLE NO. 12

EXISTING MANHOLE PROFILES



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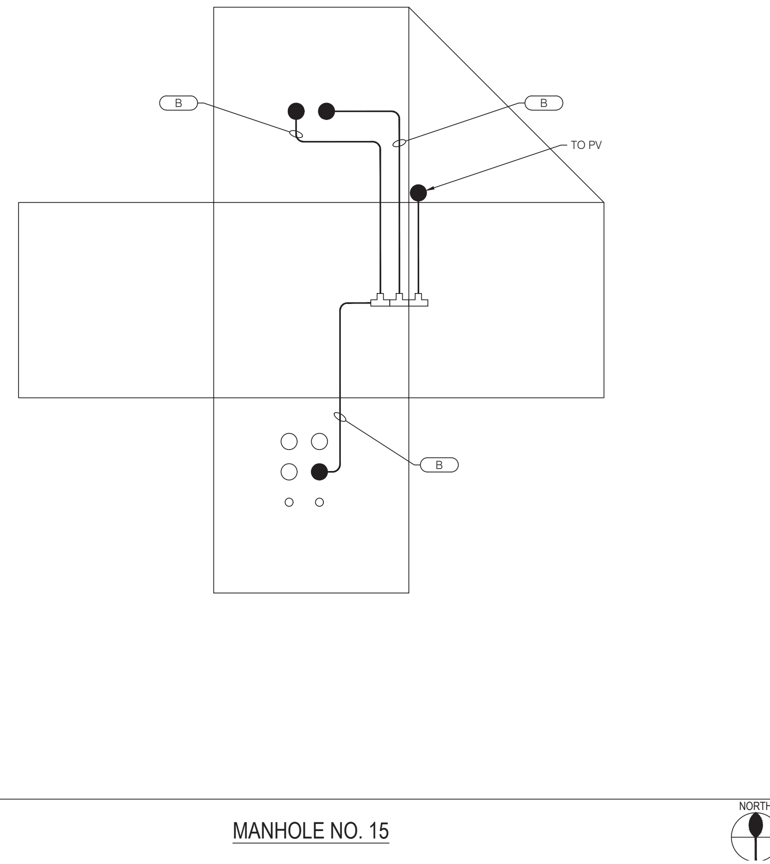
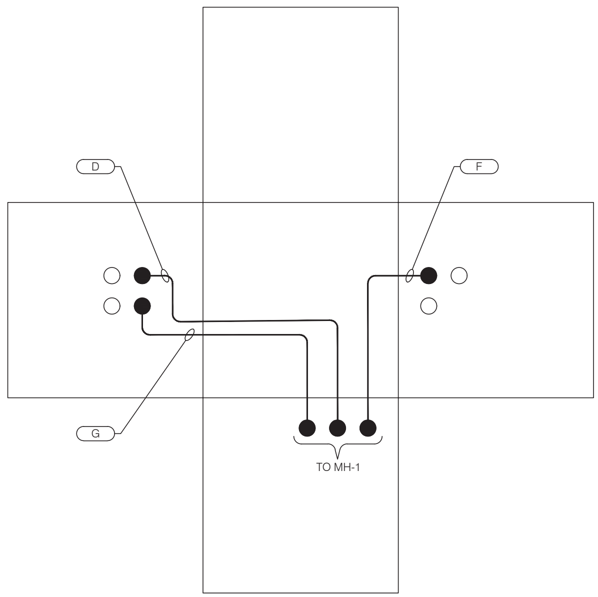


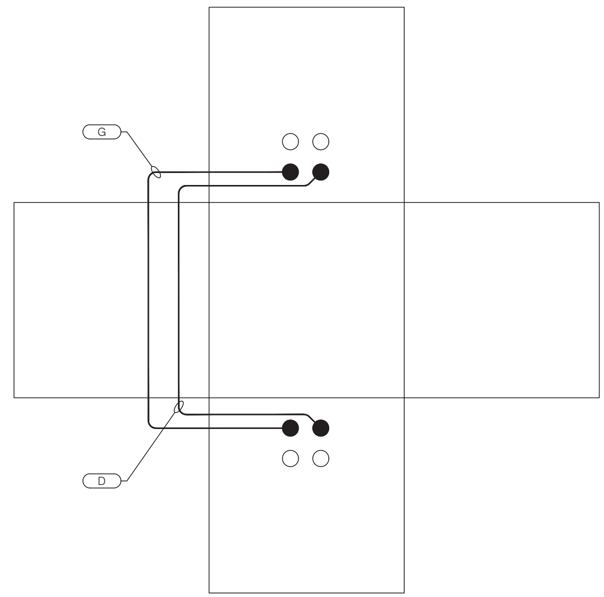
MANHOLE NO. 15

EXISTING MANHOLE PROFILES



MANHOLE NO. 19

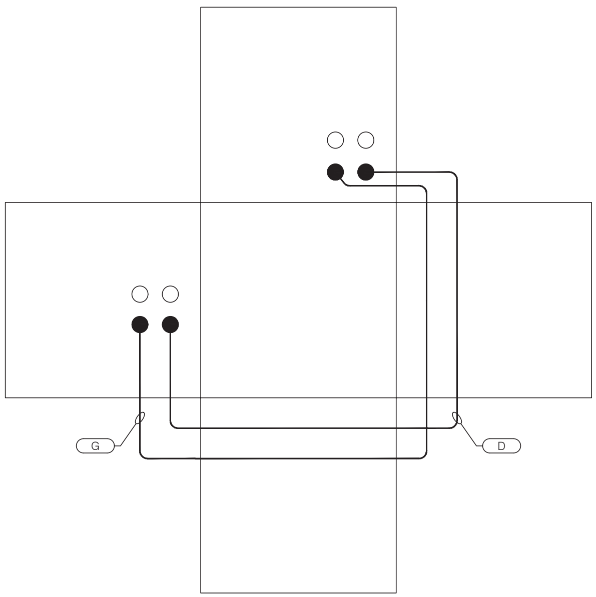
NORTH



MANHOLE NO. 20

NORTH

EXISTING MANHOLE PROFILES



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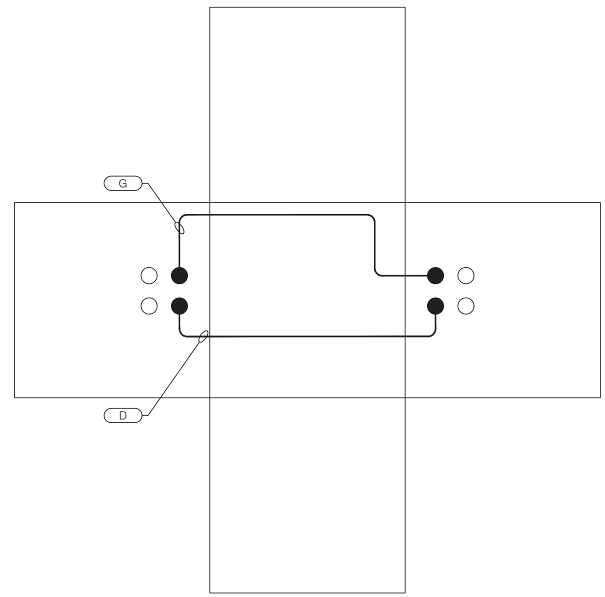
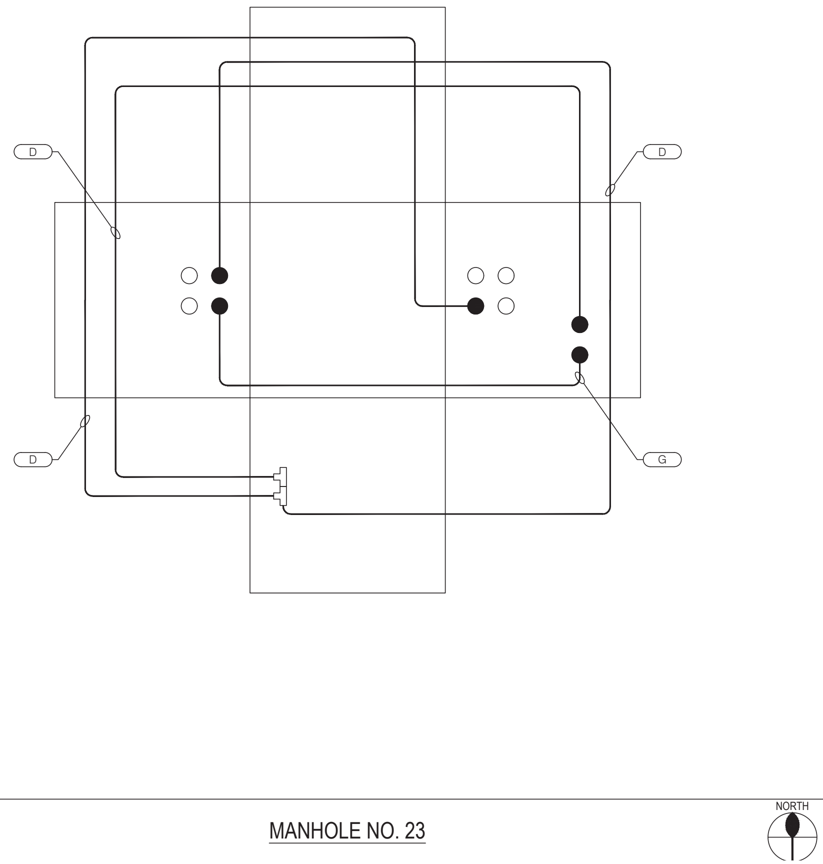


MANHOLE NO. 22

EXISTING MANHOLE PROFILES



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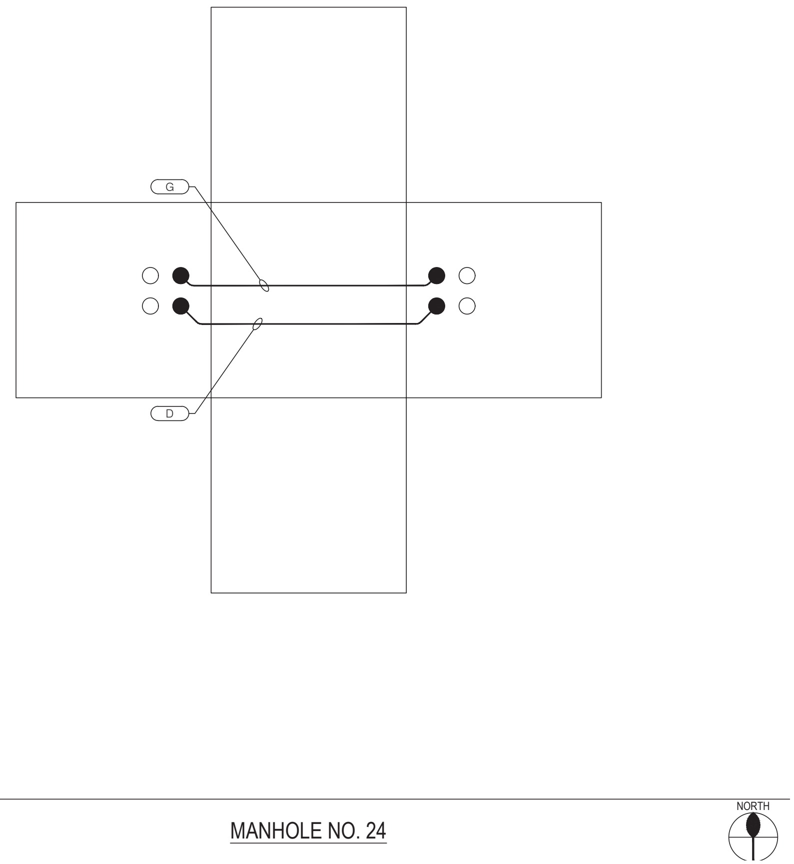
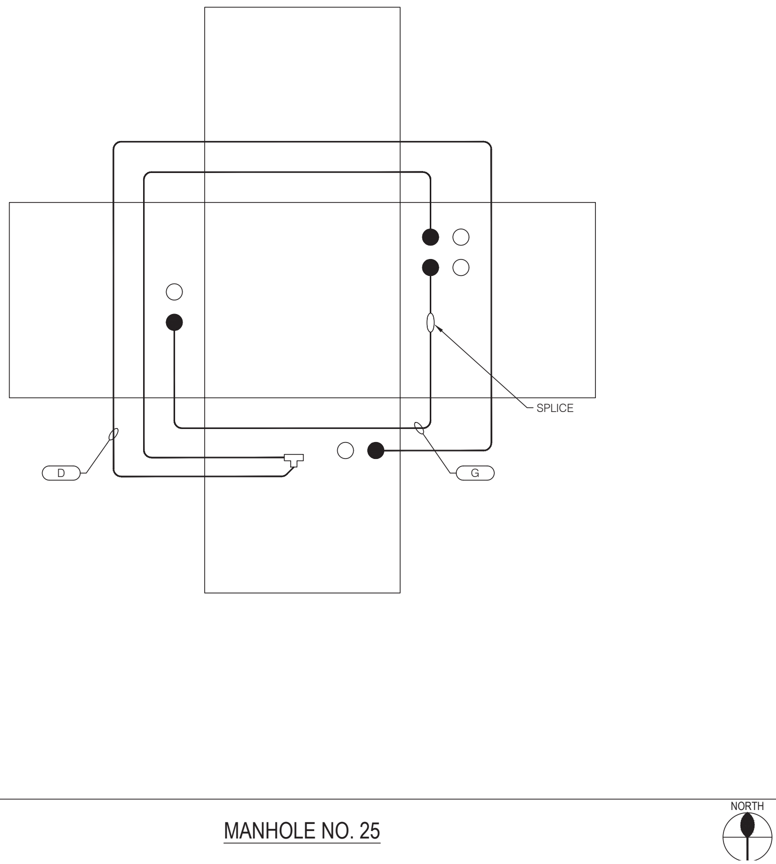


MANHOLE NO. 24

EXISTING MANHOLE PROFILES



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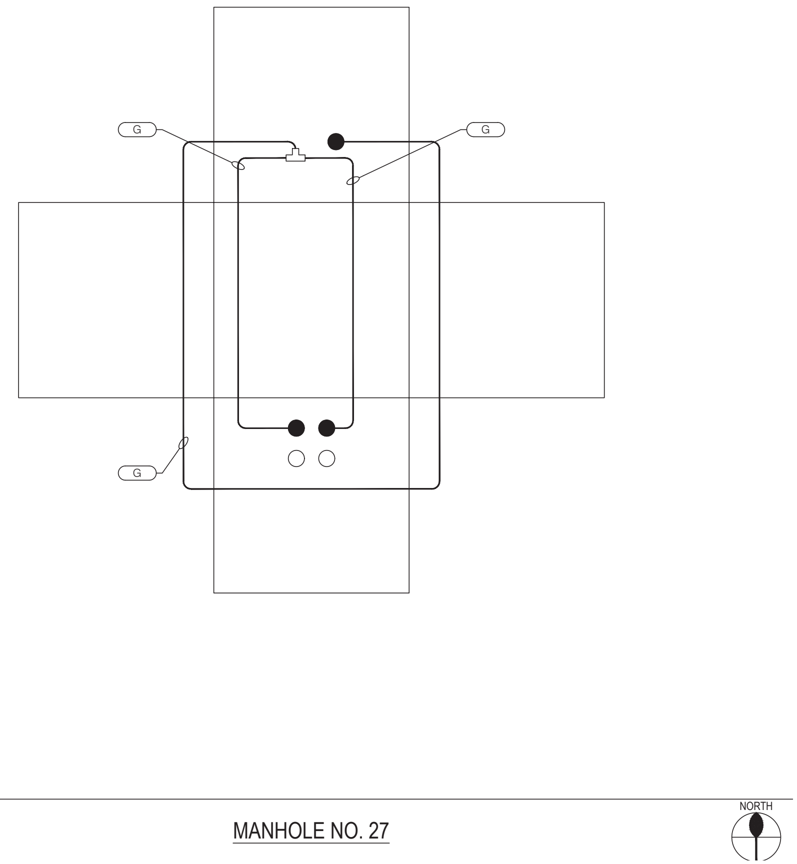
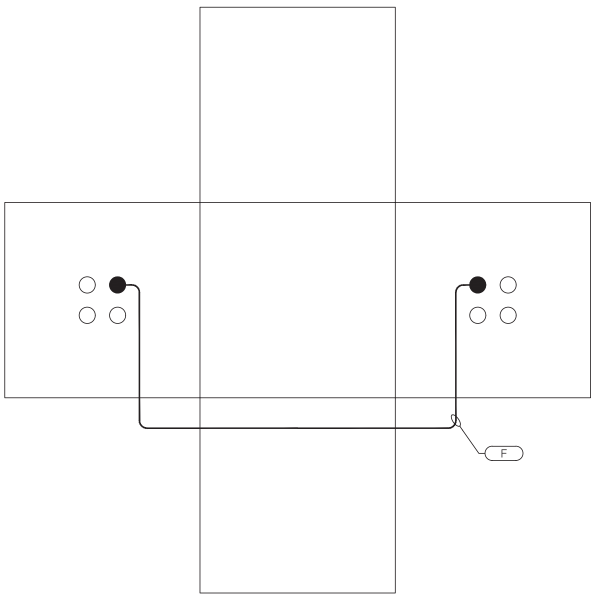


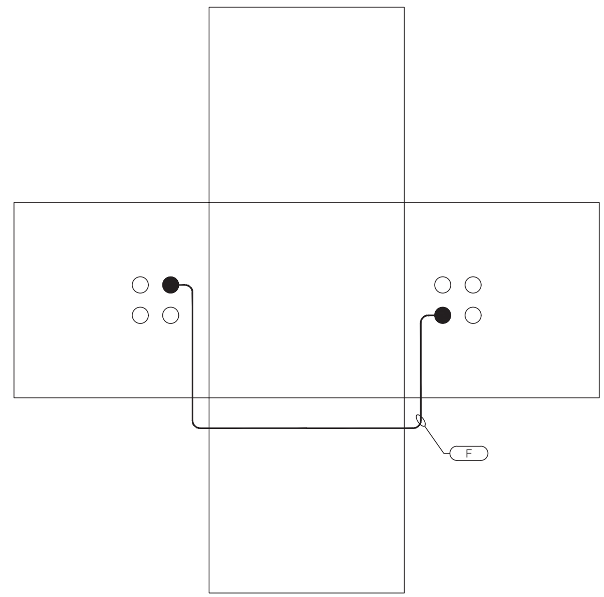
MANHOLE NO. 27

EXISTING MANHOLE PROFILES



MANHOLE NO. 28

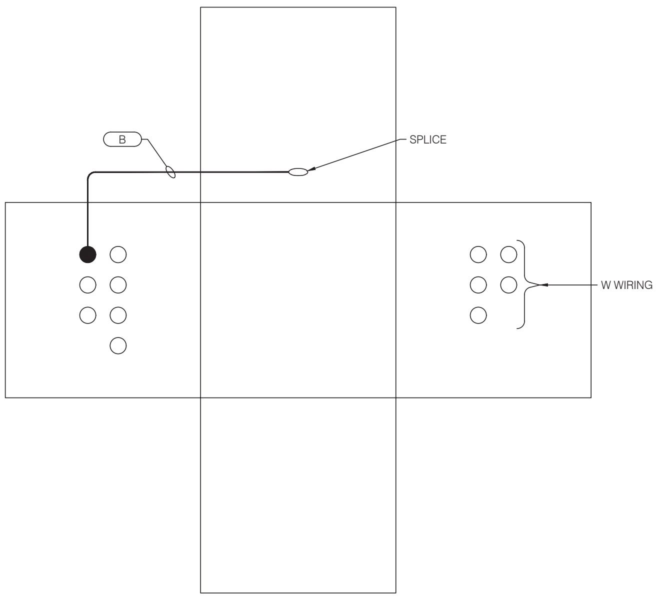
NORTH



MANHOLE NO. 29

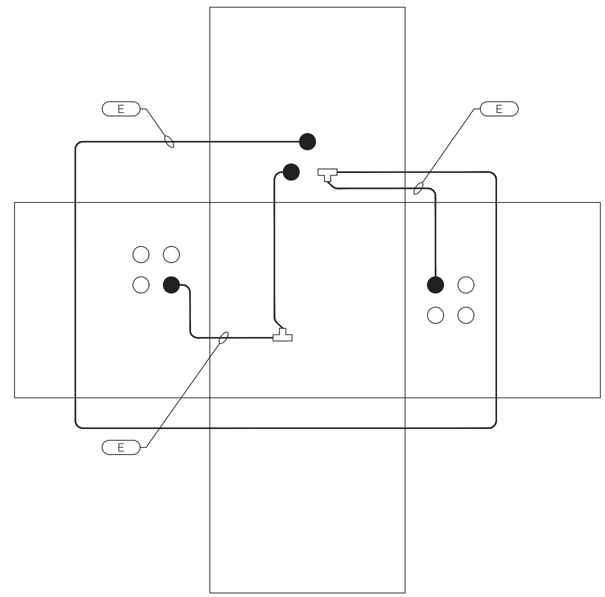
NORTH

EXISTING MANHOLE PROFILES



MANHOLE (SOUTH OF MH NO. 29)

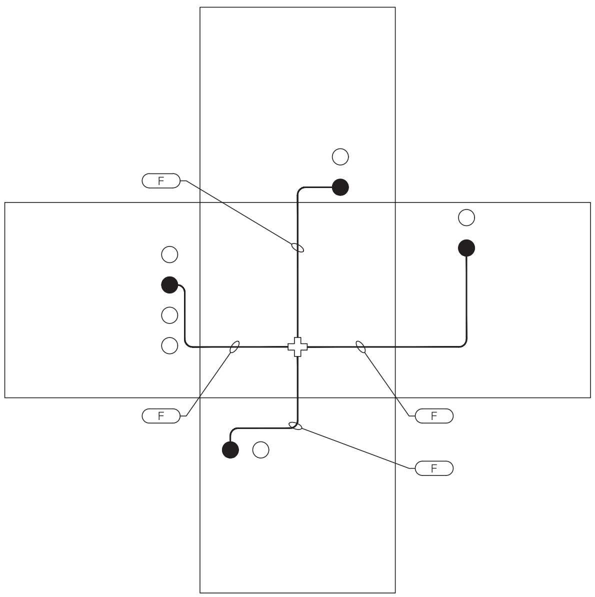
NORTH



MANHOLE NO. 30

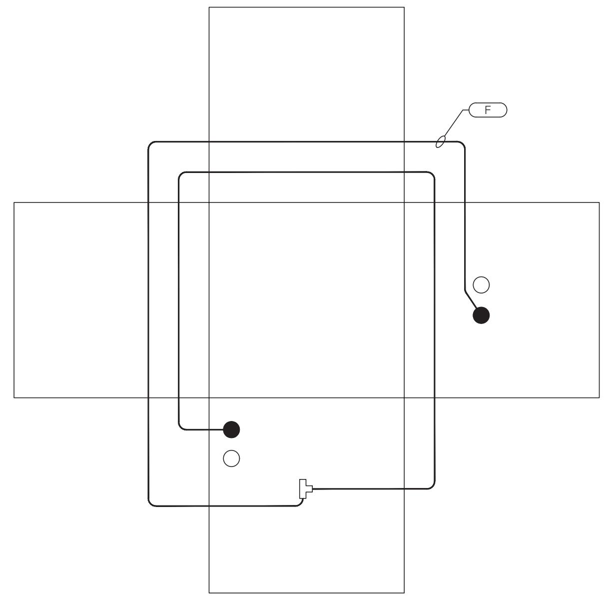
NORTH

EXISTING MANHOLE PROFILES



MANHOLE NO. 31

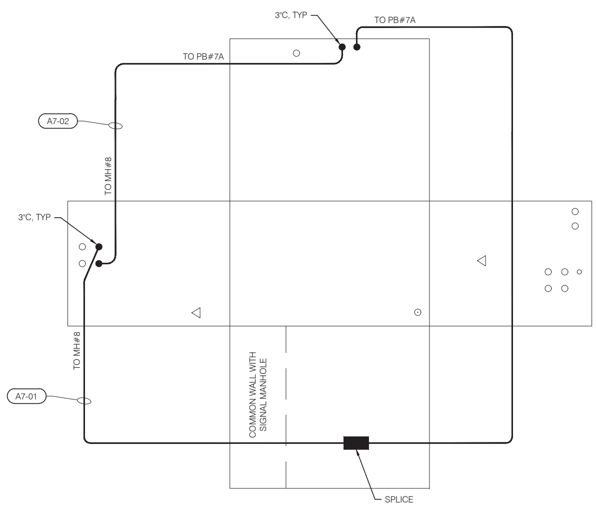
NORTH



MANHOLE NO. 32

NORTH

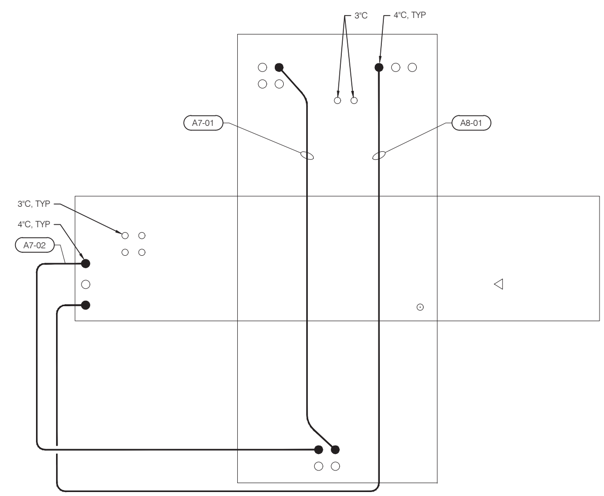
EXISTING MANHOLE PROFILES



SIZE = 5' X 8' X 6'-6" HT
NECK = 39"
SUMP PUMP - YES
LADDER - YES

MANHOLE NO. 7

NORTH



SIZE = 5' X 8' X 6'-6" HT
NECK = 92"
SUMP PUMP - YES
LADDER - YES

MANHOLE NO. 8

NORTH

EXTERIOR LIGHTING SYSTEM

The campus wide exterior lighting at Crafton Hills College presently consists of a wide variety of exterior light fixtures equipped with a broad range of lamp sources that currently illuminate the pathways and roadways of the campus.

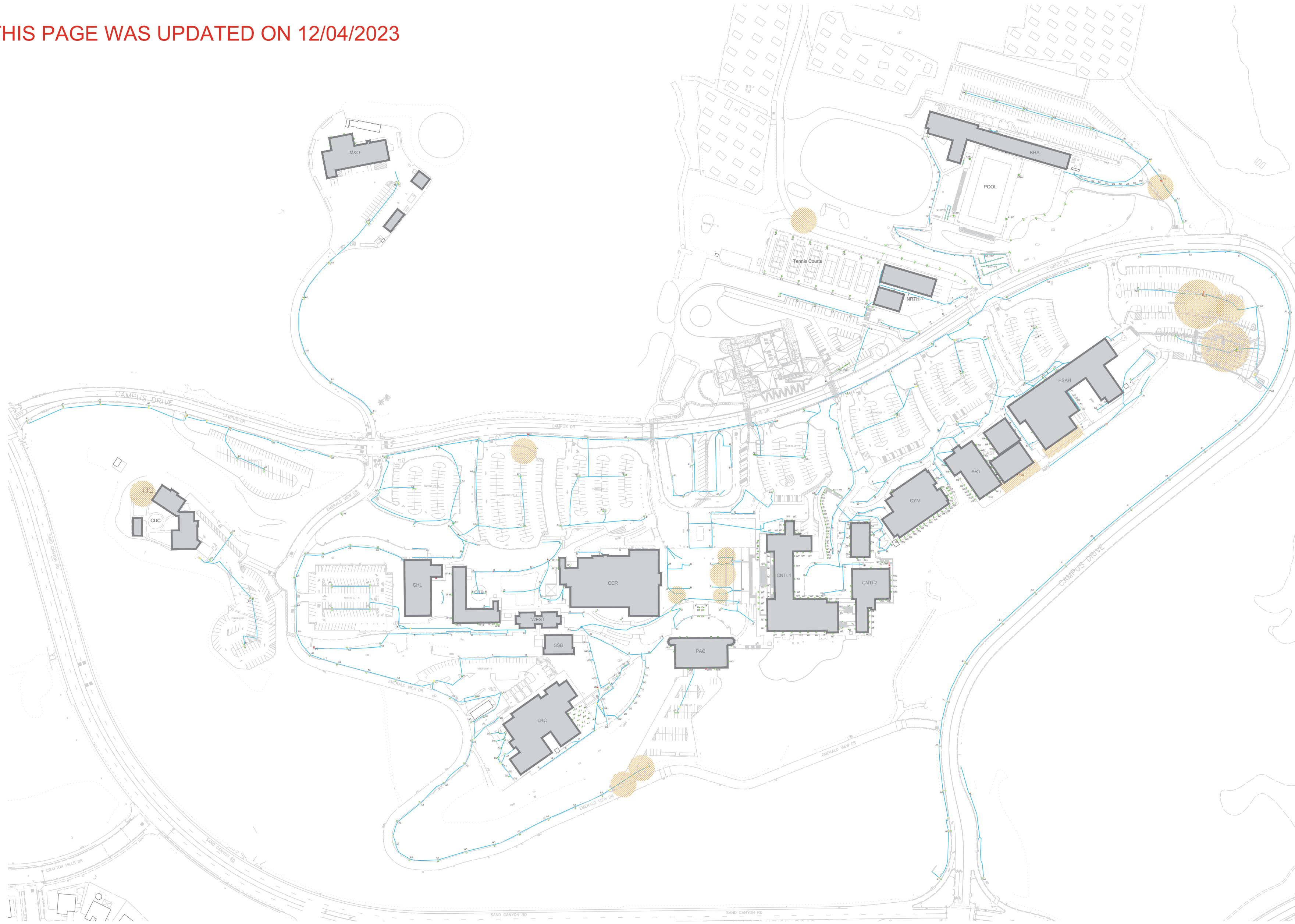
The majority of the exterior lighting fixtures illuminating the roadways are cobra head type fixtures. The fixture mounting heights and pole types vary throughout the campus. The walkways are illuminated with a combination of post tops and bollards. Light fixtures on campus are equipped with a wide variety of lamps including LED, compact fluorescent and metal halide lamps.

The lighting levels around the campus vary from as low as 0 footcandles (fc) in certain areas to as high as 34 fc in other areas, with uniformity ratios (average fc to minimum fc) in excess of 10:1. The footcandle readings were recorded using a digital light meter (model EA30 manufactured by Extech Instruments) during the month of January 2020.

The campus throughout the major areas is adequately illuminated with variety of fixtures and illumination level being consistent per IES recommended values. Few areas where the existing fixture was found to be defective and not operational, light levels were found to be inadequate which do not meet IES recommended values.

Refer to the site lighting plan at the end of this section showing the fixture layout at the campus and highlighting areas where adequate illumination is not achieved presently. Fixture schedule including the full list of light fixtures is also included at the end of this section

THIS PAGE WAS UPDATED ON 12/04/2023



FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

- EXISTING CONDUIT LINE
- PULLBOX
- JUNCTION BOX
- 'A1' POLE MOUNTED LUMINAIRE, SINGLE HEAD
- 'A2' POLE MOUNTED LUMINAIRE, DOUBLE HEAD
- 'A3' POLE MOUNTED LUMINAIRE, SINGLE HEAD
- 'B' POST TOP LUMINAIRE
- 'C' FLOOD LIGHTS
- 'D' BOLLARD LUMINAIRE
- 'L' LANDSCAPE FIXTURE
- 'S' PATHWAY LUMINAIRE
- 'W' WALL MOUNTED FIXTURE
- NON-OPERATIONAL LUMINAIRE
- AREA OF LOW FOOT CANDLES
- EARTHQUAKE FAULT LINE

SCALE: 1" = 100'

CRAFTON HILLS COLLEGE

P2S ENG

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San Diego | San Jose
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Existing Site Lighting Distribution System

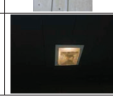
Date: 12/04/2023

EXISTING SITE LIGHTING SYSTEM

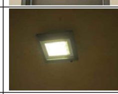
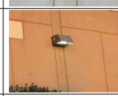
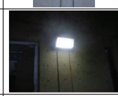
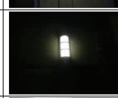
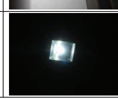
LIGHT FIXTURE SCHEDULE

SYMBOL	DESIGNATION	PHOTO	DESCRIPTION	MODEL NUMBER	CONTROLS	POLE/MOUNTING HEIGHT
	A1		STEEL POLE MOUNTED LED LUMINAIRE, SINGLE HEAD	KIM 1A-VLA2N3F-315-LED	EXERGY	34'(PLUS 3' CONCRETE BASE)
	A2		STEEL POLE MOUNTED LED LUMINAIRE, DOUBLE HEAD	KIM 1A-VLA2N3F-315-LED	EXERGY	34'(PLUS 3' CONCRETE BASE)
	A3		POLE MOUNTED LUMINAIRE, SINGLE HEAD	KIM 1A-VLA2N3F-315-LED	EXERGY	12'
	A4		STEEL POLE MOUNTED LED LUMINAIRE, SINGLE HEAD	-	-	12'
	A5		SPORTS LIGHTING LUMINAIRE	-	-	30'
	B		POST TOP LUMINAIRE	LOUIS POULSON KIP-150-150PS-MH-ED	EXERGY/SIEMENS	14'
	C		FLOOD FIXTURE	-	-	28'
	D		BOLLARD LUMINAIRE	BL 19 KHA	SIEMENS/LC&D	3'
	D2		BOLLARD LUMINAIRE	-	-	3'
	D3		BOLLARD LUMINAIRE	-	-	-
	L		LANDSCAPE FIXTURE	-	-	IN GRADE

LIGHT FIXTURE SCHEDULE

SYMBOL	DESIGNATION	PHOTO	DESCRIPTION	MODEL NUMBER	CONTROL	POLE/MOUNTING HEIGHT
	S1		PATHWAY LUMINAIRE	-	-	18"
	S2		PATHWAY LUMINAIRE	-	-	-
	S3		PATHWAY LUMINAIRE	-	-	-
	W1		WALL MOUNTED FIXTURE	-	-	8'
	W2		WALL MOUNTED FIXTURE	-	-	8'
	W3		WALL MOUNTED FIXTURE	-	-	12'
	W4		WALL MOUNTED FIXTURE	-	-	7'
	W5		WALL MOUNTED FIXTURE	-	-	7'
	W6		WALL MOUNTED FIXTURE	-	-	7'
	W7		WALL MOUNTED FIXTURE	-	-	-
	W8		WALL MOUNTED FIXTURE	-	-	-

LIGHT FIXTURE SCHEDULE

SYMBOL	DESIGNATION	PHOTO	DESCRIPTION	MODEL NUMBER	CONTROL	POLE/MOUNTING HEIGHT
	W9		WALL MOUNTED FIXTURE	-	-	-
	W10		WALL MOUNTED FIXTURE	-	-	-
	W11		WALL MOUNTED FIXTURE	-	-	-
	W12		WALL MOUNTED FIXTURE	-	-	-
	W13		WALL MOUNTED FIXTURE	-	-	-
	W14		WALL MOUNTED FIXTURE	-	-	-
	W15		WALL MOUNTED FIXTURE	-	-	-
	W16		WALL MOUNTED FIXTURE	-	-	-
	W17		WALL MOUNTED FIXTURE	-	-	-
	W18		WALL MOUNTED FIXTURE	-	-	-

ROUGH ORDER COST ESTIMATES

Priority 1	Critical - Need replacement in 0-3years	Priority 3	Fair Condition - Need Replacement in Next 5-10 years	Priority 5	New Building Impact - Based on project schedule
Priority 2	Moderately Critical - Need replacement in 3-5 years	Priority 4	Adds Value and Redundancy 5-10 years or as funding is available		

Sequential Tracking #	Campus	Infrastructure Scope	Utility	Installed Year(s)	Brief Description of the Need	Priority Level (1..4)	Project Name	Brief Scope of Project	Project Category	Can the Project be Phased - Y/N	Total Construction Costs ($)[1]	Total Project Costs - Including Soft Costs ($)	Study by (Prime Consultant)
CHC-E1	Crafton Hills College	Upgrade of existing exterior lighting and controls with new LED Lighting and controls	Electrical	-	The current exterior lighting system is a combination of metal halide and high pressure sodium	1	Provision of new LED Light fixtures and controls	Provision of new LED lighting fixtures and controls	UF	Y	$700,000	$910,000	P2S Inc
Total Priority 1 Costs											**$700,000**	**$910,000**	
CHC-E2	Crafton Hills College	Replacement of existing MV Cables	Electrical	1980	The existing MV Cables are old and are the end of their useful life.The same need to be replaced to provide a reliable service to campus buildings an minimize power interruptions	2	Replacement of MV Cables	Replacement of MV Cables	DM	Y	$450,000	$585,000	P2S Inc
CHC-E3	Crafton Hills College	Replacement of existing MV Manholes	Electrical	1980	The existing MV manholes are old and non compliant with the current code. The same need to be replaced to provide a reliable service to campus buildings and ease in maintainence	2	Replacement of MV Manholes	Replacement of MV Manholes	DM	N	$1,000,000	$1,500,000	P2S Inc
CHC-E4	Crafton Hills College	Replacement of Existing Meters in 5kV Switchgear and Main Switchboards in each of the buildings	Electrical	2010's	The existing meters are non functional and do not report correctly to a central annunciation system	2	Replacement of Existing Meters	Replacement of Existing Meters	UF	Y	$600,000	$780,000	P2S Inc
Total Priority 2 Costs											**$2,050,000**	**$2,865,000**	
CHC-E5	Crafton Hills College	Provision of new selector switches to provide form a loop system around the campus and provide redundancy and provide new duct banks to serve new buildings planned as part of the proposed master plan	Electrical	-	The current system is a radial system and does not offer reliability and redundancy	4	Provision of new selector switches	Provision of new selector switches to form loops to offer redundancy and add new duct banks and feeders for new buildngs.	NC	Y	$2,000,000	$2,600,000	P2S Inc
Total Priority 4 Costs											**$2,000,000**	**$2,600,000**	
Total Costs											**$4,750,000**	**$6,375,000**	

Project Categories

DM Deferred maintanance: systems or facilities that have not been maintained due to lack of staffing or funding. While operational, failure is imminent.

EM Emergency projects are systems or facilities that have failed or do not function as designed. Repair or replacement is required.

UF Projects or intiatives that would improve systems, facilities or operations on campus.

REG Projects related to Fire, Life, Safety; Code or OSHA compliance. Risk of harm and potential for fines or shutdown directives from regulating authorities.

NC New construction to support proposed buildings

[1]Refer to Appendix for breakdown of costs.

CHAPTER 4
Natural Gas System

SYSTEM DESCRIPTION

Natural gas is distributed to the campus by Southern California Gas Company (SoCalGas). The majority of the campus is served through a 4" high pressure gas (HPG) main from SoCalGas that is routed along Campus Drive and terminates at the main campus meter just east of parking lot M. The gas distribution operates at 5 PSI MPG and serves a total of 15 buildings.

Main campus gas meter assembly located east of lot M"

A second HPG line branches off of the 4" HPG line before it enters the main campus meter. This HPG line is routed north along Emerald View Drive where it enters a second SoCalGas owned meter. This line serves a Compressed Natural Gas filling station as well as the Maintenance and Operations building (B1).

Gas meter serving compressed natural gas filling station

Compressed natural gas filling station

The 4" HPG line that enters the main campus meter assembly serves buildings 2, 3, 4, 6, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 19. Each building served by this line has a local gas pressure regulator that steps the pressure down from medium pressure to low pressure.

Building 2 – Child Development Center (CDC)

The two buildings that make up the CDC are served by an 1-1/4" line. This building connection is not protected by an earthquake valve.

1-1/4" gas feed to Child development Center

Building 3 – Crafton Hall (CHL)

Crafton Hall is served by two gas lines, one on the north side of the building and one on the east side of the building. 2-1/2" gas entering the north side is stepped down to low pressure through the use of a GPR on the exterior on the building. This building connection is not protected by an earthquake valve.

2-1/2" gas feed serving the north side of Crafton Hall

3/4"gas entering the east side. This building connection is not protected by an earthquake valve.

3/4" gas feed serving the east side of Crafton Hall

Building 4 - Clock Tower Building (CTB)

A 3" gas line enters the Clock Tower Building below grade in the basement. This building currently has no gas load and the gas connection is capped after the GPR. This building connection is not protected by an earthquake valve.

Capped 3" gas feed serving the Clock Tower Building

Building 6 – Crafton Center (CCR)

The Crafton Center is served via a 2” line where it is regulated and meter before entering the northwest corner of the building. This building connection is not protected by an earthquake valve.

Gas feed serving the east side of the Crafton Center

Building 8 – Learning Resource Center (LRC)

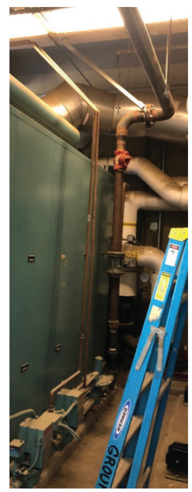
The LRC building is fed gas via an 1-1/4" connection entering on the East side of the building. This gas connection was originally used to serve a Gas Water Heater Package system located on the roof. This package system is no longer in use.

Gas vault on located to the east of the Learning Resource Center

Building 10 – Central Complex 1 (CNTL 1)

The Central Complex 1 building is served via a 6” entering the boiler room on the north side of the building. The MPG line branches off to each boiler where it is regulated and metered. The main MPG line is also regulated before serving the rest of the building. This building connection is not protected by an earthquake valve.

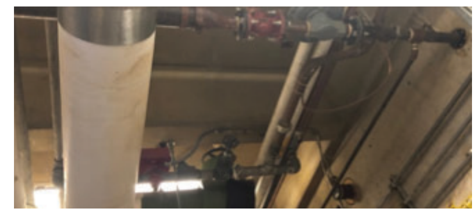
Main 6" gas feed serving the Central Complex 1



Gas feed to boiler with gas meter, GPR, and EQV

Gas feed to boiler with gas meter, GPR, and EQV

Gas feed to boiler with gas meter



Gas feed with GPR entering to serve the rest of the Central Complex 1 building

The gas line continues through the northern half of the Central Complex 1 and is then routed underground until it enters a vault just before the southern half of the building. This building connection is not protected by an earthquake valve.

Gas vault north of the Central Complex 1 south wing

Building 11 – Central Complex 2 (CNTL 2)

A 2" line branches off the gas line that serves the southern half of the Central Complex 1 and is routed east to the Central Complex 2. A gas vault is located just north of building 11 before the gas enters below grade on the north side of the building. This gas line is used to serve the gas turrets in the physics labs. This building connection is not protected by an earthquake valve.

Gas vault north of Central Complex 2

2" gas line entering Central Complex 2 below grade

Building 12 – Canyon Hall (CYN)

Canyon Hall is served by a 3" MPG line that is regulated just before it enters the north west corner of the building. This building connection is not protected by an earthquake valve.

3" gas line entering Canyon Hall

Building 13 – Visual Arts (ARTS)

The Visual Art building is served via a 1-1/4" line entering the north side of the building. After surveying the rooms in this building, it is unclear what this gas serves. This building connection is not protected by an earthquake valve.

1-1/4" gas line entering Visual Arts building

Building 14 – East Complex 1 (EAST 1)

1-1/2" gas is regulated just before entering the east side of the build in the electrical room. It then rises in the electrical room where it meter on the roof. This building connection is not protected by an earthquake valve.

1-1/2" gas line entering East Complex 1

Gas meter on the roof of East Complex 1

Building 15 – East Complex 2 (EAST 2)

1-1/2" gas enters the East Complex 2 on the north side of the building then rises to the roof were it serves 5 rooftop units. This building connection is not protected by an earthquake valve.

1-1/2" gas line entering East Complex 2

Gas piping serving the rooftop equipment of East Complex 2

Building 16 – Public Safety and Allied Health (PSAH)

The PSAH build is served via a 2" medium pressure line that is metered and regulated before entering the west side of the building. This building connection is not protected by an earthquake valve.

2" gas line entering the Public Safety and Allied Health building

Building 17 – Gymnasium (GYM)

The gymnasium building is served from a 4" line that extends from the 6" MPG line running through lot D. There is a gas vault located on the gym property just north of campus drive. A second gas vault is located on the southwest corner of the building. It is assumed that the medium pressure line is stepped down to low pressure via a regulator located in this vault. This building connection is not protected by an earthquake valve.

Gas vault along campus drive, south of the gym building

Gas vault on the south side of the gym building

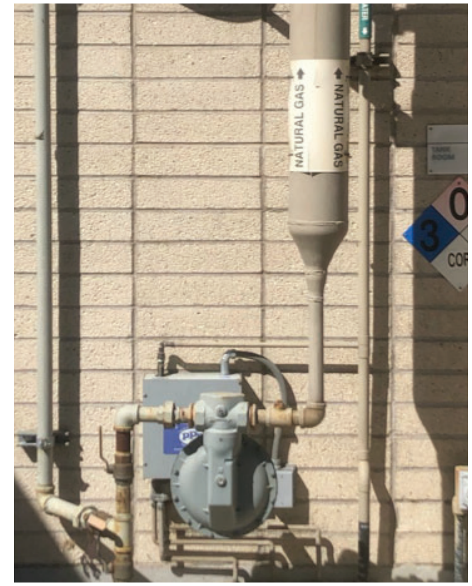
Building 18 – North Complex (NRTH)

The North Complex is served via a 1-1/4" line. This line is used to serve exterior wall mounted HVAC units. The incoming MPG line is stepped down via a GPR before serving the HVAC units. An earthquake valve is located on the line after the GPR.

1-1/4" gas line serving the North Complex buildings

Building 19 – Kinesiology, Health Education & Aquatics Complex (KHA)

The KNA building is served via a 4" MPG line. This line splits into two feeds. One feed is regulated via a GPR and served the pool heated. The second line extends to the roof before entering an earthquake valve, GPR and gas meter.



Gas regulator assembly serving the KHA building, with MPG line extending the roof

Gas meter, GPR and EQV serving the rooftop equipment of KHA building

ANALYSIS OF EXISTING SYSTEM

Age and Reliability

The majority of the campus gas infrastructure was installed 40 years ago. The distribution system throughout the campus has undergone extensions over the years to accommodate campus expansions and additions and comprises of a mixture of PE and steel lines.

There are earthquake valves installed throughout campus; observed at Central Complex 1, North Complex, etc. However, several buildings do not have earthquake valves. These buildings need to be provided with earthquake valves to meet current codes.

Redundancy and Capacity

There is a single utility-owned gas meter that serves the majority of the buildings on campus; located on the west end of lot M. In addition, there is a second utility-owned gas meter serving the M&O building and the CNG filling station. The campus thus has no redundancy should the main service fail or is taken down for maintenance. The gas meter that serves the majority of the campus is currently approaching its maximum capacity. If any additional load is introduced to the campus, coordination will be required with the gas company to ensure that the current gas meter can accommodate the additional load.

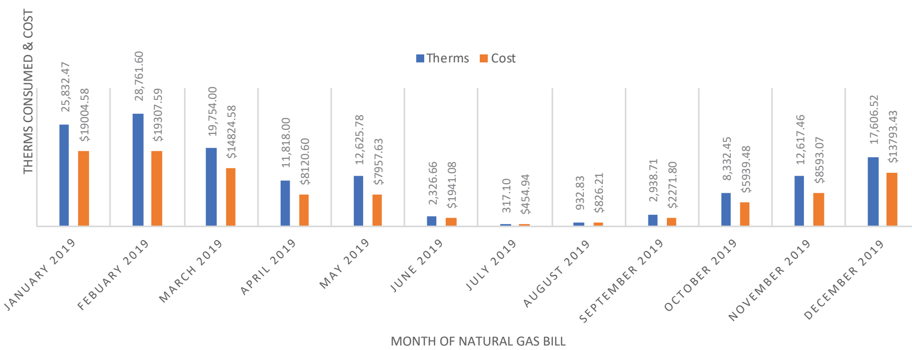
Existing Natural Gas Loads

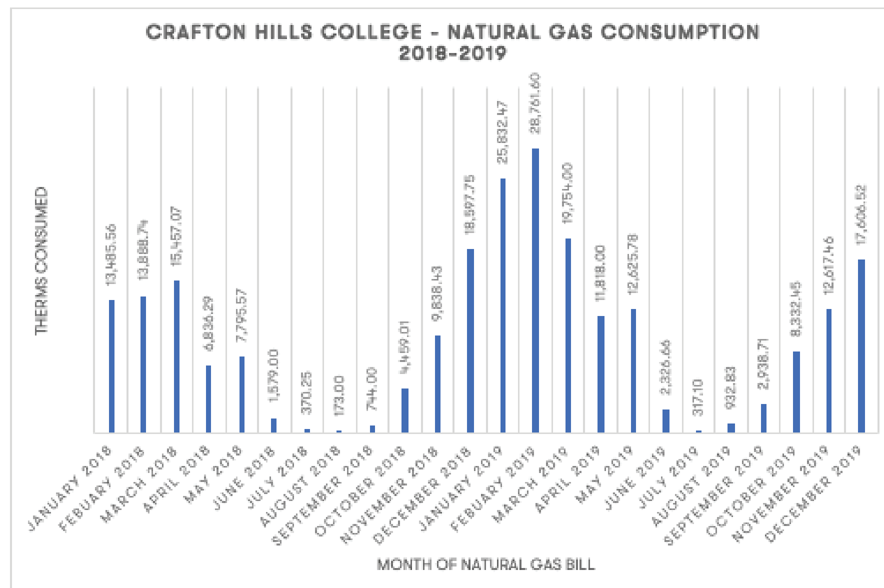
Existing gas comumption in therms for 2018 and 2019 years along with montly costs is provided in Table 1 for reference.

EXISTING CONSUMPTION DATA

Month	Therms	Cost
January 2018	13,485.56	
Febuary 2018	13,888.74	
March 2018	15,457.07	
April 2018	6,836.29	
May 2018	7,795.57	
June 2018	1,579.00	
July 2018	370.25	
August 2018	173.00	
September 2018	744.00	
October 2018	4,459.01	
November 2018	9,838.43	
December 2018	18,597.75	
January 2019	25,832.47	$19004.58
Febuary 2019	28,761.60	$19307.59
March 2019	19,754.00	$14824.58
April 2019	11,818.00	$8120.60
May 2019	12,625.78	$7957.63
June 2019	2,326.66	$1941.08
July 2019	317.10	$454.94
August 2019	932.83	$826.21
September 2019	2,938.71	$2271.80
October 2019	8,332.45	$5939.48
November 2019	12,617.46	$8593.07
December 2019	17,606.52	$13793.43
2018 Total	**93,224.66**	
2019 Total	**143,863.57**	

CONSUMPTION AND COST





Shows the actual natural gas consumed by the Crafton Hills College (CHC) from January 2018 to December 2019. The CHC campus consumed a total of 93,224.66 therms of gas for the 2018 calendar year and 143,863.57 therms for the 2019 calendar year.

ANALYSIS OF FUTURE NEEDS

An evaluation of the facilities planned as part of the master plan revealed that a net additional 83,338 square feet of buildings/spaces are planned at the campus. A review of these proposed facilities and their usage revealed that the campus would add an additional load of 5025 CFH to the existing meter system.

The table above provides estimated heating and domestic heating load demands based on occupancy type of the building. Gas loads for future buildings are calculated on a square foot basis and also provided for reference.

FINDINGS AND RECOMMENDATIONS

Based on as-built drawings and field observations, a large portion of the gas distribution is steel piping. Some of this steel piping has been installed roughly 40 years ago. It is recommended to upgrade this piping to PE piping for extended life expectancy. Additionally, it was observed that a number of the building on campus lack earthquake valves. To meet current code requirements earthquake valves would be required on the gas feeds serving following buildings:

- M&O
- CDC
- Craton Hall
- Crafton Center
- Canyon Hall
- Visual Arts
- East Complex 1
- East Complex 2
- Public Safety & Allied Health
- North Complex
- Aquatics Complex

Based on our discussions with the campus, the campus recently installed an earthquake valve at the main meter. This meter will thus meet the code requirements and will replace provision of earthquake valves at the buildings listed above.

Sub-meters were noted on several buildings on campus but not all buildings have gas submeters. It is recommended to install sub-meters on the following buildings to provide better monitoring at:

- CDC
- Crafton Hall
- Central Complex 1
- Central Complex 2
- Visual Arts
- East Complex 2
- North Complex

The addition of the proposed future buildings to campus, will require extension of gas lines to serve the buildings.

The addition of the new Gymnasium building is intended to lie on the northwest side of the KHA building. The new Gymnasium will connect to the gas line that serves existing the KHA building. This routing will minimize the amount of trenching require to connect the new Gymnasium to the campus gas distribution system.

The addition of the new East Instructional Building (EIB) will replace the existing modular buildings (ARTS, EAST 1, and EAST 2) and occupy the same site. The EIB will be able to connect to the 4" gas lateral that runs east/west to the north of the future building. All existing facilities that are planned to be renovated as part of the master plan will connect to existing gas service that currently serves these facilities. The exact capacity of the existing and extension gas lines shall be determined as part of the facility renovation/new facility project.

A proposed gas distribution plan to serve future buildings planned at the campus is provided at the end of the section.

IMPLEMENTATION AND PHASING PLAN

The installation of new submeters and earthquake valves should be implemented at a time when classes are not in sessions. This will minimize interruption of service to campus buildings. The replacement of the steel gas piping should be performed in a similar phased manner to minimize interruption of service to campus buildings when classes are in session.

EXISTING LOADS ALL BUILDINGS

Building	Gas Load (CFH)	Gas Load (Therms/Hr)	Hours per Year	Gas Load (Therms/yr)
B1 (M&O)*	147	1.5	2400	3641
B2 (CDC)	683	7.1	2400	16951
B3 (CHL)	5855	60.5	2400	145315
B4 (CTB)	0	0.0	2400	0
B6 (CCR)	200	2.1	2400	4964
B8 (LRC)	0	0.0	2400	0
B10 (CNTL 1)	10661	110.2	2400	264596
B11 (CNTL 2)	250	2.6	2400	6205
B12 (CYN)	1532	15.8	2400	38023
B13 (ARTS)	700	7.2	2400	17373
B14 (EAST 1)	510	5.3	2400	12658
B15 (EAST 2)	390	4.0	2400	9679
B16 (PSAH)	755	7.8	2400	18738
B17 (GYM)	0	0.0	2400	0
B18 (NRTH)	830	8.6	2400	20600
B19 (KHA)	4990	51.6	2400	123847
Total	**27503**	**284.4**	**38400**	**682590**

Existing natural gas loads were compiled based finding from the field investigation and existing record drawings.
**Building gas loads estimated based square footage basis for heating an domestic loads due to lack of as-builts.*

FUTURE BUILDING LOADS

Building Name	Occupancy Type	Gross Area (Sq. Ft)	Heating Load Factor (BTUH/sqft)	Estimated Heating Load (CFH)	Domestic Heating Load (CFH)	Total Gas Load (CFH)
Gymnasium (GYM)	Gymnasium	43,338	20	866.76	433.38	1300.14
East Instructional Building (EIB)	Classroom/Lab	40,000	20	800	400	1200.00
Performing Arts Center (PAC)	Public Gathering	35,504	20	710.08	355.04	1065.12
Instructional Building (IB)	Classroom/Lab	30,000	20	600	300	900.00
Total			**4465.26**			

ROUGH ORDER COST ESTIMATES

Priority 1	Critical - Need replacement in 0-3years	Priority 3	Fair Condition - Need Replacement in Next 5-10 years	Priority 5	New Building Impact - Based on project schedule
Priority 2	Moderately Critical - Need replacement in 3-5 years	Priority 4	Adds Value and Redundancy 5-10 years or as funding is available		

Sequential Tracking #	Campus	Infrastructure Scope	Utility	Installed Year(s)	Brief Description of the Need	Priority Level (1..4)	Project Name	Brief Scope of Project	Project Category	Can the Project be Phased - Y/N	Total Construction Costs ($)[1]	Total Project Costs - Including Soft Costs ($)	Study by (Prime Consultant)
CHC-P1	Crafton Hills College	Replacement of Steel Gas Lines and Provision of new valves	Plumbing		Replacement of roughy 3200 feet of existing steel gas lines.	2	Replacement of Steel Gas Lines	Replacement of Steel Gas Lines	DM		$950,000	$1,235,000	P2S Inc
Total Priority 2 Costs											**$950,000**	**$1,235,000**	
CHC-P2	Crafton Hills College	Provisions for New Building Submeters	Plumbing		Submeters should be installed on the following builidngs to for monitoring and usage purposes. CDC, Crafton Hall, Central Complex 1, Central Complex 2, Visual Arts, East Complex 2, and the North Complex. (7 Total)	4	Installation of Gas Submeters	Installation of Gas Submeters	UF	Y	$35,000	$45,500	P2S Inc
Total Priority 4 Costs											**$35,000**	**$45,500**	
Total Costs											**$985,000**	**$1,280,500**	

Project Categories

DM Deferred maintanance: systems or facilities that have not been maintained due to lack of staffing or funding. While operational, failure is imminent.

EM Emergency projects are systems or facilities that have failed or do not function as designed. Repair or replacement is required.

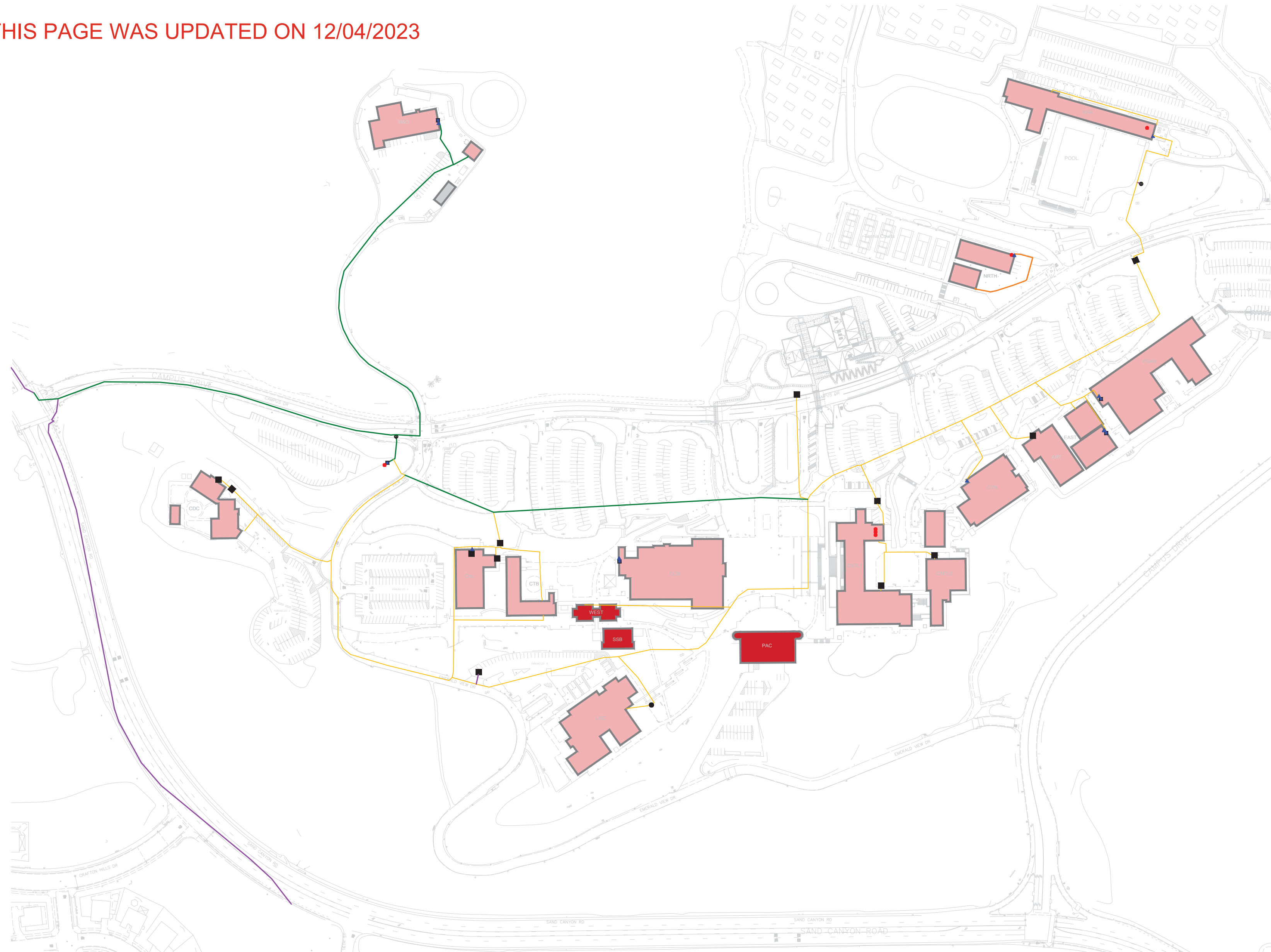
UF Projects or intiatives that would improve systems, facilities or operations on campus.

REG Projects related to Fire, Life, Safety; Code or OSHA compliance. Risk of harm and potential for fines or shutdown directives from regulating authorities.

NC New construction to support proposed buildings

[1]Refer to Appendix for breakdown of costs.

THIS PAGE WAS UPDATED ON 12/04/2023



FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

- EXISTING GAS LINE
- ABANDONED GAS LINE
- CAPPED LINE
- ISOLATION VALVE
- EARTHQUAKE VALVE
- UTILITY METER
- CAMPUS METER
- REGULATOR
- HANDHOLE
- VAULT

BUILDING LEGEND

- NO GAS SERVICE
- UNDER CONSTRUCTION
- DIRECT UTILITY SERVICE
- CAMPUS-METERED SERVICE
- CAMPUS SERVICE

SCALE: 1" = 100'

CRAFTON HILLS COLLEGE

P2S ENG

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San Diego | San Jose
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Existing Natural Gas Distribution System

Date: 12/04/2023

PROPOSED NATURAL GAS DISTRIBUTION SYSTEM

CHAPTER 5
Telecommunication System

SYSTEM DESCRIPTION

The campus telecommunications services are derived from AT&T. The AT&T incoming service runs along Sand Canyon Road, enters from the Northwest side of the campus and follows Campus Drive up to the MPOE room, in front of the college (building #10). The telecommunications services to the campus are served from a MDF or "Main Distribution Frame", located within the Learning Resources Center (LRC), building #20 in the lower portion of the campus. The new server room/MDF consists of a mix of 4-post racks and network server cabinets, that are laid out in two aisles and air cooled with in-ceiling duct work that is directed towards each rack and cabinet. There is also a centralized battery backup system for all the network equipment within the room and additional battery backup systems, out at the individual server rooms. There is a Nortel VOIP phone system serving the campus and is distributed via the fber to the individual campus buildings; the main equipment is located in the frst rack of the MPOE (building #10). Although the MDF is the main distribution, the fiber infrastructure comes from the Central Complex area back room, just outside of the campus police – located in a separate room behind the MPOE (building #10).

Crafton Center – CCR – Data #130

The following methodology was adopted in formulating our utility infrastructure master plan.

- A critical aspect in the evaluation of the existing utility systems serving a facility is a detailed and accurate field investigation of the current systems. A detailed survey of the existing utility systems that currently serve the facilities at the campus was undertaken, and existing conditions, together with potential problems, were identified. The surveyed information was verified through available record drawings and meetings with the campus facilities staff.
- Each utility system was then evaluated for capacity, functionality, reliability, ease of maintenance, age, and its ability to serve the present and future needs of the campus.
- Alterations/upgrade/modifications necessary to support new buildings, major renovations, and building replacements that form part of the proposed near-term development plan were identified.
- Costs associated with each of the required utility upgrades were then developed based on our recommendations.

Our following Utility Infrastructure Master Plan update report provides an analysis of the existing utilities currently serving the facilities, identifies alterations/upgrade/modifications necessary to support new buildings, major renovations, and building replacements that form part of the proposed near term development plan and outlines recommended solutions and costs to implement the same.

The goal of the technology site evaluation was to document current IT room conditions, confirm vault location (compare to existing master plans), document the existing backbone cabling infrastructure (from the MPOE, to the individual IT rooms) and review the IT/Telecom support systems. In addition, we reviewed:

- Existing campus Technology / Telecom Installations – Equipment Rooms, Campus Pathways/Vaults and existing Backbone Cabling
- Vaults/Pathways – confirm locations, existing conditions, requirements to meet Master Plan changes
- Review IT/Telecom Support Systems – HVAC, Power, E Power

ANALYSIS OF EXISTING SYSTEMS

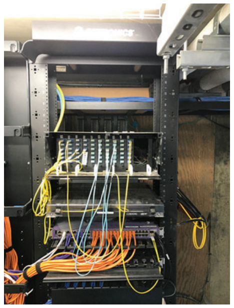
The IDF rooms located throughout the campus were reviewed during the site visit and an analysis of the same is provided at the end of the section. Each IDF room currently has (at a minimum), (1) 6 strand Single-Mode fiber and (1) 12 strand Multi-Mode fiber, terminated on the backboard in a NEMA enclosure, or directly within the server rack in a rack mounted LIU enclosure. There is a mix of Single-Mode and Multi-Mode fiber cabling to feed out to the other IDF's/server rooms, for interconnections, back to the MDF, BDF, or dedicated network closet. There is copper feed cabling installed in each IDF and there is a minimum of (1) 25-Pair feed cable terminated on the backboard and in some instances within the server racks. Most the existing copper feed cabling that was not is use (or abandoned), was removed from the IDF backboards and IDF feed conduits, when the new fiber cable infrastructure was installed. Each IDF room has a minimum of (1) 2-post server rack and is supported with ladder tray from the 2-post rack, to the back wall. All the network switch gear within the IDF/sever rooms has been replaced over the last 5 years with Extreme Networks, Black Diamond series servers; all network switches are rack mounted in the 2-post server racks. Most of the IDF rooms also have temperature control modules to make sure the room stays at a consistent temperature, with the exception of the Student Services Building, that currently has no temperature control. The IDF rooms in general were clutter free and the temperature was comfortable and in compliance of industry standards; there were some exceptions in regard to temperature, with a few rooms that are located on the outside of the campus buildings.

The campus conduit infrastructure was also reviewed and assessed during the on-site utilities walk through. An existing telecommunications distribution plan have been provided at the end of the section for reference. All of the direct services from AT&T and other service providing vendors, come in from the street feed manholes that run along side of Sand Canyon Drive (from the Northwest) and transition to Campus drive that runs up to the MPOE (from North to South) through the manholes located towards the front entrances of each parking area (South side of Campus Drive – in the grass). Within the main campus, there is a centralized conduit infrastructure that runs through the center of campus to connect all buildings, for network and telephone services. The centralized conduit infrastructure has a minimum of (2) 4" conduits and (3) 3" conduits, and 4'x4' concrete vault (below ground), and are distributed along the main thoroughfare, or within the campus landscape. All telecommunications vault and manhole locations are stand alone; no power, or other services are shared within the vault. Upon site review, most of the telecommunications vaults and manholes were dry and accessible; only a few locations had water saturation with cabling below the water line.

ANALYSIS OF FUTURE NEEDS

Our analysis of future needs summary is based on the collective information taken from the overall site walks (exterior cable pathways) and IT room evaluations (each building) of the campus. The main fiber distribution has been rerouted and consolidated over the last 5 years in order to centralize and better manage the campus networks. Currently each IT server room has "Air Blown" fiber installed in preparation of future expansions and added campus buildings. The campus network servers have also been upgraded over the last 5 years to accommodate the network demand throughout the campus. Each IT/server room that was reviewed had the same "Black Diamond" switch gear and connectivity throughout the campus. Other future needs regarding future building additions and remodels would be the preparation of the fiber infrastructure, such as signal verification or fiber strand certification; by periodically testing the fiber strands, it will ensure the cabling is functional prior to final connection. Based on the recent analysis and site walk, some preparation is already in place for future needs of expanding the network connections throughout the campus.

Based on the overall on-site evaluation, the Student Support Building, The Clock Tower Buildings, the East Complex 1 & 2 and Visual Arts, are all in the conclusion statement as IDF/server rooms that need additional attention. The Student Support Building IT server room currently has no temperature control and may be a concern if the equipment overheats. The Clock Tower IT server room appears to be a main distribution room for several of the other buildings within the same lot, it would be beneficial to identify the other buildings serviced by the Clock Tower IDF, in order to better service and trouble shoot, should there be any issues. The East Complex 1 & 2, along with the Visual Arts appears to be connected from smaller hubs within each


Clock Tower – CTB – IDF #105


Learning Resources Center – Exterior Communications Vault

building, at the time of the initial walk through, these areas were not identified or evaluated. At the time of the site walk review, all the existing manholes were identified and verified with the existing map. Most of the areas evaluated during the on-site were in good condition except for some of the campus legacy buildings; some of the legacy buildings IT rooms will just need some additional attention, in regard to protecting the cabling from damage by vendors accessing the rooms; some of the fiber interconnections currently have minimal protection from damage.

An evaluation of individual telecommunications rooms in each of the buildings and our associated findings and recommendations is provided at the end of the section.

New conduit and media infrastructure will need to be installed from the nearest manhole to serve proposed buildings planned as part of the master plan.

FINDINGS AND RECOMMENDATIONS

Based on the overall evaluation of the campus, a list of the individual recommendations, for each building were developed. Some of the overall recommendations would include cleaning out the IT server rooms, providing additional protection for the fiber and copper infrastructure (within the racks and on the backboards) and addressing room temperature in some of the outlying rooms that do not currently have controlled temperature environments. A noticeable mix of fiber strands are used throughout the campus, in several of the IT server rooms, and a detailed list of tested fiber strands could help alleviate future project delays, by providing a room by room detail of good fiber strands to use. The labeling of the fiber and copper feed cabling was in place in most of the rooms, but it would also help to have the labeling verified and at the least reviewed for accuracy. Again, in general most of the IT server rooms were clean and accessible, but it is never a good idea to store overstock materials or stage excess paperwork in and around the server rooms; continual access to areas with exposed cabling can be a potential problem, not only with access to the rack/cabinet, but with network loss because of unforeseen accidents.

The campus telecommunications infrastructure has been updated within the last 5 years; a fiber infrastructure (Air Blown) has been installed to support the campus network services. Most of the existing copper cabling not in use, was removed and cleared from the server rooms and conduits feeding the server rooms when the fiber infrastructure was installed. Although a new fiber infrastructure has been installed throughout the campus, it is recommended that the fiber cable not in use, are periodically tested to ensure that they are in good working condition for all future expansion.

A recommendation for all IDF rooms would be additional cable protection around some of the main fiber distribution patch cables; innerduct or wire management can be used to better protect the fiber patch cabling going from the termination points into the network switch.

It is recommended that the locations that have water saturation be drained and sealed, in order to protect the cabling and avoid any complications; a yearly evaluation should be performed in order to maintain the integrity of the campus telecommunications infrastructure.

- The Student Support Building #7 should be addressed; the temperature of the room at the time of review was above an acceptable level for network equipment.
- Various server rooms need to address the fiber and copper patch cabling. Several of the closets need attention in order to protect the overall performance of the networks. Wire management with covers should help reduce some of the cluttered patching.
- Fiber panels in most of the rooms were labeled with a few exceptions – some of the fiber panels were missing covers – fiber dust covers were missing – some if the jumper cables outside of the wire managers need to be supported.
- Most of the larger IDF's in the new buildings have updated cabling and equipment.
- The new fiber infrastructure has been installed throughout the campus – Air-Blown fiber is located in every server room reviewed.
- Copper feed cabling has been removed from most of the server room closets and manholes reviewed.
- Manholes reviewed were dry in most locations – Central Complex #10 in front of the main building had water within – Parking area "E" had water within and outside of Parking area "A" had water within.
- New conduit and media infrastructure will need to be installed from the nearest manhole to serve proposed buildings planned as part of the master plan.

IMPLEMENTATION AND PHASING PLAN

The installation of new telecommunications support equipment and server room clean up should be implemented at a time when classes are not in session. This will minimize interruptions to the campus data network and voice communications throughout the campus facilities. Since the campus has dedicated server rooms (IDF rooms) for each of its buildings, the replacement of telecommunications support equipment and server room clean up can be phased, and implemented in phases to minimize interruption to campus facilities.

EXISTING MEDIA (COPPER AND FIBER CABLE) INFORMATION BY BUILDING

		Single-Mode		Multi-Mode		Copper		
BLDG#	Building Name	Pair Quantity	Linear Feet	Pair Quantity	Linear Feet	Pair Quantity	Linear Feet	Notes
1	Maintenance & Operations	6	2,250	12	2,250	25	2,250	
2	Child Development Center Expansion	6	1,250	12	1,250	25	1,250	
2	Child Development Center 1	0	0	0	0	0	0	
2	Child Development Center 2	0	0	0	0	0	0	
4	Clock Tower - Student Services A	6	950	12	950	100	950	IDF #105
5	Student Services B	6	900	12	900	25	900	
5	Student Services C (Former Classroom Bldg.)	6	800	12	800	25	800	
6	Crafton Center - (Former Library)	6	1,450	12	1,450	25	1,450	Data #130
6	Administration Student Services	6	300	12	300	25	300	
7	Emergency Services (Oe2 Replacement Bldg.)	6	1,900	12	1,900	100	1,900	SSB #118
8	Learning Resource Center	6	0	12	0	500	0	LRC #8
9	Performing Arts Center	6	950	12	950	25	950	
9	Performing Arts Center Expansion	6	1,000	12	1,000	25	1,000	
10	Central Complex (Former Lab/ Admin Bldg.)	6	1,000	12	1,000	800	1,000	Data #106
10	Central Complex - Main Core	216	0	216	0	0	0	
11	Chemistry	6	1,450	12	1,450	25	1,450	
16	Occupational Ed - Emergency Services 1St Floor	6	1,850	12	1,850	50	1,850	BDF #119
16	Occupational Ed - Emergency Services 2Nd Floor	6	200	12	200	50	200	IDF #205
17	Gymnasium	6	2,350	12	2,350	25	2,350	
18	Wellness Center - North Complex	6	2,000	12	2,000	25	2,000	
21	Humanities 1	6	500	12	500	25	500	
22	Humanities 2	6	500	12	500	25	500	
24	Sciences	6	1,000	12	1,000	25	1,000	
26	Community Recreational Facility	6	2,300	12	2,300	25	2,300	
26	Community Center	6	2,700	12	2,700	25	2,700	
6	Bookstore (Former College Center)	6	1,000	12	1,000	25	1,000	
Total			**28,600**		**28,600**		**28,600**	

ROUGH ORDER COST ESTIMATES

Priority 1	Critical - Need replacement in 0-3years	Priority 3	Fair Condition - Need Replacement in Next 5-10 years	Priority 5	New Building Impact - Based on project schedule
Priority 2	Moderately Critical - Need replacement in 3-5 years	Priority 4	Adds Value and Redundancy 5-10 years or as funding is available		

IT/Server Room #	Campus	Infrastructure Scope	Utility	Installed Year(s)	Brief Description of the Need	Priority Level (1..4)	Building Name	Brief Scope of Project	Project Category	Can the Project be Phased - Y/N	Total Construction Costs ($)[1]	Total Project Costs - Including Soft Costs ($)	Study by (Prime Consultant)
CHC-T1	Crafton Hills College	New Duct Banks and Media	Technology		Provision of new duct banks and media to new buildings.	5	Campus	Provision of new duct banks and media to new buildings.	NC		$200,000	$260,000	P2S Inc
Total Priority 5 Costs											**$200,000**	**$260,000**	

Project Categories

DM Deferred maintanance: systems or facilities that have not been maintained due to lack of staffing or funding. While operational, failure is imminent.

EM Emergency projects are systems or facilities that have failed or do not function as designed. Repair or replacement is required.

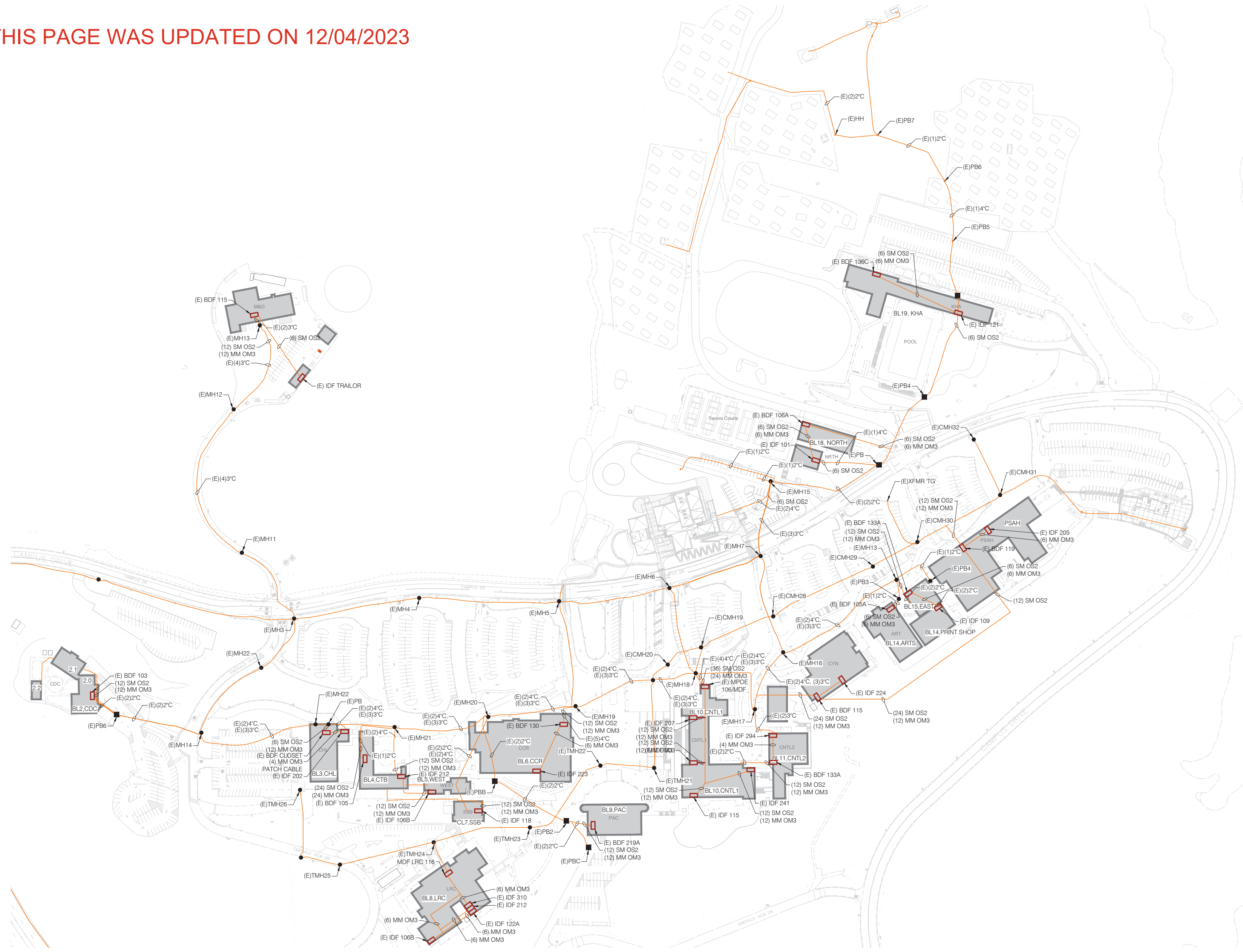
UF Projects or intiatives that would improve systems, facilities or operations on campus.

REG Projects related to Fire, Life, Safety; Code or OSHA compliance. Risk of harm and potential for fines or shutdown directives from regulating authorities.

NC New construction to support proposed buildings

[1]Refer to Appendix for breakdown of costs.

THIS PAGE WAS UPDATED ON 12/04/2023



FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

- EXISTING CONDUIT
- EXISTING TELECOM MANHOLE
- EXISTING TELECOM PULLBOX
- EXISTING TELECOM HANDHOLD
- EARTHQUAKE FAULT LINE

BUILDING LEGEND

EXISTING BUILDING
UNDER CONSTRUCTION

SCALE: 1" = 100'

CRAFTON HILLS COLLEGE

P2S ENG

Long Beach | Los Angeles
San Diego | San Jose
p2sinc.com

Contact Info:
Mohammad Wasif
(562)497-2999
mohammad.wasif@p2sinc.com

Existing Telecommunication Distribution System

Date: 12/04/2023

PROPOSED TELECOM DISTRIBUTION SYSTEM

Following is an evaluation of individual telecommunications rooms in each of the buildiings and our associated findings and recommendations.

Clock Tower – #4 – CTB (former Student Services "A") IDF #105

The Crafton Tower building is a single-story building and has roughly 10,000 ft floor area. Its usage is mainly for office use. Building age is unknown.

SCHEDULE

The building is not occupied full time. The custodian occupies the building till 1200 AM midnight. Evening or night classes on this campus are not offered.

IT Room – 105

Contains (2) 2-post racks, wire management (vertical/ horizontal) and ladder tray to the wall.

Rack 1 – Contain a total of (3) 48-Port Patch Panels – roughly 50% patched.

Rack 2 – Contains (1) LIU chassis for Single-Mode (SM) and Multi-Mode (MM) fiber – SM fiber has 72 strands, with 18 strands in use – MM fiber has 72 strands, with 6 strands in use. There is an additional splice tray for fiber feeding a second floor area – two strands in use.

UPS equipment – Rack 2 – UPS currently unplugged – backup goes to the wall backup unit – Isolite eCircuit.

Servers – Rack 2 – (2) total server switches – No Other Equipment

Copper backbone – Multiple copper feeds within the room; some abandoned and some in use.

Fiber backbone – Air Blown fiber – Yes.

Grounding – Yes – Currently the ground wire is "Tie Wrapped" to the existing electrical pipes.

Temperature Control – Yes – the temperature was good – this room does not have any rack mounted alarming modules.

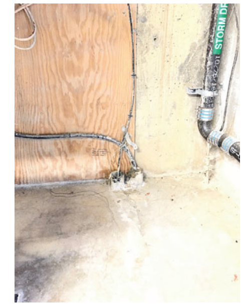
OTHER OBSERVATIONS:

- Fiber feed cabling cuts across the pathway behind the rack; Fiber cabling feeding from the wall to rack is too short and should have been routed from the wall into the ladder tray and down to the rack mounted LIU
- The room in general is free of clutter
- There is no fire stop in any of the existing conduits
- There is a lot of copper cabling is this room that appears to be abandoned
- Visibly is appears that there has been some water penetrating the walls and floors.

RECOMMENDATIONS:

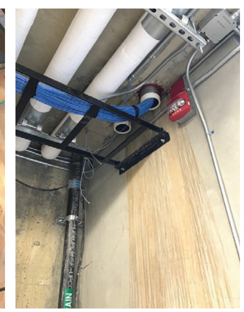
- The ground wiring should be properly secured to the wall and independent of other wiring.
- Copper feed cabling should be reviewed, and abandoned cabling should be removed.
- UPS equipment not in use should be removed.
- Fiber jumper cabling should be dressed and protected within the wire management to avoid potential damage.











Crafton Center – #6 – CCR – DATA #130

The Crafton Hall building is a two-story building and has roughly 50,000 ft2 floor area. It's a multi-use building with office space and student planning. Building age is 4 years old.

SCHEDULE

The building is occupied from 700 AM till 500 PM, most of times. The custodian occupies the building till 1200 AM midnight. Evening or night classes on this campus are not offered.

Data Room – #130

Contains (4) 2-post racks, wire management (vertical/horizontal) and ladder tray to the wall.

Rack 1 – Contains (6) 48-Port Patch Panels – roughly 50% patched.

Rack 2 – Contains (1) LIU chassis for Single-Mode (SM) and Multi-Mode (MM) fiber – SM fiber has 24 strands, with 4 strands in use – MM fiber has 24 strands, with 4 strands in use. There are an additional 6 stands of MM fiber in a rack mounted LIU, that are separate from the main fiber patch panel – 2 strands are in use.

Rack 3 – Contains (6) 48-Port Patch Panels – roughly 20% patched.

Rack 4 – Contains Multiple Extron Modules & Equipment – XTP Crosspoint with 27 total modules.

UPS – Backup goes to the wall backup unit – Isolite eCircuit.

Servers – Rack 2 – (5) total server switches – No Other Equipment

Copper backbone – minimal copper feed cabling on the backboard.

Fiber backbone – Air Blown fiber – Yes.

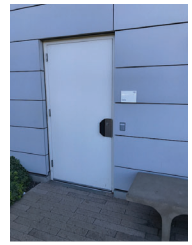
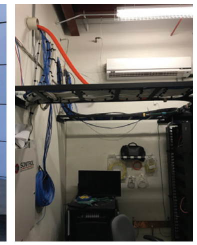
Grounding – Yes.

OTHER OBSERVATIONS:

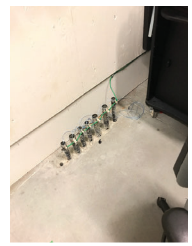
- Small cable bundle of Cat6 cable and other low voltage cable, coiled behind the server racks
- The room in general is free of clutter
- There is no fire stop in horizontal sleeves feeding into the room and in some of the vertical sleeves on the floor.

RECOMMENDATIONS:

- Miscellaneous cabling can be dressed into the cable management.
- Fire stop all of the vertical and horizontal conduits.












Student Support Building – #7.0 – SSB

The Student Services "A" building is a three-story building and has 9,970 ft2 floor area. Its usage is mainly for offices and classes spaces. Building is forty years old.

SCHEDULE

The building is occupied from 700 AM till 500 PM, most of times. The custodian occupies the building till 1200 AM midnight. Evening or night classes on this campus are not offered.

SSB - Room #118

Contains (1) 2-post rack, wire management (horizontal only); no ladder tray.

Rack 1 – Contains (2) 96-Port Patch Panels – roughly 70% patched.

Rack 1 – Contains (1) LIU chassis for Single-Mode (SM) and Multi-Mode (MM) fiber – SM fiber has 12 strands, with 2 strands in use – MM fiber has 12 strands, with 2 strands in use.

UPS – Rack mounted ups plugged into the wall.

Copper backbone – minimal copper feed cabling on the backboard – multiple connections.

Fiber backbone – Air Blown fiber – Yes; draped along the side of the 2-post rack.

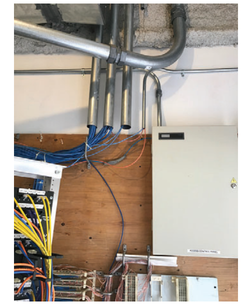
Grounding – No.

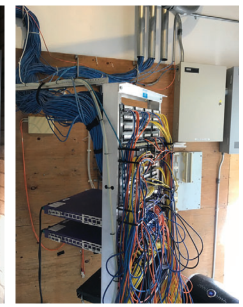
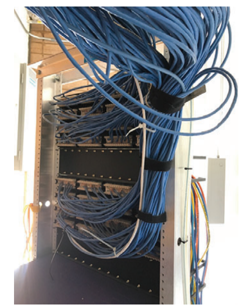
OTHER OBSERVATIONS:

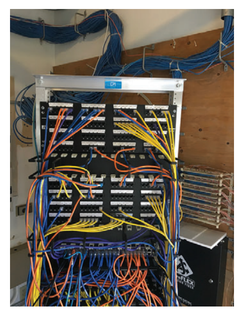
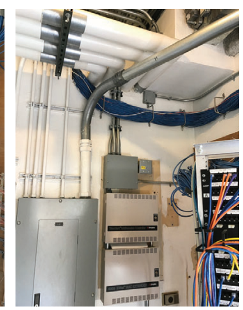
- No temperature control in the room – stand alone AC for air flow. EXTREMELY HOT
- The room in general has miscellaneous clutter throughout.
- There is no fire stop in vertical sleeves feeding into the room and in some of the horizontal sleeves on the floor.

RECOMMENDATIONS:

- Temperature control to keep the equipment cool.
- Complete room layout for the 2-post rack and supporting equipment. Side mount and re-terminate station cabling. Cable labeling should also be addressed
- Ladder tray to the wall to support the 2-post rack.
- Vertical and horizontal wire management, with covers.
- Grounding for all IT components.
- Velcro for all of the cable bundles.
- Innerduct protection for the air-blown fiber – along the side of the 2-post rack.
- Fire stop all of the vertical and horizontal conduits.

Learning Resource Center – #8 – LRC

The Learning Resource Center is a three-story building and has 58,500 SF floor area. Its use ranges from offices, classrooms, computer laboratory, auto shop garage spaces, and for firefighting training. Building is nine years old.

SCHEDULE

The building is occupied from 700 AM till 500 PM, most of times. The custodian occupies the building till 1200 AM midnight. Evening or night classes on this campus are not offered.

BDF

Contains (5) 2-post racks, wire management (vertical and horizontal) and ladder tray throughout.

Contains (6) Enclosed server racks for the network distribution.

Rack 1 - Contains the temperature room alert module and stationary control equipment.

Rack 2 – Contains fiber networks switches, for multiple devices.

Rack 3 – Contains the fiber terminations; roughly 72 strands of Single-Mode and Multi-Mode.

Rack 4 – Contains additional network switches to distribute to the other 2-post racks.

Rack 5 – Contains – XTP Crosspoint with 18 total modules.

Copper Patch Panels – (2) 96-Port – roughly 70% patched.

Fiber panels – (3) LIU chassis for Single-Mode (SM) and Multi-Mode (MM) fiber – SM fiber has 72 strands, with 12 strands in use – MM fiber has 72 strands, with 12 strands in use.

UPS – Floor mounted power control units – with emergency backup.

Copper backbone – Copper feed cabling on the backboard – multiple connections.

Fiber backbone – Air Blown fiber – Yes; draped along the side of the 2-post rack.

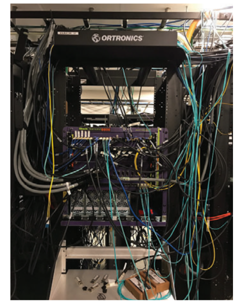
Grounding – Yes.

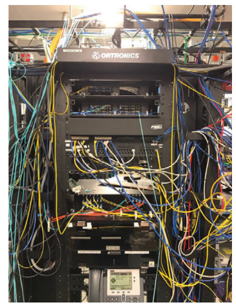
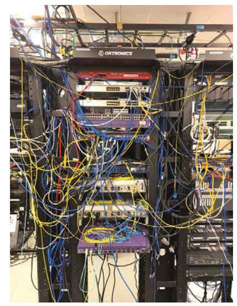
OTHER OBSERVATIONS:

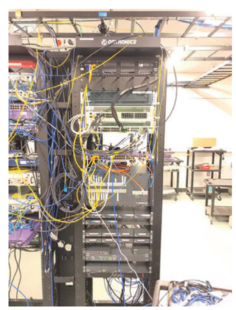
- The room in general has miscellaneous clutter throughout.
- It appears that some of the air flow is out of line with the server racks.
- There is some fire stop in vertical sleeves feeding into the room and in some of the horizontal sleeves on the floor.

RECOMMENDATIONS:

- Cable management on the fiber and copper jumper cabling.
- Fire stop all of the vertical and horizontal conduits.
- Assess the air flow on the hot and cold isles.


Central Complex – #10 – CNTL 1 – Main Core

The Central Complex building is a single-story building and is roughly 10,000 square feet. Its usage is mainly for security and office space in the front building. Building age is unknown at this time.

SCHEDULE

The building is occupied from 700 AM till 500 PM, most of times. The custodian occupies the building till 1200 AM midnight. Evening or night classes on this campus are not offered.

Data Room – #106

Contains (2) 2-post racks, wire management (vertical/horizontal) and ladder tray to the wall.

Rack 1 (#101) – Contains the (1) fiber LIU, room alert module, fiber switches, analog circuits and some AT&T equipment. There are copper and fiber feed cables terminated within the rack.

Rack 2 (#102) – Contains the AT&T backhaul with fiber switches and ups backup devices.

Fiber panels – Rack 1 – (1) LIU chassis for Single-Mode (SM) – SM fiber has 12 strands, with 6 strands in use.

Servers – Rack 1 – (8) total server switches – Rack 2 – (2) total server switches.

Copper backbone – multiple copper feed cables throughout, terminated on the backboard.

Fiber backbone – Air Blown fiber – Yes.

Grounding – Yes.

Temperature Control – Yes.

OTHER OBSERVATIONS:

- Cable management to most server ports; some of the fiber patching is loosely dressed.
- The room in general is free of clutter
- There is no fire stop in horizontal sleeves feeding into the room and in some of the vertical sleeves on the floor.

RECOMMENDATIONS:

- Miscellaneous cabling can be dressed into the cable management.
- Fire stop all of the vertical and horizontal conduits.
- Remove the abandoned copper feed cabling and any excess equipment.

Central Complex – #10 – CNTL 1 – Main Core – Back Room

Data Room – Main Core

Contains (2) 2-post and (1) 4-post rack, wire management (vertical/horizontal) and ladder tray to the wall.

Rack 1 – Contains (5) fiber LIU's that are configured with Single and Multi-Mode ports.

Rack 2 – Contains fiber and copper switches.

Rack 3 – Cabinet – Contains copper cabling and copper switches.

Fiber panels – Rack 1 –LIU chassis for Single-Mode (SM) – approximately 216 strands of SM fiber, with approximately 56 strands in use. LIU chassis for Multi-Mode (MM) – approximately 216 strands of SM fiber, with approximately 56 strands in use.

Servers – Rack 2 – (10) total server switches – Fiber switches are approximately 90% in use.

Copper backbone – copper feed cables throughout, terminated on the backboard.

Fiber backbone – Air Blown fiber – Yes.

Grounding – Yes.

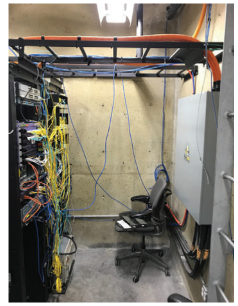
Temperature Control – Yes.

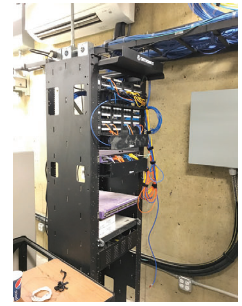
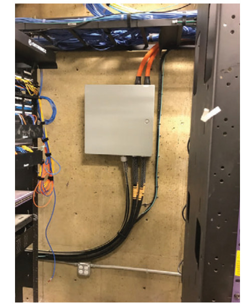
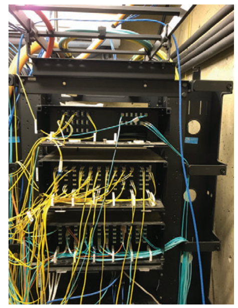
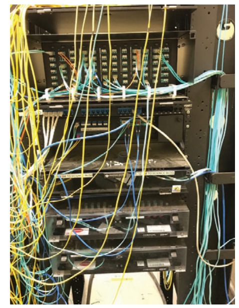
OTHER OBSERVATIONS:

- Most of the fiber patching is loosely dressed and needs to be supported.
- The room in general is free of clutter
- There is no fire stop in horizontal sleeves feeding into the room and in some of the vertical sleeves on the floor.

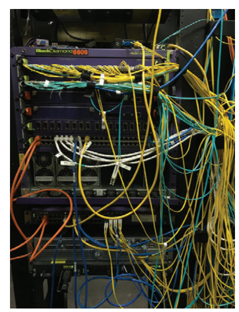
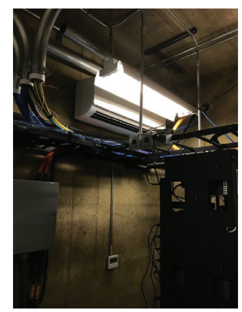
RECOMMENDATIONS:

- Fiber cabling needs to be dressed into the cable management.
- Fire stop all of the vertical and horizontal conduits.
- Remove the abandoned copper feed cabling and any excess equipment.
- Remove the unused ups from Rack 1.






Fire Tech – Public Safety & Allied Health – #16 – PSAH – BDF #119

The Fire Tech – Public Safety & Allied Health building is a two-story building and has roughly 47,000 square foot of space. Its usage is mainly classroom study. Building is roughly 4 years old.

SCHEDULE

The building is occupied from 700 AM till 500 PM, most of times. The custodian occupies the building till 1200 AM midnight. Evening or night classes on this campus are not offered.

BDF Room – #119

Contains (3) 2-post racks, wire management (vertical/horizontal) and ladder tray to the wall.

Rack 1 – Contains the (1) network switch.

Rack 2 – Contains the (1) fiber LIU, room alert module, fiber switch and network switches.

Rack 3 – Contains the workstation cabling.

Copper Patch Panels – Rack 3 - (4) 48-Port – roughly 60% patched.

Fiber panels – (1) LIU chassis for Single-Mode (SM) and Multi-Mode (MM) fiber – SM fiber has 12 strands, with 2 strands in use – MM fiber has 12 strands, with 2 strands in use.

Servers – Rack 2 – (3) total server switches.

Copper backbone – minimal copper feed cables, terminated on the backboard.

Fiber backbone – Air Blown fiber – Yes.

Grounding – Yes.

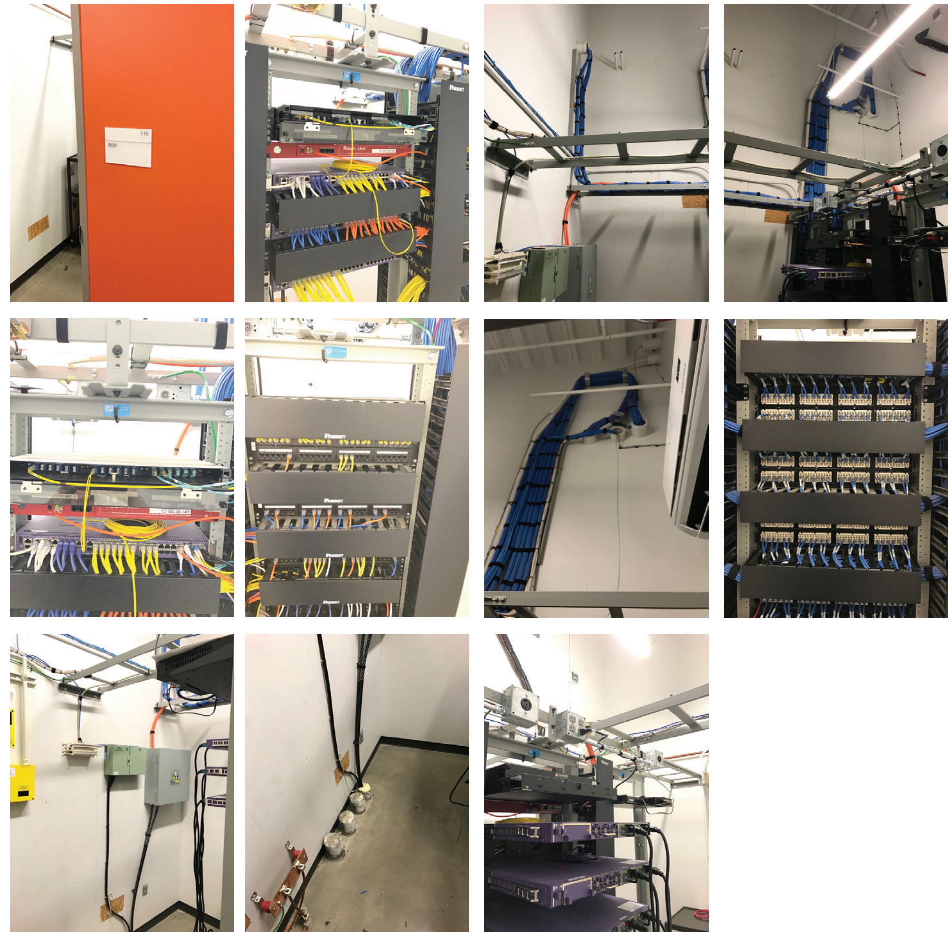
Temperature Control – Yes.

OTHER OBSERVATIONS:

- There is no fire stop in horizontal sleeves feeding into the room and in some of the vertical sleeves on the floor.

RECOMMENDATIONS:

- Miscellaneous cabling can be dressed into the cable management.
- Fire stop all of the vertical and horizontal conduits.



Fire Tech – Public Safety & Allied Health – #16 – PSAH – 2nd Floor – IDF #205

IDF Room – #205

Contains (3) 2-post racks, wire management (vertical/horizontal) and ladder tray to the wall.

Rack 1 – No Equipment.

Rack 2 – Contains the (1) fiber LIU, room alert module, fiber switch and network switches.

Rack 3 – Contains the workstation cabling.

Copper Patch Panels – Rack 3 - (3) 48-Port – roughly 60% patched.

Fiber panels – (1) LIU chassis for Single-Mode (SM) and Multi-Mode (MM) fiber – SM fiber has 12 strands, with 2 strands in use – MM fiber has 12 strands, with 2 strands in use.

Servers – Rack 2 – (2) total server switches.

Copper backbone – minimal copper feed cables, terminated on the backboard.

Fiber backbone – Air Blown fiber – Yes.

Grounding – Yes.

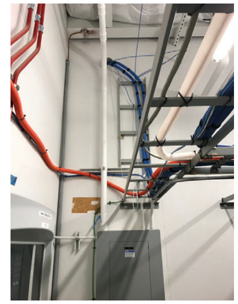
Temperature Control – Yes.

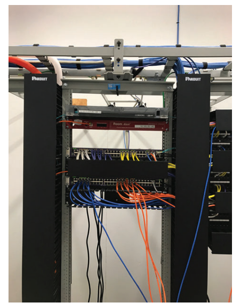
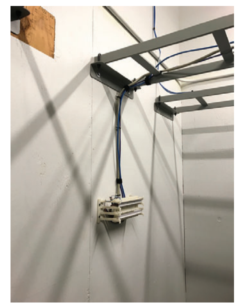
OTHER OBSERVATIONS:

- There is no fire stop in horizontal sleeves feeding into the room and in some of the vertical sleeves on the floor.

RECOMMENDATIONS:

- Miscellaneous cabling can be dressed into the cable management.
- Fire stop all of the vertical and horizontal conduits.


CHAPTER 6

Sanitary Sewer System

SYSTEM DESCRIPTION

The Crafton Hills College (CHC) sanitary sewer system is served by an 8-inch Vitrified Clay Pipe (VCP) public main located in Sand Canyon Road. In general, sewage flows travel west and south on campus and join the public system in Sand Canyon Road. The City of Redlands public sewer mains are identified in Figure 1a, Existing Utility map – Sanitary Sewer. This study is limited to the analysis of the on-site campus sanitary sewer system.

The Sewer System Management Plan (SSMP) prepared for San Bernardino Community College District (SBCCD) by Holmes International was also reviewed as a part of this analysis. The SSMP requires that a hydraulic analysis be performed of the existing sewer system in order to determine any system constraints that could potentially lead to sewer spills. Furthermore, it requires that a Capital Improvement Plan (CIP) be established in order to provide hydraulic capacity within the campus sewer system. This report should satisfy the hydraulic analysis required and will also layout key system elements to be upgraded or replaced as a part of a separate CIP.

METHODOLOGY

The City of Redlands does not publish sewer planning factors. Since the City of Redlands does not provide direction it was logical to follow an adjacent municipality's design criteria. Therefore, the City of San Bernardino Department of Public Works Sewer Policy and Procedures was reviewed to evaluate the procedure for calculating design flow. Per the City of San Bernardino policy and procedures, division II, item 9 [Qd=3.6(Qa)0.85] where Qd is the design flow and Qa is the average daily flow. In order to determine the average flow for the on-site buildings Table A of the Procedures indicated that for Junior Colleges and Universities average flows are estimated at 0.0025 cfs/AC. However, since the planning factors in the policy and procedure document are basic and are geared towards master planning purposes we determined that a more accurate analysis could be completed based on individual building uses rather than an overall campus use of Junior College. Therefore, average daily flows from each building were calculated on an occupancy type basis per Table F229 of the City of Los Angeles Bureau of Engineering Sewer Design Manual included in Appendix B. Several building types generation rates are tied to student enrollment. Therefore, the most current Master Plan was consulted for the existing and future student enrollment. Utilizing this methodology the Average Daily Flow (ADF) generation rates increase for existing buildings in the future scenario based on expected student growth as indicated in the Master Plan.

Utilizing Manning's equation this study compared the calculated design flow rates to the downstream pipe's capacity to determine whether the downstream pipe has adequate capacity.

ANALYSIS OF EXISTING SYSTEM

The existing Polyvinyl Chloride (PVC) sewer system was not videoed and reviewed as a part of this analysis and due to the relatively young age of the system and no reported issues by Facilities, it was considered to be in good condition.

Table 1-1 summarizes the existing campus buildings' square footage was used to determine the average daily flow generated on campus.

Based upon the criteria herein, the existing average daily flow rate generated from on campus buildings is calculated at approximately 136,015 gallons per day (gpd), which is equivalent to a design flow rate of 1.417 cubic feet per second (cfs).

The capacity of the existing system was calculated using Manning's equation and based on the material type, slope, and size of the existing sewer pipes. A sanitary sewer capacity analysis was performed for each private main on campus. Each of the private sanitary sewer mains corresponds to an Area "A" through "F". A key map illustrating the sewer area locations is provided.

Engineering industry standards dictate that the maximum allowable flow for sewer pipe is one-half the full flow capacity of the pipe. Existing pipes which exceed the one-half full standard may not need replacement based on other factors such as slope, age, location, etc.

For existing pipes where the material was unknown, PVC was assumed.

TABLE 1-1 BUILDING GROSS SQUARE FOOTAGE/AVERAGE DAILY FLOWS

Building Name	GSF	ADF (GPD)	ADF (CFS)	Design Flow (CFS)
Crafton Hall	9,360	3,370	0.005	0.035
Clock Tower Building	9,970	3,589	0.005	0.037
West Complex	7,540	2,714	0.004	0.028
Crafton Center	46,542	16,755	0.025	0.174
Student Support Building	5,575	2,007	0.003	0.021
Learning Resource Center	59,100	21,276	0.032	0.222
Central Complex 1	24,840	8,942	0.013	0.093
Central Complex 2	18,038	6,494	0.01	0.068
Canyon Hall	34,147	12,293	0.018	0.128
Visual Arts	10,800	3,888	0.006	0.040
Public Safety & Allied Health	31,035	11,173	0.017	0.116
East Instructional Building (FUTURE)	40,000	14,400	0.022	0.150
Performing Arts Center Expansion	35,504	14,699	0.022	0.153
Instructional Building (FUTURE)	40,000	14,400	0.022	0.150
East Valley Public Safety Training Center	32,000	11,520	0.017	0.120
Gymnasium Replacement	43,318	12,995	0.019	0.135
Maintainence & Operation	3,600	720	0.001	0.007
Child Development Center	9,135	700	0.001	0.007

ANALYSIS OF FUTURE NEEDS

The sanitary sewer system was evaluated with the addition of the proposed buildings as discussed in the Executive Summary, recommendations have been made to relocate, demolish and replace various existing sanitary sewer pipe lines in order to accommodate the future development. This is conceptually illustrated in the Future Conditions Utility Map – Sanitary Sewer. The proposed sanitary sewer alignments are the basis for the proposed system evaluation and analysis presented herein.

Based upon the City of San Bernardino criteria, the future average daily flow generated on campus is estimated at 161,935 gpd, which is equivalent to a design flow rate of 1.687 cfs.

The proposed sanitary sewer system model and using Manning's equation, provides a calculated flow capacity for the proposed sanitary sewer system. Based on the criteria herein, the sanitary sewer pipe is considered at capacity when half-full. The average daily flow is derived from the proposed building allocation per the current campus master plan. All new pipes were assumed to be PVC and have a minimum slope of 0.5%, if unknown. Further description is provided in the Findings and Recommendations Section.

FINDINGS AND RECOMMENDATIONS

Findings

The anticipated sewage flow rates from the existing and future buildings are all within the capacity of the campus' sewer system.

Table 1-5, below, provides a summary of the total sanitary sewer flow entering the City of Redlands sewer main in Sand Canyon Rd in both the existing and proposed conditions.

TABLE 1-5: SANITARY SEWER FLOW SUMMARY

	Average Daily Flow (gpd)	Design Flow (cfs)
Existing Campus Generated Sewer Flows	136,015	1.417
Proposed Campus Generated Sewer Flows	161,935	1.687
Net Increase	**25,920**	**0.270**

Tables 1-2 through 1-4 provide a summary of the sanitary sewer system maximum flow rate (or capacity); average daily flow rate, and design flow rate for both existing and proposed sanitary sewer systems at each pipe segment.

Recommendations

Based upon coordination with Facilities staff and past campus improvements, there are generally no sewer issues at this time. No capital projects have been identified only projects related to proposed buildings. The recommendations presented herein include extension of the sanitary sewer system to serve proposed buildings presented in the Master Plan; and removal and relocation of existing sanitary sewer service mains and laterals serving existing buildings planned to be demolished to provide a clear site for future development. Descriptions of each priority level are provided in the executive summary of this report.

Priority 4 – Sewer system shall be maintained on a regular basis to ensure operational life expectancy and minimize associated maintenance issues. This may include but is not limited to regular manhole inspection, CCTV inspection, hydro jet cleaning, etc.

The findings and recommendations presented in this report are determined from City of San Bernardino sanitary sewer design criteria and standard planning guidelines as well as the City of Los Angeles Bureau of Engineering Sewer Design Manual. It is acknowledged that CHC is not within these jurisdictional limits; however these design guidelines provide the best information possible for the analysis. It should be noted that the analysis assumes that the existing campus square footage will be maintained and that existing utilities are in adequate condition and maintained. In the case that the individual proposed building designs yield larger flow rates than presented herein, it is recommended that the college re-evaluate the data analysis and update the findings.

EXISTING SANITARY SEWER WATER BASINS

THIS PAGE WAS UPDATED ON 12/04/2023

FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

EXISTING SANITARY SEWER LINE
SANITARY SANITARY SEWER VALVE
EARTHQUAKE FAULT LINE

BUILDING LEGEND

EXISTING BUILDING................................
UNDER CONSTRUCTION........................

CRAFTON HILLS COLLEGE

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Existing Sanitary Sewer System

Date: 12/04/2023

PROPOSED SANITARY SEWER WATER DISTRIBUTION SYSTEM

CHAPTER 7
Storm Drain System

SYSTEM DESCRIPTION

This storm drain section of the report includes the following based on the project scope:

- Summary of storm water regulations
- Concept level BMP recommendations
- Concept exhibits and unit costs
- Hydrology and hydraulics of storm drain systems are not included

EXISTING STORM DRAIN AND BMP SYSTEM

The Crafton Hills College (CHC) campus drains in a generally south and westerly direction to Sand Canyon Road. The campus currently utilizes a detention basin located at the west intersection of Campus Drive and Sand Canyon Road. The basin discharges via overland flow to an unnamed creek which eventually discharges to San Timoteo Creek. Another basin is located east of Canyon Hall, eventually discharging to San Timoteo Creek. The existing campus possesses a few storm water best management practices (BMPs) to address water quality. Some are currently in use while others have the potential to be utilized. We have included descriptions of both types of BMPs below.

Vegetated Swale – The campus's existing vegetated swale provides pre-treatment filtration for on-onsite runoff. Vegetated swales are open, shallow channels, lined with vegetative cover that collect and slowly convey runoff to downstream discharge points. Typically the vegetative cover is comprised of low-lying grasses; however, thicker, denser ground cover may be used in certain circumstances. Pollutant removal is achieved through settling of particulate material, attachment to vegetative cover and plant uptake. Vegetated swales also reduce the effects of hydromodification by allowing for infiltration, evaporation, and reduced velocities. Hydromodification is generally defined by modifications to an area which alters or effects natural drainage patterns and infiltration rates, i.e. replacing an open field with a paved parking lot. Effectiveness of the vegetated swales is increased by maximizing the resonance time in the swale accomplished with flat slopes and large longitudinal distances which also attenuate for hydromodification. Vegetated swales are effective in reducing flow velocities, promoting infiltration, and allowing particulates to attach to vegetation or other suspended solids.

Detention Basin - A dry extended detention basin consists of a basin whose outlet has been designed to detain the stormwater runoff from a water quality design storm. Generally, the water is detained for a minimum of 48 hours to allow sediment and other pollutants to settle. They do not have a permanent pool and can be used to provide flood control by including additional flood detention storage.

Fig. 2a – Existing Utility Map – Storm Drain and BMPs, shows existing BMP and storm drain locations.

REGULATIONS

The design and construction of on-site improvements are subject to review and approval of the Department of the State Architect (DSA). DSA is the permitting jurisdiction applicable to CHC. Typically DSA offers no review of drainage facilities and does not require hydrology, hydraulic, or water quality calculations.

Santa Ana River Hydrologic Unit

The Project site is located within the Santa Ana River Hydrologic Unit, which includes portions of Riverside, San Bernardino, and Los Angeles counties, as well as a significant portion of northern and central Orange County. The Santa Ana River Hydrologic Unit is approximately 2,700 square miles and makes up the majority of the jurisdictional area of the Santa Ana RWQCB (RWQCB Region 8; USGS 2007).

In addition to falling within the Santa Ana River Hydrologic Unit, the campus is also within the Upper Santa Ana River Hydrologic Area and the Reservoir Hydrologic Sub-Area (801.55).

San Bernardino County MS4 Permit

The requirement to implement storm water BMPs for development projects is based on Section 402 (p) of the Clean Water Act. The Federal Clean Water Act amendments of 1987 established a framework for regulating storm water discharges from municipal, industrial, and construction activities under the National Pollutant Discharge System (NPDES) program. Under the Federal Clean Water Act, municipalities throughout the nation are issued a Municipal NPDES Permit. The primary goal of the Municipal Permit is to stop polluted discharges from entering the storm water conveyance system and local receiving and coastal waters.

On January 29, 2010, the Santa Ana Regional Water Quality Control Board adopted Riverside County MS4 Permit Order No. R8-2010-0036, NPDES No. CAS 618036 specifying the Area-Wide Urban Runoff Management Program. The NPDES permit specifies discharge requirements for the San Bernardino County Flood Control District, the County of San Bernardino, and the Incorporated Cities of San Bernardino within the Santa Ana Region. The Principal Permittee is the San Bernardino County Flood Control District, which is responsible for overseeing the development and implementation of the area-wide storm water program, including development and maintenance of a model Water Quality Management Plan (WQMP) for local agency new development and significant redevelopment programs.

The model WQMP Guidance and Template provide a framework to incorporate some of the watershed protection principles into the Permittees' planning, construction and post-construction phases of priority projects. The model WQMP requires site design (including, where feasible, Low Impact Development principles), source control and treatment control elements to reduce the discharge of pollutants in urban runoff. On April 30, 2004, the Regional Board approved the model WQMP Guidance and Template. The Permittees are requiring project proponents to develop and implement site-specific WQMPs. This Order requires the Permittees to verify functionality of post-construction structural BMPs prior to issuance of certificate of occupancy and to track and ensure long term operation and maintenance of post-construction BMPs in approved WQMPs.

The Permit requires project proponents to first consider preventative and conservation techniques (e.g., preserve and protect natural features to the maximum extent practicable) prior to considering mitigative techniques (structural treatment, such as infiltration systems). The mitigative measures should be prioritized with the highest priority for BMPs that remove storm water pollutants and reduce runoff volume, such as infiltration, then other BMPs, such as harvesting and use, evapotranspiration and bio-treatment should be considered. To the maximum extent practicable, these Low Impact Development (LID) Best Management Practices (BMPs) must be implemented at the project site. The Regional Board recognizes that site conditions, including site soils, contaminant plumes, high groundwater levels, etc., could limit the applicability of infiltration and other LID BMPs at certain project sites. Where LID BMPs are not feasible at the project site, more traditional, but equally effective control measures should be implemented. This Order provides for alternatives and in-lieu programs where the preferred LID BMPs are infeasible.

As a Co-Permittee, the City of Redlands requires development and re-development projects to submit WQMPs to minimize the detrimental effects of urbanization on the beneficial uses of receiving waters. WQMPs provide the framework for minimizing the adverse effects of development and re-development projects on receiving waters. These effects may be minimized through the implementation of site designs that reduce runoff and pollutant transport by minimizing impervious surfaces and maximizing on-site infiltration, source-control BMPs, and/or either on-site structural treatment control BMPs, or participation in regional or watershed-based structural treatment control BMPs. As discussed earlier in the report DSA is the permitting agency for CHC, not the City of Redlands; however since DSA does not have storm water quality guidelines to aid CHC in complying with Federal and State requirements it makes logical sense that the campus adhere to the City of Redlands requirements since CHC ultimately discharges to City of Redlands MS-4 facilities.

In addition to addressing post-development urban storm water quality, the WQMP includes requirements to protect environmentally sensitive areas and to address potential hydromodification issues that may result from each project. The WQMP requires identification of hydrologic conditions of concern (HCOC). An HCOC exists when a site's hydrologic regime is altered and there are likely to be significant impacts on downstream channels and aquatic habitats, alone or in conjunction with impacts of other projects. Currently, new development and significant re-development projects are required to perform this assessment and incorporate appropriate BMPs to ensure existing hydrologic conditions are maintained. The new permit requires the Permittees to implement, where feasible, LID techniques to minimize HCOC and supports the implementation of in-stream hydromodification protection and/or mitigation alternatives where appropriate.

LID TECHNIQUES

Low Impact Design (LID) techniques use integrated, implemented measures designed to manage storm water via vegetation. LID techniques aim to:

- Reduce polluted stormwater entering receiving waters
- Reduce impervious surface thereby reducing runoff and promoting infiltration
- Increase urban green space
- Reduce heat island effect
- Reduce flows to existing stormwater conveyances

Examples of LID techniques recommended by the City of Redlands and other adjacent municipalities include the following:

- Use bioretention cells as rain gardens in landscaped parking lot islands to reduce runoff volume and filter pollutants.
- Disconnect the downspouts from roofs and direct the flow to permeable paver areas or other vegetated infiltration / filtration practices.
- Use multi-functional open drainage systems in lieu of more conventional curb-and-gutter systems.
- Use green roofs for runoff reduction, energy savings, improved air quality, and enhanced aesthetics.
- Apply a treatment train approach to provide multiple opportunities for stormwater treatment and reduce the possibility of system failure. Consider combining a grassed swale with permeable paver overflow areas and a landscaped bioretention cell.

FINDINGS AND RECOMMENDATIONS

BMP Recommendations

The table below indicates the anticipated removal efficiencies for various sustainable stormwater treatment BMPs. The matrix should assist project designers in selecting appropriate BMPs for individual projects based on the potential pollutants of concern.

TABLE 2-1: POTENTIAL POLLUTANT REMOVAL EFFICIENCIES

	Extended Detention Basin	Wet Ponds	Wetland Basins	Swales	Infiltration Basins & Trenches	Retention/ Irrigation Reuse	Bio-retention
Nutrients	L	M	M	L	H	H	L
Sediment	M	H	H	M	H	H	H
Metals	M	H	H	M	H	H	H
Pathogens	M	H	H	L	H	H	H
Organics	M	H	H	M	H	H	M
Toxicity	M	H	H	M	H	H	M
Trash	H	H	H	L	H	H	H

L= Low M= Medium H= High

The following BMPs are recommended:

- Continued use and maintenance of the existing vegetated swale and detention basin.
- Each future building project should prepare a WQMP per the City of Redlands' template in order to document all project related BMPs and mitigation measures.
- The following LID strategies should be incorporated with future development where feasible:
  - Maximize natural infiltration capacity
  - Preserve existing drainage patterns and time of concentration
  - Protect existing vegetation and sensitive areas
  - Minimize impervious areas
  - Disconnect impervious areas
  - Minimize construction footprints
  - Revegetate disturbed areas
  - Implement source control measures such as:
    - Using activity restrictions
    - Implementing a spill contingency plan
    - Performing regular street/parking lot sweeping
    - Utilizing efficient irrigation systems
  - Installing storm drain signage to discourage illegal dumping
  - Properly operate and design vehicle maintenance/wash areas, docks, etc.

Several of the future buildings proposed along the southern portions of campus will be situated such that they will not drain to the existing vegetated swale and detention basin. These buildings will need to incorporate local BMPs such as small scale detention basins, bio-filtration basins, vegetated swales, etc. prior to discharging runoff to the existing natural drainage channels adjacent to Sand Canyon Road. Fig. 2b – Future Utility Map – Storm Drain and BMPs, shows potential BMP and storm drain locations.

With further analysis CHC could consider treating storm water runoff from some of the future building sites in a regional fashion, such that some BMPs could be shared. A complete Storm Water Management Plan could analyze the existing and future hydrology of the campus and incorporate BMPs based on the hydrology and hydraulic characteristics.

Unit Costs

Based on California Stormwater Quality Association (CASQA) data; unit costs for some of the recommended BMPs can be expected to fall within the following ranges:

- Vegetated swales - $0.50/sf to $0.70/sf
- Detention Basins - $1.00/cf to $1.50/cf
- Vegetated Buffer Strips - $0.30/sf to $0.70/sf
- Porous/Permeable Paving - $15/sf to $25/sf
- Bioretention Areas - $10/sf to $40/sf
- Pervious AC Pavement - $1.75/sf – $3.50/sf*
- Pervious Concrete Pavement - $6/sf - $9/sf
- Porous Pavers - $10/sf – $15/sf
- Cisterns (55 gal example) - $80-$120
- Green Roofs (New) - $5/sf - $10/sf

*Unit cost is for pavement material only, does not include demolition, excavation, etc.

Note that the cost described above are average market costs. For more specific costs.

Future building budgets should incorporate allowances for sustainable BMPs to be designed and constructed with the building project.

Recommendations

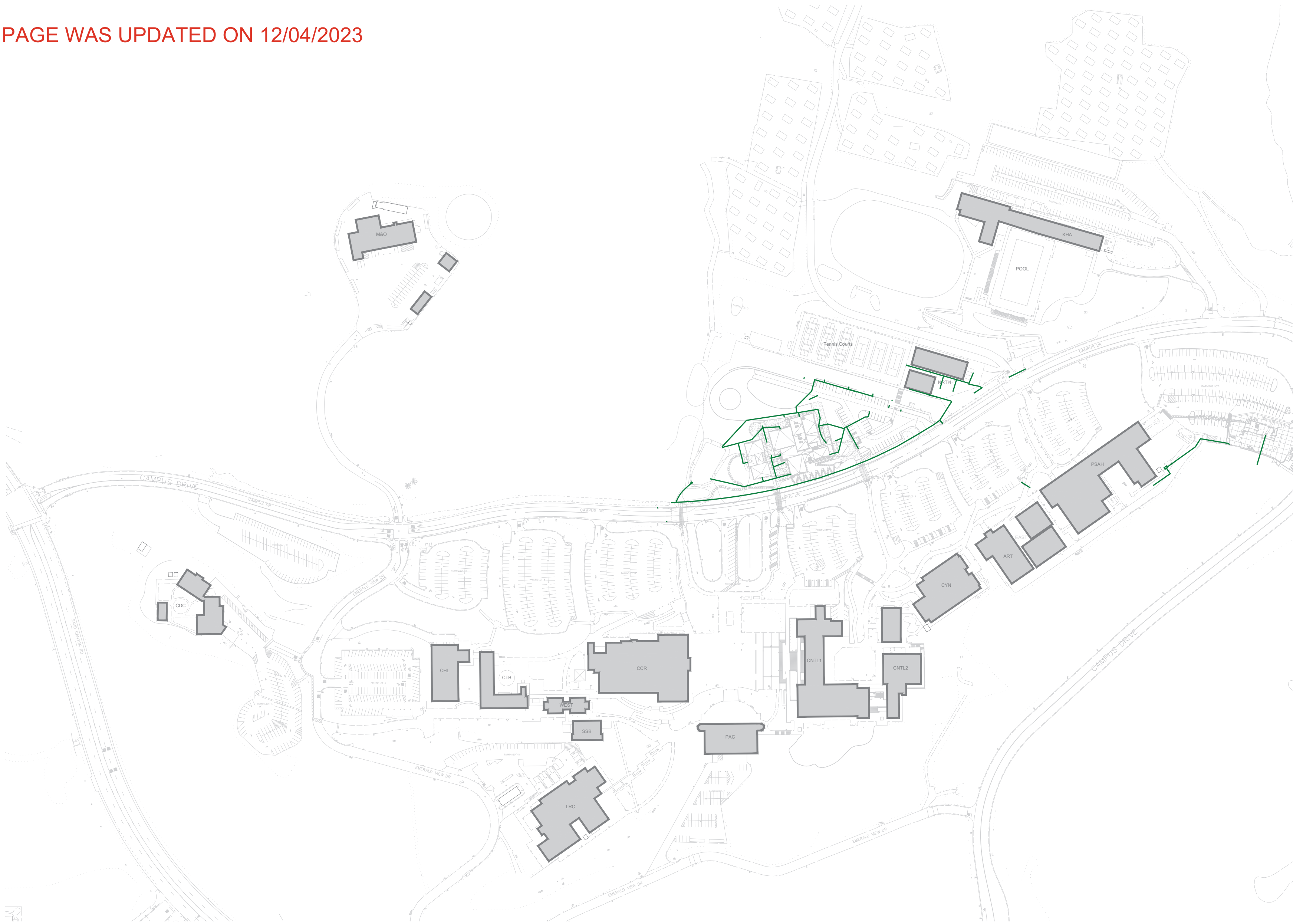
Based upon coordination with Facilities staff and past campus improvements, there are generally no storm drain issues at this time. No capital projects have been identified only projects related to proposed buildings. The recommendations presented herein include extension of the storm drain systems to serve proposed buildings presented in the Master Plan; and removal and relocation of existing storm drains serving existing buildings planned to be demolished to provide a clear site for future development. Descriptions of each priority level are provided in the executive summary of this report.

Priority 4 – Storm drain system shall be maintained on a regular basis to ensure operational life expectancy and minimize associated maintenance issues. This may include but is not limited to regular manhole and inlet inspection, CCTV inspection, hydro jet cleaning, removal of sediment and debris, etc. Frequency could be every 5-10 years, or as needed.

Priority 4 – BMP Maintenance. This shall include regular cleaning and inspection of bio-swales, detention basins, etc. Frequency could be every 5-10 years, or as needed.

It should be noted that the analysis assumes that the existing campus square footage will be maintained and that existing utilities are in adequate condition and maintained. In the case that the individual proposed building designs yield larger flow rates than presented herein, it is recommended that the college re-evaluate the data analysis and update the findings.

THIS PAGE WAS UPDATED ON 12/04/2023



FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

EXISTING STORM DRAIN LINE
SANITARY STORM DRAIN VALVE
EARTHQUAKE FAULT LINE

BUILDING LEGEND

EXISTING BUILDING....................
UNDER CONSTRUCTION....................

CRAFTON HILLS COLLEGE

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Existing Storm Drain System

Date: 12/04/2023

PROPOSED STORM DRAIN DISTRIBUTION SYSTEM

CHAPTER 8
Domestic and Irrigation Water System

SYSTEM DESCRIPTION

CHC has a public combined backbone water system for the campus. Two tanks owned and operated by the City of Redlands (City) are located up the hill from the main campus area. Individual water services for domestic consumption and for firefighting purposes are provided at several locations along Campus Drive. The existing irrigation water is drawn from the existing potable meters without sub-metering. A non-potable/recycled water line has been installed to serve the campus and reduce the potable water usage and sewer capacity fees.

The campus currently resides within the service limits of the City of Redlands for both sewer and water service. The City of Redlands (City) provides water to the campus irrigation system at multiple combined domestic/irrigation meter locations. Billing information for a two year period for the water meters which includes meter numbers, sizes, and water usage was obtained from current water bills provided by The City of Redlands. A sample of water bills, current bill rates, and usage history by meter is included in the appendices.

The existing irrigation water distribution system and locations of the City connections are shown on Existing Utility Map – Water/Irrigation Water Distribution.

Discussions with CHC facilities personnel revealed that the existing irrigation system is currently operating satisfactorily. Purple pipe, valve boxes, etc. have been installed with the newer irrigation systems. A non-potable/recycled water line has been installed to serve the campus.

METHODOLOGY

Existing domestic water demands for the campus were based on an existing City of Redlands meter readings, see Appendix C. The current billing cycle is approximately 60 days. The average daily usage was determined from the collective meter readings. Results of this analysis are summarized in the following table 3.1.

Irrigation services are cross connected to the potable system at the existing domestic meters; therefore an accurate estimation of existing irrigation usage cannot be determined from the water meter data. The YVWD Draft Recycled Water Design Criteria Manual indicates that Schools/Parks should plan for an Average Daily Demand (ADD) of 2,800 gpd/acre. While this may be a good ADD for planning purposes it is much too conservative for actual design demands. In many instances planning demands can be as much as four times greater than actual demands. However, based on our past project experience of educational campuses in suburban settings, landscape demand usually comprises approximately 25% of the overall water demand on average. During the summer months when school is not in session irrigation water is a greater percentage of the overall water used, however during the fall and spring months when school is in session far less irrigation is necessary consequently the percentage for irrigation would be less. Therefore, based on the overall water meter data we can assume that 25% of the water used for the entire campus is for irrigation purposes. The following table summarizes the estimated existing irrigation demands.

TABLE 3-1: ESTIMATED EXISTING IRRIGATION USE

Meter No.	Size	Avg Day (gpd)
701198663	4"	7330
70212796	8"	0
70212793	8"	10671
70212796	2"	0
70212793	2"	17266
20822077	6"	0
4939610	6"	11220
70212621	6"	45490
70212621	1"	9088
Total		**101,067**
0 Reading Due To No Fires		

ANALYSIS OF EXISTING SYSTEM

The existing domestic services are connected to the public 14" Cement-Mortar Lined and Coated main in Campus Dr. This public main is served by the highest water tank located up the hill from the main portion of campus and has an approximate elevation of 2560' at its base. The main portions of campus vary in elevation from approximately 2360' to 2260', thus pressures in the main are estimated to be 130 psi to 90 psi respectively.

The existing YVWD 16" Ductile Iron (DI) recycled water main in Sand Canyon Rd has reduced pressure, via downstream pressure regulators, of 2340', or approximately 60 psi at both entrances to CHC. The possibility of adjusting the downstream pressure regulators was discussed with YVWD personnel in order to increase the pressure in the existing main adjacent to the campus. However, due to other YVWD facilities and customers located between the regulating station and the campus, YVWD cannot increase the pressure in the existing main at this time.

ANALYSIS OF FUTURE NEEDS

Based on the current master plan the campus is expected to add approximately 200,000 sf of building area, which is an increase of 38%. Applying this same proportionate increase in irrigation demands for the future buildings renders the following estimated future irrigation demands.

TABLE 3-2: ESTIMATED FUTURE IRRIGATION WATER USE

Meter No.	Size	Avg Day (gpd)
701198663	4"	8650
70212796	8"	0
70212793	8"	12592
70212796	2"	0
70212793	2"	20374
20822077	6"	0
4939610	6"	13240
70212621	6"	53670
70212621	1"	10724
Total		**119,260**
0 Reading Due To No Fires		

It is important to note that this analysis assumes the existing and future irrigation demands are spread uniformly across the campus. Due to inconclusive water meter data a more accurate determination cannot be made at this time.

In order to deliver recycled water from the existing main in Sand Canyon Road a private main has been installed to connect the existing irrigation POCs to the recycled system, as illustrated in Figure 3b, Future Conditions Utility Map – Water/Irrigation Water. It has been previously noted, that CHC staff indicated that they require 90 psi at each irrigation point of connection for proper operation. 60 psi is typically used as a minimum pressure, however based on the unique topography of the campus, the existing irrigation layout, etc. 90 psi maybe more appropriate as a minimum pressure. Due to the elevation of the campus and the relatively low pressure in the existing 16" DIP main in Sand Canyon Road a booster pump station is required near the POC with the existing main. It is important to note the final agreed upon minimum desired pressure in the system will affect the booster pump size and design.

FINDINGS AND RECOMMENDATIONS

Findings

An evaluation of the existing water/irrigation water system revealed that the system adequately supports the demand of existing buildings and landscape areas with no significant pipe losses due to pipe size or elevation. However if the existing irrigation system were disconnected from the public main in Campus Dr and connected to the public recycled water main, savings would be realized by decreased usage and sewer capacity fees.

According to the City of Redlands utility bills CHC is currently charged an average of $3.49/HCF by the City for water regardless of potable, fire, or irrigation usage. The City currently charges $0.99/HCF for Non-Potable Water Usage. Increased usage on campus facilitated by the switch to recycled water for irrigation purposes could reduce the monthly water bill. Furthermore, since sewer fees are calculated from water usage they could also be potentially reduced.

Recommendations

The recommendations have been categorized into priority levels. Descriptions of each priority level are provided in the executive summary of this report.

It is recommended that future landscape areas are provided irrigation water service from existing irrigation systems where possible rather than installing new POCs to the public main.

Future Conditions Utility Map – Water/Irrigation Water Distribution, the following are recommendations for improvements to the existing irrigation water system:

PRIORITY 1

- Replacement of outdated devices including Irrigation backflows.
- Replacement of outdated devices, upgrade of existing irrigation controllers to new wireless control system.
- Install new irrigation sub-meters at strategic locations for system monitoring. Integrate with new system controllers.

It should be noted that the analysis assumes that the existing campus square footage will be maintained and that existing utilities are in adequate condition and maintained. In the case that the individual proposed building designs yield larger flow rates than presented herein, it is recommended that the college re-evaluate the data analysis and update the findings.

ROUGH ORDER COST ESTIMATES

Priority 1	Critical - Need replacement in 0-3years	Priority 3	Fair Condition - Need Replacement in Next 5-10 years	Priority 5	New Building Impact - Based on project schedule
Priority 2	Moderately Critical - Need replacement in 3-5 years	Priority 4	Adds Value and Redundancy 5-10 years or as funding is available		

Sequential Tracking #	Campus	Infrastructure Scope	Utility	Installed Year(s)	Brief Description of the Need	Priority Level (1..4)	Project Name	Brief Scope of Project	Project Category	Can the Project be Phased - Y/N	Total Construction Costs ($)[1]	Total Project Costs - Including Soft Costs ($)	Study by (Prime Consultant)
CHC-C1	Crafton Hills College	Irrigation Back Flow Replacement	Irrigation	-	Replacement of outdated devices	1	Back Flow Replacement	Irrigation Enhancement	UF	Y	$100,000	$130,000	Snipes Dye
CHC-C2	Crafton Hills College	Irrigation Controller Replacement	Irrigation	-	Replacement of outdated devices, upgrade of existing irrigation controllers to new wirelss control system	1	Irrigation Controller Replacement	Irrigation Enhancement	UF	Y	$500,000	$650,000	Snipes Dye
CHC-C3	Crafton Hills College	Irrigation Sub Metering	Irrigation	-	Install new irrigation sub meters at strategic locations for system monitoring. Integrate with new system controllers.	1	Irrigation Sub Meters	Irrigation Enhancement	UF	Y	$150,000	$195,000	Snipes Dye
Total Priority 1 Costs											**$750,000**	**$975,000**	
CHC-C4	Crafton Hills College	Storm Drain Cleaning	Storm Drain	-	Cleaning of all sotrm drains every 10 years.	4	Storm Drain Cleaning	Storm drain maintenance	UF	Y	$50,000	$65,000	Snipes Dye
CHC-C5	Crafton Hills College	Bio-Swale Maintenance	Storm Drain	-	Cleaning of all storm drains every 10 years.	4	Storm Drain Cleaning	Storm drain maintenance	UF	Y	$50,000	$65,000	Snipes Dye
CHC-C6	Crafton Hills College	BL 19 - Underground Storm water receptor	Storm Drain	-	Clean every 10 years. Due 2024	4	Storm Drain Cleaning	Storm drain maintenance	UF	Y	$50,000	$65,000	Snipes Dye
Total Priority 4 Costs											**$150,000**	**$195,000**	
Total Costs											**$900,000**	**$1,170,000**	

Project Categories

DM Deferred maintanance: systems or facilities that have not been maintained due to lack of staffing or funding. While operational, failure is imminent.

EM Emergency projects are systems or facilities that have failed or do not function as designed. Repair or replacement is required.

UF Projects or intiatives that would improve systems, facilities or operations on campus.

REG Projects related to Fire, Life, Safety; Code or OSHA compliance. Risk of harm and potential for fines or shutdown directives from regulating authorities.

NC New construction to support proposed buildings

[1]Refer to Appendix for breakdown of costs.

THIS PAGE WAS UPDATED ON 12/04/2023

FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

EXISTING DOMESTIC WATER LINE
DOMESTIC WATER VALVE
EARTHQUAKE FAULT LINE

BUILDING LEGEND

EXISTING BUILDING
UNDER CONSTRUCTION

SCALE: 1" = 100'
0 100

CRAFTON HILLS COLLEGE

P2S ENG

Long Beach | Los Angeles
San Diego | San Jose
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Existing Domestic Water Distribution System

Date: 12/04/2023

THIS PAGE WAS UPDATED ON 12/04/2023

FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
GYM	GYMNASIUM
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

LEGEND

EXISTING IRRIGATION LINE

IRRIGATION VALVE

EARTHQUAKE FAULT LINE

BUILDING LEGEND

EXISTING BUILDING

UNDER CONSTRUCTION

SCALE: 1" = 100'

0 100

CRAFTON HILLS COLLEGE

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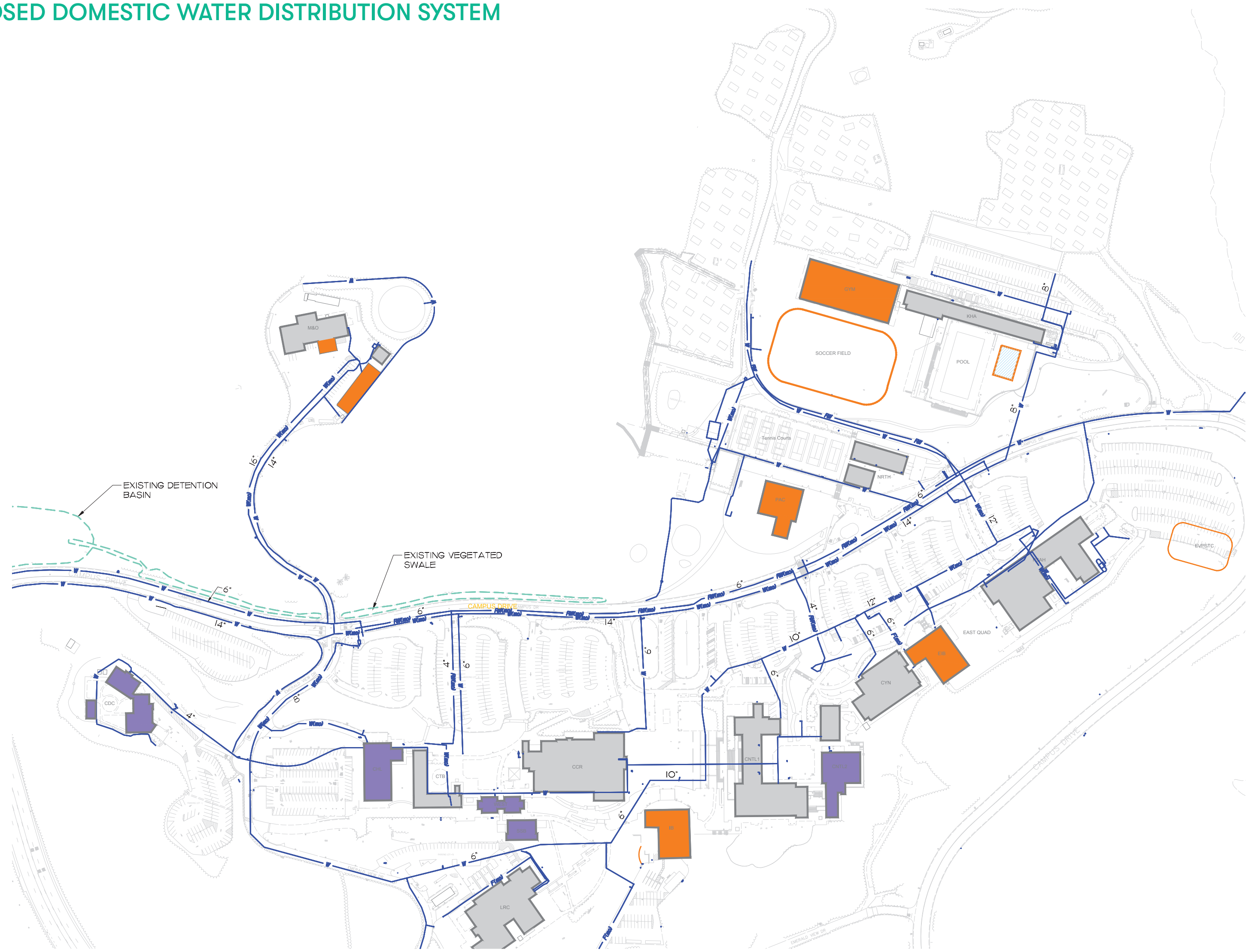
Existing Irrigation System

Date: 12/04/2023

PROPOSED DOMESTIC WATER DISTRIBUTION SYSTEM



FACILITY LEGEND

ART	VISUAL ARTS
CYN	CANYON HALL
CNTL1	CENTRAL COMPLEX
CNTL2	CENTRAL COMPLEX 2
CDC	CHILD DEVELOPMENT CENTER
CTB	CLOCK TOWER BUILDING
CCR	CRAFTON CENTER
CHL	CRAFTON HALL
EAST	EAST COMPLEX
EIB	EAST INSTRUCTIONAL BUILDING
EVPSTC	EAST VALLEY PUBLIC SAFELY TRAINING CENTER
GYM	GYMNASIUM
IB	INSTRUCTIONAL BUILDING
KHA	KINESIOLOGY, HEALTH EDUCATION, AQUATIC COMPLEX
LRC	LEARNING RESOURCES CENTER
M&O	MAINTENANCE AND OPERATIONS
M&O ADD	MAINTENANCE AND OPERATIONS ADDITION
NRTH	NORTH COMPLEX
PAC	PERFORMING ARTS CENTER
PSAH	PUBLIC SAFETY AND ALLIED HEALTH
SSB	STUDENT SUPPORT BUILDING
WEST	WEST COMPLEX

BUILDING LEGEND

- EXISTING BUILDING
- UNDER CONSTRUCTION
- FUTURE BUILDING
- BUILDING RENOVATION/EXPANSION

UTILITY LEGEND

- EXISTING WATER LINE
- EXISTING VEGETATED SWALE AND DETENTION BASIN

CHAPTER 9
Appendix

CHILLED & HEATING HOT WATER SYSTEMS

Description	Qty	Unit	Cost/Unit	Total Costs
Replacement of existing chiller CH-3 (250tons)	1	Ea	$300,000	$300,000
Replacement of existing chiller CH-1, 2 and 4 ((2) 250tons and (1) 90 tons)	3	LF	$250,000	$750,000
Replacement of existing boilers B1 and B2 (3MMBtu Ea)	2	LF	$150,000	$300,000
Replacement of existing control system	1	LS	450000	$450,000
Replacement of existing cooling towers CT-1 and CT-2 and condenser pumps	2	LF	225000	$450,000
Soft Costs @ 30%				$675,000
Total Costs				**$2,925,000**

ELECTRICAL SYSTEM

Description	Qty	Unit	Cost/Unit	Total Costs
Provision of new electrical duct banks	3400	LF	$300	$1,020,000
Provision of new LED Lighting and Controls	1	LS	$700,000	$700,000
Provision of new MV Selector Switches	6	Ea	$150,000	$900,000
Provision of new MV Cables	15000	LF	$30	$450,000
Provision of new manholes	20	LF	$50,000	$1,000,000
Provision of new metering	24	Ea	$25,000	$600,000
Soft Costs @ 30%				$1,401,000
Total Costs				**$6,071,000**

NATURAL GAS SYSTEM

Description	Qty	Unit	Cost/Unit	Total Costs
Provision of new PE gas lines including demoltion of existing steel gas lines and new isolation valves	3170	LF	$300	$951,000
Provision of new gas submeters	7	Ea	$5,000	$35,000
Soft Costs @ 30%				$295,800
Total Costs				**$1,281,800**

TELECOMMUNICATIONS SYSTEM

Description	Qty	Unit	Cost/Unit	Total Costs
Provision of new telecom duct banks	650	LF	$300	$195,000
Soft Costs @ 30%				$58,500
Total Costs				**$253,500**

PUBLIC AND COMMERCIAL FACILITIES AVERAGE DAILY FLOW PROJECTIONS

Bureau of Engineering
Manual - Part F

SEWER DESIGN
6/92 F 200

PUBLIC AND COMMERCIAL FACILITIES AVERAGE DAILY FLOW PROJECTIONS
TABLE F229

Units	Ave. daily flow (gpd/unit)	Type description
SEAT	5/SEAT	AUDITORIUM
1000 GR.SQ.FT.	25/1000 GR.SQ.FT.	AUTO PARKING
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	AUTO REPAIR GARAGE
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	BAKERY
7 GR.SQ.FT.	5/7 GR.SQ.FT.	BALLROOM
1000 GR.SQ.FT.	200/1000 GR.SQ.FT.	BANK: HEADQUARTERS
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	BANK: BRANCH
15 GR.SQ.FT.	20/15 GR.SQ.FT.	BANQUET RMS/CONFERENCE
SEAT	20/SEAT	BAR: FIXED SEAT
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	BAR: JUICE (NO FOOD)
15 GR.SQ.FT.	20/15 GR.SQ.FT.	BAR:PUB. AREAS(TABLES)
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	BARBER SHOP
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	BEAUTY COLLEGE
1000 GR.SQ.FT.	25/1000 GR.SQ.FT.	BEAUTY CLG. STRG>15%
1000 GR.SQ.FT.	200/1000 GR.SQ.FT.	BEAUTY COLLEGE:OFFICE>
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	BEAUTY PARLOR
OFFICE	200/OFFICE	BLDG. CONSTR. OFFICE
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	BOWLING ALLEY
SEAT	50/SEAT	CAFETERIA: FIXED SEAT
GPM PEAK	412/GPM	CARWASH: BASED ON PEAK
STALL	206/STALL	CAR WASH: COIN-OPERATED
5 GPM PEAK	412/GPM	CARWASH: IN BAY
SEAT	5/SEAT	CHURCH:FIXED SEAT
1000 GR.SQ.FT.	300/1000 GR.SQ.FT	CHIROPRACTIC OFFICE
OCCUPANT	10/OCCUPANT	ChurchSch:DayCare/Elem.
20 GR.SQ.FT.	5/20 GR.SQ.FT.	CHURCH SCH: 1 DAY USE/W
N/A	NO CHARGE	CITY: BLDG. CONTS. OFC.
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	CLINIC
SEAT	20/SEAT	COCKTAIL LOUNGE:FXD ST
1000 GR.SQ.FT.	25/1000 GR.SQ.FT.	COLD STORAGE:NO SALES
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	ColdStorage:RetailSales
FIXTURE	120/FIXTURE	COMFORT STATION:PUBLIC
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	COMMERCIAL USE
OCCUPANT	5/OCCUPANT	COMMUNITY CENTER
1000 GR.SQ.FT.	200/1000 GR.SQ.FT.	CREDIT UNION
GPM PEAK	412/GPM	DAIRY
GPM PEAK	412/GPM	DAIRY: BARN
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	DAIRY: RETAIL AREA
7 GR.SQ.FT.	5/7 GR.SQ.FT.	DANCE HALL
15 GR.SQ.FT.	20/15 GR.SQ.FT.	DISCOTEQUE
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	DOUGHNUT SHOP
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	DRUG ABUSE
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	
FILM PROCESSINGGPM PEAK	412/GPM	FOOD PROCESSING PLANT
URINAL OR W.C.	120/W.C.	GAS STATION:SELF SERVE
STATION	430/STATION	GAS STATION:4 BAYS MAX

Bureau of Engineering
Manual - Part F

SEWER DESIGN
6/92 F 200

1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	GYMNASIUM
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	HANGAR (AIRCRAFT)
BED	85/BED	HOSPITAL: CONVALESCENT
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	HOSPITAL: DOG AND CAT
BED	85/BED	HOSPITAL: NONPROFIT
BED	500/BED	HOSPITAL: SURGICAL
UNIT	150/UNIT	HOUSEKEEPING:LIGHT
GPM PEAK	412/GPM	INDUSTRIAL
INMATE	85/INMATE	JAIL
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	DOG KENNEL/OPEN
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	LAB: COMMERCIAL
GPM PEAK	412/GPM	LAUNDROMAT:INDUSTRIAL
WASHER	220/WASHER	LAUNDROMAT
WASHER	220/WASHER	LAUNDROMAT:AUTOMATIC
50 GR.SQ.FT.	50/50 GR.SQ.FT.	LIBRARY:PUBLIC AREA
1000 GR.SQ.FT.	25/1000 GR.SQ.FT.	LIBRARY:STACKS/STORAGE
SEAT	5/SEAT	LODGE HALL
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	MACHINE SHOP
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	MNFG/INDUSTRY
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	MASSAGE PARLOR
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	MEDICAL BLDG
1000 GR.SQ.FT.	200/1000 GR.SQ.FT.	MINI-MALL (SHELL)
7 GR.SQ.FT.	5/7 GR.SQ.FT.	MORTUARY:CHAPEL
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	MORTUARY: LIVING AREA
ROOM	150/ROOM	MOTEL
1000 GR.SQ.FT.	25/1000 GR.SQ.FT.	MUSEUM: ALL AREAS
1000 GR.SQ.FT.	200/1000 GR.SQ.FT.	OFFICE OVER 15%
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	MUSEUM: SALE AREA
1000 GR.SQ.FT.	200/1000 GR.SQ.FT.	OFFICE BUILDING
GPM PEAK	412/GPM	PLATING PLANT
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	POOL HALL(NO BEER/WINE)
1000 GR.SQ.FT.	120/1000 GR.SQ.FT.	POST OFFICE: FLOOR PLAN
STUDENT	85/STUDENT	DORM: COLLEGE OR RES.
DWELLING UNIT	330/DU	RES: TOWNHS/SET GRD
DWELLING	150/DU	RES: APT. - 1 BDR
DWELLING	200/DU	RES: APT. - 2 BDR
DWELLING	250/DU	RES: APT. - 3 BDR
DWELLING	100/DU	RES: APT. - BACH/SNGLE
BED	85/BED	RES: BOARDING HOUSE
DWELLING	150/DU	RES: CONDO-1 BDR
DWELLING	200/DU	RES: CONDO-2 BDR
DWELLING	250/DU	RES: CONDO-3 BDR
DWELLING UNIT	300/DU	RES: DUPLEX
HOME SPACE	200/SPACE	RES: MOBILE HOME
DWELLING UNIT	330/DU	RES: SNGL FAM DWL.
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	RES: ARTIST (2/3 AREA)
DWELLING	100/DU	
RES: ARTIST RESDNCE.DWELLING UNIT	330/DU	RES: GUEST HOUSE W/KIT.
BED	85/BED	REST HOME
SEAT DINING	50/SEAT	RESTAURANT: DRIVE-UP
PARKING STALL	100/STALL	RESTAURANT: DRIVE-UP
SEAT	50/SEAT	RESTAURANT: FIXED SEAT
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	RESTAURANT: TAKE-OUT

1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	RETAIL AREA
CHILD	10/CHILD	SCHL: DAY CARE CENTER
STUDENT	10/STUDENT	SCHL: ELEMENTARY/JR-HI
STUDENT	15/STUDENT	SCHL: HIGH SCHOOL
35 GR.SQ.FT.	10/35 GR.SQ.FT.	SCHL: KINDERGARTEN
CHILD	10/CHILD	SCHL: NURSERY-DAY CARE
STUDENT	10/STUDENT	SCHL: SPECIAL CLASS-LAC
STUDENT	15/STUDENT	SCHL: TRADE OR VOCTNL
STUDENT	20/STUDENT	SCHL: UNIV. OR COLLEGE
1000 GR.SQ.FT.	25/1000 GR.SQ.FT.	StorageBldg-RentingSpace
1000 GR.SQ.FT.	10/1000 GR.SQ.FT.	ICE CREAM STORE(RETAIL)
70 GR.SQ.FT.	5/7 GR.SQ.FT.	STUDIO: MOTION PICTURE
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	STUDIO: RECORDING
VEHICLE	12/VEHICLE	THEATRE: DRIVE-IN
SEAT	5/SEAT	THEATRE: FIXED SEAT
1000 GR.SQ.FT.	5/SEAT	THEATRE: MOVIE HOUSE
1000 GR.SQ.FT.	300/1000 GR.SQ.FT.	VETERINARIAN
1000 GR.SQ.FT.	25/1000 GR.SQ.FT.	WAREHOUSE
STATION	430/STATION	WASTE DUMP: RECREATIONAL
1000 GR.SQ.FT.	215/1000 GR.SQ.FT.	WINE TASTING RM: KTCHN
1000 GR.SQ.FT.	100/1000 GR.SQ.FT.	WineTastingRm: AllArea

EXPLANATION FOOTNOTES

1. The column headings are:
   Average Daily Flow = flow in gallons per day (gpd) per unit as indicated. For example, "5/7 gr. sq. ft." means 5 gpd per every 7 gross square feet of development. Type description - type of development or process.

2. Gr. sq. ft. = gross square feet: area included within the exterior of the surrounding walls of a building excluding courts.

3. Gpm Peak = peak flow in gallons per minute. There is an assumption that the peak to average flow ratio is 3.5. Therefore, 1 gpm x 1440 min/day) 3.5 = 412 gpd which is the unit flow factor in the table.

4. Example Calculation - Assume a 10,000 sq. ft. office building is proposed. The estimated average daily flow is calculated as 10,000 sq. ft. x 200 gpd/1000 sq. ft. = 2000 gpd.

5. Another Example - Assume a car wash (in bay type) is proposed. The estimated peak flow is 5 gpm as determined by industrial waste permit or other data. The average daily flow is estimated as 5 gpm x 412 gpd/gpm = 2060 gpd.

YUCAIPA VALLEY WATER DISTRICT
DEVELOPER HANDBOOK & STANDARD DRAWINGS
FOR
WATER & SEWER FACILITIES

TABLE OF CONTENTS

i

ii

DESIGN CRITERIA FOR RECYCLED WATER DISTRIBUTION SYSTEMS

SECTION IV
DESIGN CRITERIA
FOR
RECYCLED WATER DISTRIBUTION SYSTEMS

Recycled water system improvements proposed for inclusion into the District's Service Area shall be designed in accordance with all appropriate AWWA standards and the following criteria:

A. SYSTEM DEMAND CRITERIA

District staff reserves the right to determine criteria for each recycled water system or sub-system based upon conditions that may exist for that particular location, anticipated level of development, planned use, or other criteria. In general, water pipelines, tanks, pump stations, pressure reducing stations, and appurtenances shall be sized to handle the highest demand on the system within the sphere of influence and shall provide capacity for the maximum hourly flow and the maximum daily flow plus fire flow. Where landscape plans are prepared by a Landscape Architect, the demands shown thereon shall be used for system design. As a minimum, the following demands shall be utilized:

1. Recycled Water System Unit Demands

Average Day Demand (ADD) is the average amount of water needed by a classification of user and shall be defined as follows:

Land Use	Average Day Recycled Water Demand (ADD)
Single Family Units with Lots Less than 20,000 Square Feet	420 gpd
Single Family Units with Lots Equal to or Greater than 20,000 Square Feet	770 gpd
Light Commercial	400 gpd/acre
Industrial	800 gpd/acre
Schools and Parks	2,800 gpd/acre

gpd=gallons per day

2. Peaking Factors

Maximum Day Demand (MDD) shall equal 250 percent of the average day demand.

Peak Hour Demand (PHD) shall equal 667 percent of the average day demand.

Recycled water supplies shall be designed to produce 125 percent of the maximum day demand.

Recycled water pipelines to all Service Areas shall be looped to provide dual direction supply and system flexibility. Dead end transmission mains are undesirable, but will be considered on a case-by-case basis.

B. SYSTEM ANALYSIS

The proposed recycled water system shall be analyzed for the following two conditions:

1. Peak Hour Demands with Booster Pumping Plants On

For the peak hour demand flow analysis, the pressure shall be a minimum of 40 psi and a maximum of 125 psi at the proposed pad elevations. The maximum velocity in the pipelines shall be 8.0 feet per second (fps).

2. Minimum Hour Demands with Wells and Boosters On

For the minimum hour demand analysis, the maximum velocity in the pipelines shall be 5.0 fps and the maximum pressure at each node shall be 125 psi.

The Developer's engineer will be required to submit an analysis of anticipated flow demands and system pressures. The District shall accept or modify the submitted analysis.

C. **RECYCLED WATER PIPELINE SIZING CRITERIA**

Minimum size water pipeline is 4 inch inner diameter (I.D.).

For maximum hourly flow, pipeline shall be sized to provide a residual pressure of 40 psi and a maximum velocity of 8.0 fps.

The capacity of water mains shall be determined by using the Williams and Hazen Formula with a "C" factor of 120.

District staff reserves the right to specify sizing of any water pipeline. For master planning purposes, District staff may require a larger size pipeline than normally required for a particular project to satisfy the District's design standards for system distribution. The District's Board of Directors may authorize participation and payment of increased cost of such water pipeline in accordance with the District's criteria.

D. **RECYCLED WATER PIPELINE LOCATION**

Unless otherwise approved by District staff, all water pipelines shall be located on the northerly or easterly side of the street, 7.0 feet from curb face or berm. Location shall not interfere with other existing utilities.

The cover over the water pipeline shall be sufficient to provide protection of the water pipeline and for the operation of the appurtenances. The depth from the ground surface (pavement, graded travel way, or open ground) to the top of the water pipeline shall be 2.5 feet for 4 inch pipeline, 3.0 feet for 6 inch, 8 inch, and 12 inch pipe, and 3.5 feet for 14 inch or larger. District staff may increase or decrease this required depth as necessary to cover non-standard conditions. Minimum slope of water pipelines shall be 0.5 percent unless otherwise authorized by District staff. Where parallel pipelines are proposed (generally at pressure breaks), pipeline depths shall be staggered with the higher pressure pipeline being located above the lower pressure pipeline.

IV-3

E. **CURVE DATA**

Water pipeline joints shall not be pulled more than 60 percent of the manufacturer's recommended offset. The minimum bending radius for water pipelines are as follows:

Pipe Diameter	Allowable Pipe Deflection	DIP (18' JTS) Min. Radius (ft)
4"	5°0'	200
6"	4°16'	240
8"	3°13'	320
12"	3°13'	320
16"	2°9'	480

Where a smaller radius of curvature is required, pipe stick lengths shall be reduced or fittings shall be used.

F. **OTHER UTILITIES**

Recycled water pipeline installation near potable water or sewer lines shall be in accordance with State of California, Regulations Related to Drinking Water, Title 22, Chapter 16, California Waterworks Standards or the District's criteria, whichever is most restrictive. In general, recycled water pipelines should cross perpendicular to sewer and water pipelines, a minimum of 1 foot below waterlines and 1 foot above sewer lines. If the recycled water pipeline crosses beneath the sewer or above the water pipeline, it shall comply with the State Regulations and plans shall be reviewed and approved by the California Department of Public Health. Recycled water pipelines parallel to sewer pipelines shall be located a minimum of 10 feet (outside to outside) from the pipelines. Recycled water pipelines parallel to potable water pipelines shall be located a minimum of 4 feet (outside to outside) from the pipelines.

When crossing other utilities, a minimum vertical clearance of 6 inches shall be provided (outside to outside).

IV-4

G. **RECYCLED WATER PIPELINE MATERIALS**

Unless otherwise authorized by District staff, all recycled water pipelines shall be ductile iron pipe, Class 350 (Class 300 for 16 inch diameter and larger) in accordance with the District's standards, unless conditions dictate the use of CML/CMC welded steel pipe.

H. **VALVES**

1. **Location**

- Small water pipelines (12 inch diameter and smaller): To provide flexibility of operation, generally located on discharge side of pipeline connections; 1 at 90 degree bends, 3 at tees, 4 at crosses, and at beginning of dead end mains.
- Large water pipelines (14 inch diameter and larger): To be determined for each system to meet operational requirements.
- If one of the options above does not apply, valves shall be spaced at 1,000 foot maximum intervals or as directed by the District.

2. **Type**

- For 4 inch through 12 inch diameter pipelines, use full line size gate valves. For 14 inch and larger pipelines, use full line size butterfly valves.

Unless otherwise provided for, all valves 2 inches through 12 inches shall be resilient seat gate valves in accordance with AWWA Standard C509.

Valves shall be installed with valve can and cover as shown on the District's Standard Drawings.

Pressure class rating shall be minimum 250 psi.

I. **COMBINATION AIR VACUUM AND AIR RELEASE VALVES**

Combination air vacuum valves shall be located at all high points of water pipelines. Minimum size of air valves shall be 1 inch and shall be sized as follows:

Pipeline Diameter	Air Valve Size (Minimum)
4" through 12"	1"
16", 20", & 24"	2"

In phased tract development, air valves shall be located at the end of the pipeline as dictated by the phasing plan. When additional phases are constructed, the air valve shall be removed unless it is required by one of the criteria listed above. Air valve service runs shall be purple polyethylene (preferred), or encased in purple polyethylene bagging.

J. **BLOWOFF VALVE ASSEMBLIES**

Blowoffs shall be in accordance with the District's Standard Drawings, located behind the curb face at right angles to the water pipeline. Blowoffs shall be located at all low points of the pipeline, and at all dead-ends or terminal points.

Minimum size of permanent blowoffs shall be 4 inches for mainlines 12 inches or less, and 6 inches for mainlines larger than 12 inches. Minimum size of temporary blowoffs shall be 2 inches.

K. **NON-POTABLE HYDRANTS**

Non-potable hydrants shall be located where requested by the District and shall be in accordance with District Standard Drawing W-18. Hydrants shall be painted purple to match other District recycled facilities.

L. **SERVICE INSTALLATIONS**

Services shall be in accordance with the District's Standard Drawings unless otherwise approved in writing by District staff. One inch service runs shall be provided for 3/4 inch and 1 inch meters, and 2 inch service runs shall be provided for 1-1/2 inch and 2 inch meters. One inch and 2 inch service runs shall be purple polyethylene (preferred), or encased in purple polyethylene bagging.

M. CORROSIVE SOIL AND PIPE IDENTIFICATION

Recycled water pipelines shall be encased in purple polyethylene bags.

N. BACKFLOW PREVENTION

All non-residential water services shall have a District approved backflow prevention device installed adjacent to meter.

O. RECYCLED WATER FOR ON-SITE NON-RESIDENTIAL SITES

The District has prepared a separate guideline for design and construction of privately owned onsite facilities. Said guideline is included at the back of this section as Exhibit IV-1.

P. RECYCLED WATER FOR ON-SITE RESIDENTIAL DUAL-PLUMBED HOMES

The District has prepared a separate guideline for design and construction of privately owned onsite facilities. Said guideline is included at the back of this section as Exhibit IV-2.

TABLE OF CONTENTS

SECTION 1.0

INTRODUCTION AND GENERAL POLICIES

1.1 SCOPE

The design and construction of non-residential on-site recycled water facilities including, but not limited to: landscape irrigation systems, systems used for industrial processes, construction purposes, water features, recreational impoundment systems, and other approved uses shall comply with these standards set forth herein, and to any conditions, standards, and requirements set forth by Yucaipa Valley Water District in addition to these standard specifications.

1.2 INTERPRETATION

The District Engineer shall decide all questions of interpretation of "good engineering practice," guided by the various standards and manuals.

1.3 APPLICABLE CODES AND POLICIES

Ordinances, requirements, and applicable standards of governmental agencies having jurisdiction within the District's service area shall be observed in the design and construction of recycled water systems. Such requirements include but are not limited to current revisions of the following:

A. The Uniform Plumbing Code.

B. Municipal Codes of the counties of Riverside and San Bernardino, as applicable.

C. State of California, Department of Health Services, Title 22.

D. Regional Water Quality Control Board Regulations.

E. Regulations and Policy Statements as adopted and amended by the Board of Directors of the Yucaipa Valley Water District.

1.4 YUCAIPA VALLEY WATER DISTRICT JURISDICTION

The District is responsible for the approval of plans and inspection of all non-residential on-site recycled water systems within the District's service area. Where repairs or replacement of a service line on the upstream side of the meter is required, it shall be the responsibility of the District, unless it is a system upgrade, in which case the owner or customer will be billed for the work. Conversely, the cost of repairs or replacement of the on-site facilities shall be the responsibility of the property owner.

1.5 DEVELOPER'S ENGINEER/LANDSCAPE ARCHITECT RESPONSIBILITY

These standards establish uniform policies and procedures for the design and construction of on-site recycled water facilities. They are not intended to be a substitute for knowledge, judgment, or experience. The contained procedures shall be reviewed by the engineer/landscape architect and shall be applied as necessary to the project. Proposed deviations to these standards shall be submitted in writing in conjunction with the plan review submittal.

The plans shall be revised or supplemented at any time it is determined that the District's requirements have not been met.

Before design, the developer must obtain approval to use recycled water for the proposed system and verification of locations and size of proposed points of connection.

1.6 REFERENCE SPECIFICATIONS

References to standards such as the Standard Drawings of the District, AWWA, and ASTM shall refer to the latest edition or revision of such standards unless otherwise specified.

1.7 PROHIBITIONS AND LIMITATIONS

Design of on-site recycled water facilities shall conform to the following:

A. The recycled water system shall be separate and independent of any potable water system. Cross connections between potable water facilities and recycled water facilities are prohibited.

B. Hose bibs on recycled water facilities are prohibited. Where potable and recycled water is used on-site, potable water hose bibs must be attached to the building.

C. Drinking fountains shall be protected from the spray of recycled water in an approved manner prior to installation.

D. Overspray and run-off shall be limited or prevented.

E. Potable and recycled water lines must maintain required separation at all times.

F. Recycled water shall not be used for any purpose other than landscape irrigation and approved uses.

G. The system shall be designed to irrigate the on-site area within the allowable time periods.

1.8 BACKFLOW PREVENTION AND CROSS CONNECTION

Backflow prevention devices will normally not be required on the recycled water service using recycled water. However, in accordance with Section 2.10, Cross Connection Prevention, in the YVWD Rules and Regulations for Non-Potable Water Use and Distribution, backflow prevention devices will be required on the potable water service, when a parcel receives potable and recycled water service.

No connection between potable waterlines and recycled waterlines are allowed.

SECTION 2.0

CONVERSION OF WATER SYSTEMS

2.1 POTABLE TO RECYCLED WATER SYSTEM

In general, all irrigation facilities converting from a potable to a recycled water supply shall conform to the District's Design and Construction specifications. The District will notify the required state agencies of the intent to convert and solicit their involvement through out the process. The facilities to be converted shall be investigated in detail including review of any record drawings, potholing of existing facilities, and determinations by the District of measures necessary to bring the system into full compliance with these standard specifications. The applicant, owner, or customer shall pay all costs to convert the system.

2.2 RECYCLED TO POTABLE WATER SYSTEM

If due to any system failure, use violations, or other reasons as determined by the District, it becomes necessary to convert from a recycled water supply to a potable water supply, it shall be the responsibility of the owner, applicant, or customer to pay all costs for such conversion. After notifying state and county health agencies of the intent of the conversion, the recycled water service shall be removed and plugged at the District main or abandoned in a manner approved by the District and State or Local Agencies. The on-site non-residential facilities shall be modified, as required by the District, Local and State Agencies, for use as a potable water system.

local agency having jurisdiction. These shall include Administrative Codes, Civil Codes, and Health Regulations.

F. WATER AND SEWER PLAN APPROVAL PROCESS

The Developer's engineer shall design the facilities and prepare the water and/or sewer construction drawings to the District's requirements (see Sections II through V). Developer's engineer shall submit to District staff all water and sewer construction drawings for review. The District may revise, modify, or require redesign of any concepts, drawings, or details submitted. Construction must begin within one year of approval of the water and/or sewer construction drawings; if more than one year has elapsed, the project must go through plan check procedure again before starting construction, including depositing additional plan check fees. The steps required to obtain plan or project site map approval are as follows:

1. Attend Preliminary Planning Meeting

Arrange a preliminary planning meeting with the District's Engineering Department to discuss the proposed project. At the preliminary planning meeting, submit a tentative tract map or project site map with the preliminary water and/or sewer facilities shown. Upon review of the project, the District may require a preliminary report and/or hydraulic network analysis.

The District will discuss the general location and size of required facilities as well as provide information on known existing District facilities in the area. If available, District staff will provide "record" plans for existing facilities.

The District provides water and/or sewer service to customers when the customer's property is located within the District's Service Area. If customers are outside an existing Service Area, they may obtain service by 1) annexing into the District's Service Area or 2) seeking service from another nearby Public or Private Utility. The District should be consulted for advice regarding service in either of the above circumstances.

In order for a property to be served by the District, the property boundary must front or be common to a public right-of-way or a District easement where District mainline facilities reside (i.e. no water services or sewer laterals shall be constructed through a privately owned parcel in an easement). If necessary and when allowed by the District, the Developer shall construct a mainline extension (water and/or sewer pipeline) to the property and provide easements for said extensions.

2. **Submit Deposit for Preliminary Engineering Review by District Staff (if Necessary)**

Depending on the extent of preliminary engineering required, District staff may require a deposit to cover staff time before plan checking begins. In any case, the Engineering and Plan Check Deposit must be submitted prior to District staff reviewing any preliminary reports, hydraulic network analyses, or plan checks.

3. **Submit Preliminary Report and/or Hydraulic Network Analyses (if Required)**

If required, the preliminary report and hydraulic network analyses must be submitted to District staff for review and comments. The preliminary report and/or hydraulic network analyses must be approved prior to submittal of any drawings for plan checking. Once District staff and the Developer's engineer have agreed on a conceptual design, detailed plans may be prepared and submitted.

4. **Submit First Plan Check with Plan Check Deposit**

The normal plan check deposit is 3% of construction costs or a District determined minimum for small projects. Any unused plan check funds will be refunded to the payee or applied to inspection fees, at Developer's option. After review and approval of the preliminary report and/or hydraulic network analyses, the Developer's engineer must submit the following for the first plan check:

- Three copies of the water construction drawings.
- Three copies of the sewer construction drawings.
- One copy of the street improvement drawings.

- One copy of the grading plans.
- One copy of the storm drain plans.
- Two copies of tentative Tract/Parcel Map.
- Two copies of Tract Phasing Map (including lot numbers and street names).
- Fire flow requirements for each phase.
- Certification letter from engineer whose stamp appears on the plans stating that he has reviewed the plans and they are complete, accurate, and ready for review by the District.

Submittals must be complete or they will be rejected. Each submittal shall include a transmittal listing all items submitted. Details regarding preparation of plans and grant deed documents are included in Section II. Details regarding design criteria are included in Section III for water, Section IV for recycled water, and Section V for sewer.

After District staff reviews the first plan check submittal for completeness, the plans will be sent to District's consultant for a detailed review. District staff will provide comments on one set of the water and sewer construction drawings and return them to the Developer's engineer for revisions. All subsequent plan checks shall be sent to the District's consultant. District staff's goal is to complete the first plan check within 20 working days of receipt of a complete submittal. Plan check review time varies depending on the number of plans in the review process, size of the project, complexity of the plans, and completeness of the plans.

After the first set of check prints are returned, no changes except those requested or approved by the District shall be made by the Developer's engineer. If the Developer's engineer wishes to make a change other than that requested by the District, a print marked with the proposed change in red pencil shall be submitted for approval. Only after written approval shall the original be changed. The authorized change shall be highlighted on the next recheck submittal. Drawings that do not follow the requirements contained in this handbook and/or that are unclear, misleading, or confusing will be subject to rejection without review.

5. **Submit Subsequent Plan Checks**

For each subsequent plan check, the Developer's engineer must submit the following:

- Previous District plan check set.
- Two copies of the revised construction drawings.
- Any additional material requested.

Submittals must be complete or they will be rejected. If drawings are not yet satisfactory, the District will make comments on one set of the drawings and return same to the Developer's engineer for revisions. This procedure will be repeated as necessary until the drawings are complete. If the Developer's engineer does not return previous District plan check sets, the plan check procedure will start from the beginning.

District staff's goal is to complete the second plan check within 10 to 15 working days of receipt of a complete submittal and the third plan check within 5 to 7 working days of the receipt of a complete submittal. Plan review time varies depending on the number of plans in the review process, size of the project, complexity of the plans, and completeness of the plans.

6. **Submit Final Plans for Approval**

After all plan checks are completed and the plans are acceptable to District staff, the original mylars must be submitted to District staff for signature along with the digital files. Prior to final approval of the construction drawings, the Developer must pay the outstanding balance for the plan check work order, execute a Development Agreement, and provide executed Grant Deeds or Grants of Easement. A sample Development Agreement and Grant of Easement form are provided at the end of this section as Exhibits I-3 and I-4.

7. **District Signs Plans**

Once all submittals have been completed to District staff's satisfaction, the mylars will be signed. The Developer's engineer is required to obtain signatures from all other agencies

and provide District staff with the original mylars and three blueline prints. Original water and sewer plan mylars become the property of the District.

Once signed, the originals cannot be modified without written permission from the District's engineer. Any modification after signing shall be noted in the revision block and the cover sheet revision block.

Plan checks resubmitted after one year, regardless of the number of previous submittals, will be deemed "expired". "Expired" plan checks resubmitted will be subject to the District's current design requirements and considered a "first plan check submittal".

G. PRECEDENCE OF DOCUMENTS

The Developer's Handbook shall apply to performance of the Work; provided, however, that in resolving conflicts, errors, omissions, or discrepancies, the order of precedence shall be as follows:

1. Construction Plans
2. District Standard Drawings
3. Technical Specifications
4. Greenbook
5. Referenced Standard Specifications and Drawings

H. GRANTS OF EASEMENT

All proposed easements shall be approved by the District prior to plan approval. Where allowed, the Grant of Easement shall be on the District's form and shall consist of three parts: the Grant of Easement form, the legal description, and the plat map.

The legal description shall be designated as Exhibit "A" and, if appropriate, shall have the assessor's parcel number indicated on the upper right corner of the exhibits. The legal description shall be prepared by a California Registered Land Surveyor and signed and stamped by said surveyor.

EXHIBIT I-2
WATER AND SEWER UNIT COSTS FOR CONSTRUCTION COST ESTIMATE

YUCAIPA VALLEY WATER DISTRICT

To Be Used For Calculating Fees For Plan Checking, Inspection, and Bonding.
January 2008

WATER SYSTEM UNIT COSTS

4" DIP (includes fittings/valves) @ $36.00/LF
6" DIP (includes fittings/valves) @ $45.00/LF
8" DIP (includes fittings/valves) @ $60.00/LF
12" DIP (includes fittings/valves) @ $75.00/LF
16" DIP (includes fittings/valves) @ $100.00/LF
20" DIP (includes fittings/valves) @ $125.00/LF
24" DIP (includes fittings/valves) @ $150.00/LF
6" Fire Hydrant Assembly @ $4,000.00/EA
4" Blow-Off Assembly @ $1,000.00/EA
1" Air and Vaccuum Valve Assembly @ $1,000.00/EA
2" Air and Vaccuum Valve Assembly @ $2,000.00/EA
3/4" or 1" Copper Service @ $1,000.00/EA

SEWER SYSTEM UNIT COSTS

8" VCP Main @ $45.00/LF
10" VCP Main @ $55.00/LF
12" VCP Main @ $65.00/LF
15" VCP Main @ $80.00/LF
4" VCP Laterals @ $30.00/LF
Manholes @ $2,500.00/EA

EXAMPLE RECYCLED WATER FEE COST WORKSHEET

YUCAIPA VALLEY WATER DISTRICT
CONSTRUCTION COST ESTIMATE & FEE SCHEDULE
TRACT NO.
APN:

Date: ________ LOTS

Material:					
8" DIP	0	LF @	$60.00	PER LF	$0.00
1" Copper Service Lateral	0	EA @	$1,000.00	EA	$0.00
Std. Fire Hydrant Assembly	0	EA @	$4,000.00	EA	$0.00
4" Blow-off Assembly	0	EA @	$1,000.00	EA	$0.00
1" Air/Vac Assembly	0	EA @	$1,000.00	EA	$0.00
			Construction Cost Estimate		**$0.00**
Plan Check Deposit: 3% of Construction Cost ($1,500 minimum)			$0.00		
DUE PRIOR TO RECORDING:					
100% Performance Bond*			$0.00		
100% Material/Labor Bond			$0.00		
*Rollover to one-year 100% Maintenance Bond upon acceptance of tract					
Prelim. Account Establishment Charge:	0	LOTS @	$25.00	PER LOT	$0.00
			TOTAL DUE PRIOR TO RECORDING		**$0.00**
DUE PRIOR TO RENDERING SERVICE:					
Inspection Deposit: 7% of Construction Cost Estimate					$0.00
NOTE: 7% minimum deposit to include remaining balance of plan check deposit. Actual cost shall be invoiced monthly on a time & material basis					
Meter Sets:	0	LOTS @	$325.00	PER LOT	$0.00
**Tie-In/Hot Tap Deposit:	0	EA @	estimate	EA	$0.00
**Fire Hydrant/Meter Abandonments:	0	EA @	estimate	EA	$0.00
(**Allow 4 to 6 weeks for scheduling)					
			TOTAL DUE PRIOR TO RENDERING SERVICE		**$0.00**
DUE PRIOR TO BUILDING PERMIT:					
Water Development Impact Fee:	0	LOTS @	$12,339.00	PER LOT	$0.00
(Credit for existing service)					($)
			TOTAL DUE PRIOR TO BUILDING PERMIT		**$0.00**

*****FEES IN EFFECT AT TIME OF PAYMENT SHALL PREVAIL*****

Calc. ________
Chk. ________
Appr. ________

CITY OF REDLANDS
MUNICIPAL UTILITIES & ENGINEERING DEPARTMENT

Water and Wastewater Service Rate Schedule
Effective July 1, 2018 (Rates and charges shown are bi-monthly)

Water Usage Rate

Building Water Usage & Rate:

First 16 units	$1.46/100 cubic feet
17 – 27 units	$1.78/100 cubic feet
Over 27 units	$2.69/100 cubic feet

Non-Building Water Usage & Rate:

First 27 units	$1.78/100 cubic feet
Over 27 units	$2.69/100 cubic feet

***1 Unit** = 100 cubic feet or 748 gallons*

Water Service Charge

Meter Size & Charge:

5/8″ Meter	$ 32.10
3/4″ Meter	$ 43.17
1″ Meter	$ 64.67
1½″ Meter	$ 116.79
2″ Meter	$ 172.83
3″ Meter	$ 299.23
4″ Meter	$ 462.10
6″ Meter	$ 853.02
8″ Meter	$1256.97
10″ Meter	$2977.00
12″ Meter	$3915.20

** Prior agriculture irrigation rate customers are only charged the $4.59 customer service component of this charge.*

Fire Protection Water Usage Rate

Fire Protection or Fire Hydrant Water Usage & Rate:

All units	$2.69/100 cubic feet

NOTE: Any use of fire protection water service for any purpose other than verified fire protection system testing or actual fire protection needs will be subject to a **$40.00** charge, plus the full non-fire protection meter service charge and any applicable wastewater charges at the prevailing rate.

Fire Protection Water Service Charge

Meter Size & Charge:

2″ Meter	$ 10.19
3″ Meter	$ 18.10
4″ Meter	$ 31.75
6″ Meter	$ 80.73
8″ Meter	$165.22
10″ Meter	$292.32
12″ Meter	$468.46

Non-Potable Water Usage Rate

Non-Potable Water Usage Rate:
$ .99/100 cubic feet

Conversion Customer Water Usage Rate:
$.64/100 cubic feet

Non-Potable Water Service Charge

Meter Size & Charge:

3/4″ Meter	$ 13.81	3″ Meter	$ 95.50
1″ Meter	$ 20.65	4″ Meter	$147.45
1½″ Meter	$ 37.29	6″ Meter	$272.16
2″ Meter	$ 55.16	8″ Meter	$401.04

Wastewater (Sewer) Service Rate

Residential Rate: Single Family Dwelling Unit $50.05 Multiple-Family Dwelling Unit $37.59

Non-Residential Rate:

Minimum Charge	$37.59	Medium Strength II	$3.64/100 cubic feet
Low Strength I	$2.05/100 cubic feet	Medium Strength III	$4.11/100 cubic feet
Low Strength II	$2.16/100 cubic feet	High Strength I	$4.60/100 cubic feet
Low Strength III	$2.64/100 cubic feet	High Strength II	$5.00/100 cubic feet
Medium Strength I	$3.17/100 cubic feet	Large Volume User *	$2.76/100 cubic feet

School Rate: Elementary $119.36/100 ADA Secondary & High $198.94/100 ADA

** Large Volume Users are classified as users with greater than 25,000 gallons per day discharge.*

Fire Hydrant Construction Water Service Rate and Charges

Water Usage Rate:	2.69/100 cubic feet
Monthly Water Service Charge:	$ 73.60
Fire Hydrant Construction Meter Pre-Payment:	$1,200.00

- Minimum Meter Service Charge (if less than 30 days) will be $73.60
- Repairs to damaged fire hydrant construction meters will be charged at prevailing time and material rates to repair the meter.
- Lost or stolen fire hydrant construction meters will be charged a $1,200.00 replacement charge.

Unauthorized Fire Hydrant Connection Charge: $150.00
(Plus estimated water usage charged at the prevailing potable water rate)

Septage Tank Dumping Rate

Septage Tank Dumping: $.11/gallon $12.60 minimum

Miscellaneous Fees and Charges

Establish New Municipal Services Account Charge (Will appear on first billing)	$15.00
Request for Same Day Water Turn-On Service After 3:00 p.m.	$26.00
After-Hours Request for Water Turn-On Service (Stand-By Call)	$60.00
Meter Test Charge (Plus the cost to install a new meter based upon actual meter size—Charge waived if meter is over-registering per AWWA Standards)	$40.00
Failure to Notify Change of Ownership Charge	$35.00
Obstructed Water Meter Resulting in an Estimated Read or Re-Read Trip Charge	$15.00
Turn-off For Non-Payment of Municipal Services Account Charge	$46.00
Broken Angle Meter Stop Charge	$75.00
Broken Lock Charge	$15.00
Remove Meter After Illegal Turn-On Charge	$50.00
Remove Straight Connection Charge	$75.00
Jumper Fee (for use on buildings under construction (pre-landscape))	$50.00
Cut Service at the Main Charge	Time and Materials
Submittal to Collection Agency Charge	40% of Balance
Return Check or Electronic/Automatic Debit Charge	$35.00
Check-By-Phone Charge	$ 6.00

Late Charge – 10% of unpaid balance. Fee is calculated on each service component separately to arrive at a total charge.

Pre-Payment– Shall be three times the cost of the estimated monthly service or $70.00, whichever is greater. In the event your account is turned off for non-payment, a pre-payment may be required in order to re-establish your services. The pre-payment amount shall be applied as a credit to the applicant's account at the end of one year of satisfactory payment history (6 payments) or when the account is closed.

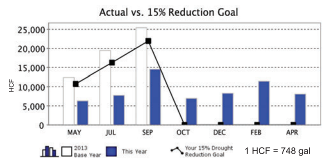
City of REDLANDS

P.O. Box 6903
Redlands, CA 92375-0903
909-798-7516

Account No. 10-2086.300

Customer and Service Address:

SAN BERNARDINO COM COLLEGE
11711 SAND CANYON RD
YUCAIPA CA 92399



Period	Days	Daily Average Water Usage
Current	59	102,780 Gallons
Last Bill	59	145,429 Gallons
2013	0	0 Gallons

Bill Date: 05/07/2020

Reading Period Covers: February 28, 2020 **To:** April 27, 2020

Meter No.	Meter Size	Prior Read	Current Read	HCF Units
70198663	4"	24335	24923	588
70212796	8"	455	455	0
70212793	8"	227361	228217	856
70212796	2"	1065	1065	0
70212793	2"	82468	83853	1385
20822077	6"	2	2	0
4939610	6"	52	952	900
70212621	6"	108920	112569	3649
70212621	1"	5396	6125	729

BILLING DETAILS

Previous Balance and Credits:

3/12/20	Previous Balance	26395.32
3/30/20	Payment Received - Thank You	26395.32CR
	Balance Foward	$0.00

Charges Since Last Billing:

5/07/20	4" Water Service Charge	462.10
5/07/20	8" Water Service Charge (2)	2513.94
5/07/20	6"Fire Protection Water Service Charge (2)	161.46
5/07/20	6" Non-Potable Water Service Charge	272.16
5/07/20	Water Usage Charge	1552.03
5/07/20	Water Usage Charge	5998.60
5/07/20	Fire Protection Water Usage Charge	2421.00
5/07/20	Non-Potable Water Usage Charge	2335.36
5/07/20	Water Usage Charge	466.56
5/07/20	School Sewer Service	12128.40
5/07/20	Total Current Charges	$28311.61
	GRAND TOTAL AMOUNT DUE	$28311.61

City of REDLANDS

Please detatch and return this bottom portion with your payment

**** COPY BILL ****

Account No: 10-2086.300 **Service At:** 11711 SAND CANYON RD

P.O. Box 6903
Redlands, CA 92375-0903
909-798-7516

A 10% late charge will apply if your payment is received after this due date: **JUNE 01, 2020**

Total Amount Due: **$28311.61**

SAN BERNARDINO COM COLLEGE
ACCOUNTS PAYABLE
550 E HOSPITALITY LN STE 200
SAN BERNARDINO, CA 92408

010208630000028311616

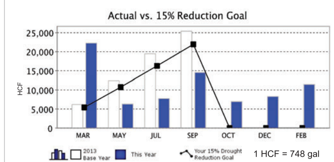
City of REDLANDS

P.O. Box 6903
Redlands, CA 92375-0903
909-798-7516

Account No. 10-2086.300

Customer and Service Address:

SAN BERNARDINO COM COLLEGE
11711 SAND CANYON RD
YUCAIPA CA 92399



Period	Days	Daily Average Water Usage
Current	59	145,429 Gallons
Last Bill	62	100,256 Gallons
2013	63	301,491 Gallons

Bill Date: 03/12/2020

Reading Period Covers: December 31, 2019 **To:** February 28, 2020

Meter No.	Meter Size	Prior Read	Current Read	HCF Units
70198663	4"	24040	24335	295
70212796	8"	455	455	0
70212793	8"	226872	227361	489
70212796	2"	1065	1065	0
70212793	2"	81508	82468	960
20822077	6"	2	2	0
4939610	6"	52	52	0
70212621	6"	99523	108920	9397
70212621	1"	5066	5396	330

BILLING DETAILS

Previous Balance and Credits:

1/09/20	Previous Balance	25669.93
2/03/20	Payment Received - Thank You	25669.93CR
	Balance Foward	$0.00

Charges Since Last Billing:

3/12/20	4" Water Service Charge	462.10
3/12/20	8" Water Service Charge (2)	2513.94
3/12/20	6"Fire Protection Water Service Charge (2)	161.46
3/12/20	6" Non-Potable Water Service Charge	272.16
3/12/20	Water Usage Charge	763.86
3/12/20	Water Usage Charge	3868.12
3/12/20	Non-Potable Water Usage Charge	6014.08
3/12/20	Water Usage Charge	211.20
3/12/20	School Sewer Service	12128.40
3/12/20	Total Current Charges	$26395.32
	GRAND TOTAL AMOUNT DUE	$26395.32

City of REDLANDS

Please detatch and return this bottom portion with your payment

**** COPY BILL ****

Account No: 10-2086.300 **Service At:** 11711 SAND CANYON RD

P.O. Box 6903
Redlands, CA 92375-0903
909-798-7516

A 10% late charge will apply if your payment is received after this due date: **APRIL 06, 2020**

Total Amount Due: **$26395.32**

SAN BERNARDINO COM COLLEGE
ACCOUNTS PAYABLE
550 E HOSPITALITY LN STE 200
SAN BERNARDINO, CA 92408

010208630000026395322

City of REDLANDS

P.O. Box 6903
Redlands, CA 92375-0903
909-798-7516

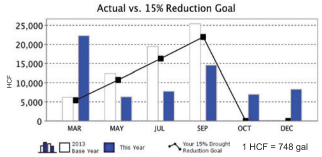
Account No. 10-2086.300

Customer and Service Address:

SAN BERNARDINO COM COLLEGE
11711 SAND CANYON RD
YUCAIPA CA 92399

Bill Date: 01/09/2020

Reading Period Covers: October 30, 2019 **To:** December 31, 2019



Period	Days	Daily Average Water Usage
Current	62	100,256 Gallons
Last Bill	56	93,179 Gallons
2013	63	301,491 Gallons

Meter No.	Meter Size	Prior Read	Current Read	HCF Units
70198663	4"	23794	24040	246
70212796	8"	455	455	0
70212793	8"	225517	226872	1355
70212796	2"	1065	1065	0
70212793	2"	80734	81508	774
20822077	6"	0	2	2
4939610	6"	52	52	0
70212621	6"	95116	99523	4407
70212621	1"	3540	5066	1526

BILLING DETAILS

Previous Balance and Credits:

11/07/19	Previous Balance	29184.72
12/23/19	Payment Received - Thank You	32103.19CR
	Balance Foward	$2918.47CR

Charges Since Last Billing:

12/03/19	Late Charge	2918.47
1/09/20	4" Water Service Charge	462.10
1/09/20	8" Water Service Charge (2)	2513.94
1/09/20	6"Fire Protection Water Service Charge (2)	161.46
1/09/20	6" Non-Potable Water Service Charge	272.16
1/09/20	Water Usage Charge	632.05
1/09/20	Water Usage Charge	5697.32
1/09/20	Fire Protection Water Usage Charge	5.38
1/09/20	Non-Potable Water Usage Charge	2820.48
1/09/20	Water Usage Charge	976.64
1/09/20	School Sewer Service	12128.40
1/09/20	Total Current Charges	$28588.40
	GRAND TOTAL AMOUNT DUE	$25669.93

City of REDLANDS

Please detatch and return this bottom portion with your payment

** COPY BILL **

Account No: 10-2086.300 **Service At:** 11711 SAND CANYON RD

P.O. Box 6903
Redlands, CA 92375-0903
909-798-7516

A 10% late charge will apply if your payment is received after this due date: **FEBRUARY 03, 2020**

Total Amount Due: **$25669.93**

SAN BERNARDINO COM COLLEGE
ACCOUNTS PAYABLE
550 E HOSPITALITY LN STE 200
SAN BERNARDINO, CA 92408

010208630000025669933

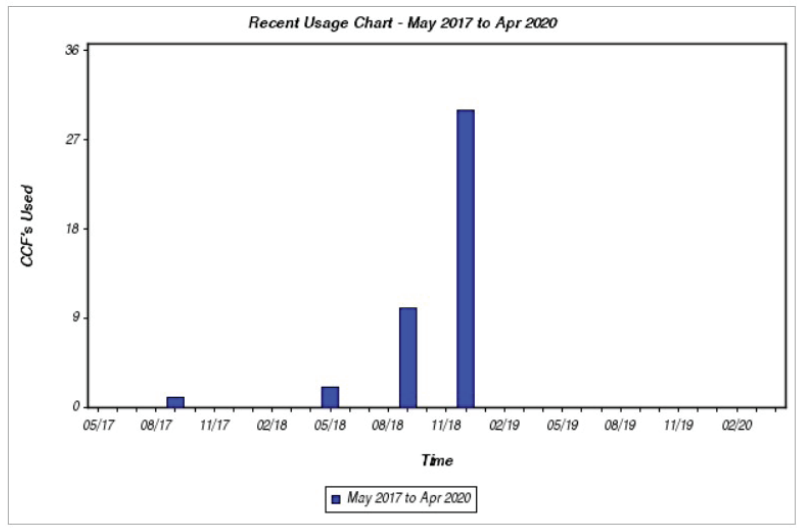
Utility Service	Water		
Type of Meter	6-NORMAL		
Meter Number	70212796	**Reading Date**	04/27/2020
Current Usage	0 CCF	**Start Reading**	455
		End Reading	455
		Reading Type	Actual Reading

View Consumption History
Hide Usage Analysis

Usage Analysis

Usage This Period : 0 CCF
Same Time Last Year : 0 CCF

Your average usage per day is unchanged when compared to last year's reading.



Utility Service	Water
Type of Meter	5-NORMAL
Meter Number	70198663
Current Usage	588 CCF

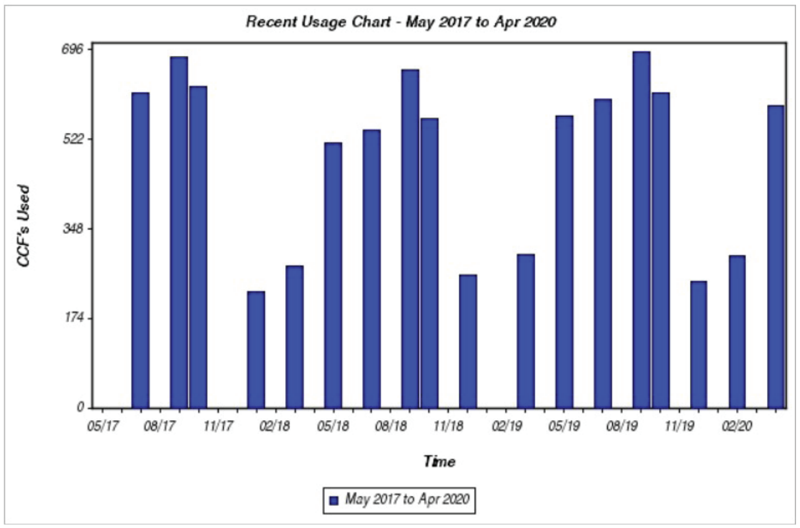
Reading Date	04/27/2020
Start Reading	24335
End Reading	24923
Reading Type	Estimated Reading

View Consumption History
Hide Usage Analysis

Usage Analysis

Usage This Period :	588 CCF
Same Time Last Year :	567 CCF

Your average usage per day has **increased by 3%** when compared to last year's reading.



Utility Service	Water
Type of Meter	7-Non-Building
Meter Number	70212621
Current Usage	3649 CCF

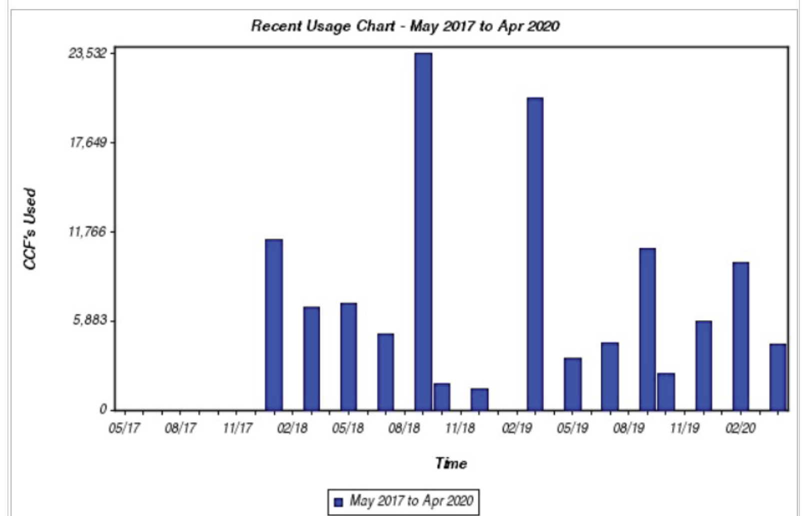
Reading Date	04/27/2020
Start Reading	108920
End Reading	112569
Reading Type	Estimated Reading

View Consumption History
Hide Usage Analysis

Usage Analysis

Usage This Period :	4378 CCF
Same Time Last Year :	3439 CCF

Your average usage per day has **increased by 27%** when compared to last year's reading.



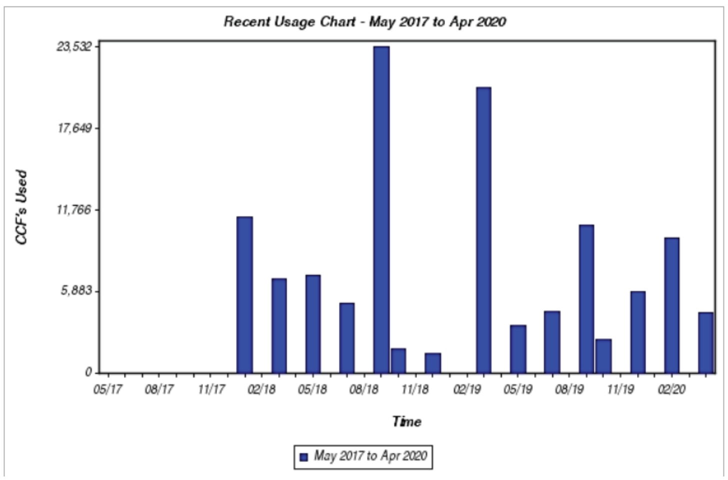
Utility Service	Water		
Type of Meter	7-Non-Building		
Meter Number	70212621	**Reading Date**	04/27/2020
Current Usage	3649 CCF	**Start Reading**	108920
		End Reading	112569
		Reading Type	Estimated Reading

View Consumption History
Hide Usage Analysis

Usage Analysis

Usage This Period :	4378 CCF
Same Time Last Year :	3439 CCF

Your average usage per day has **increased by 27%** when compared to last year's reading.



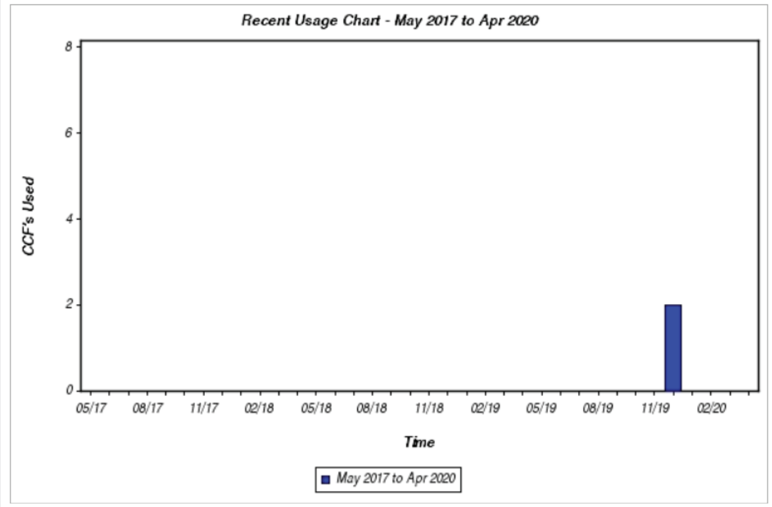
Utility Service	Water		
Type of Meter	4-FIRE LINES		
Meter Number	20822077	**Reading Date**	04/27/2020
Current Usage	0 CCF	**Start Reading**	2
		End Reading	2
		Reading Type	Actual Reading

View Consumption History
Hide Usage Analysis

Usage Analysis

Usage This Period :	0 CCF
Same Time Last Year :	0 CCF

Your average usage per day is unchanged when compared to last year's reading.



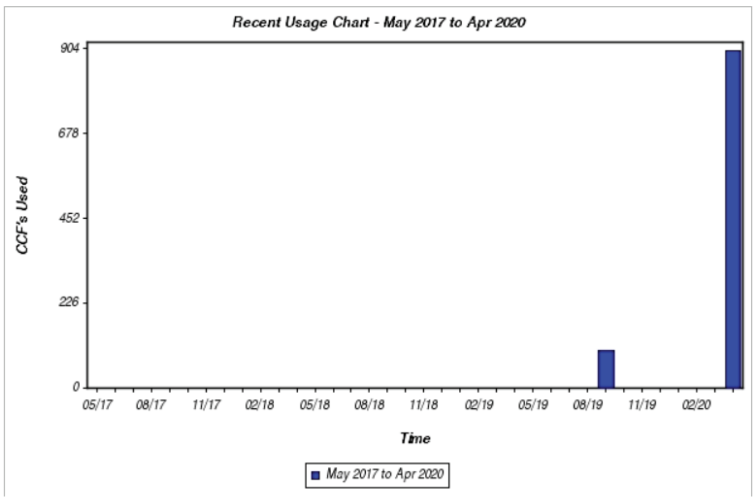
Type of Meter	3-FIRE LINES		
Meter Number	4939610	**Reading Date**	04/27/2020
Current Usage	900 CCF	**Start Reading**	52
		End Reading	952
		Reading Type	Actual Reading

View Consumption History
Hide Usage Analysis

Usage Analysis

Usage This Period :	900 CCF
Same Time Last Year :	0 CCF

Your average usage per dayhas **increased**when compared to last year's reading.



Utility Service	Water		
Type of Meter	2-NORMAL		
Meter Number	70212793	**Reading Date**	04/27/2020
Current Usage	856 CCF	**Start Reading**	227361
		End Reading	228217
		Reading Type	Estimated Reading

View Consumption History
Hide Usage Analysis

Usage Analysis

Usage This Period :	2241 CCF
Same Time Last Year :	2325 CCF

Your average usage per day has **decreased by 4%** when compared to last year's reading.