Riverside Community College District
Infrastructure Upgrade Project

Utility Program

Norco Campus

June 14, 2010

PSOMAS

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EXECUTIVE SUMMARY

0.1 INTRODUCTION

The Norco Campus is a forward-looking engineering and technology-based educational institution located on 141-acres. This campus is beginning its third phase of expansion since opening in 1991. The more than 10,000 students they serve each semester go on to earn associate's degrees, transfer to four-year colleges and universities, or enter the workforce fully prepared for the careers they have chosen.

The Norco Campus is one of the three Riverside Community College District (RCCD) campuses. To serve the expanding student body, a number of new academic and support buildings have been identified in the Norco Campus Long Range Facilities Master Plan (dated January 2008), identified herein as the Master Plan. This report defined that Campus will need to expand to accommodate the student enrollment which is anticipated to grow to 16,000 students.

0.2 OBJECTIVE

The objective of this Utility Program is to evaluate the existing utility systems currently servicing the facilities and make general recommendations to upgrade and modify the utility systems to support the future development as proposed by the Proposed Future Building Layout. This programming for master planning will be used in establishing the future construction phasing. The Utility Program is also the next step prior to Master Planning, Schematic Design, and Implementation. The following existing utility systems are considered in this report:

- Sanitary Sewer
- Domestic and Fire Water
- Irrigation Water
- Storm Drain
- Chilled Water
- Hot Water
- Electrical
- Telecommunications
- Central Plant Expansion
- Natural Gas

Supporting Psomas as a subconsultant in this report, P2S Engineering has performed assessments of the chilled water, hot water, electrical, telecommunications, central plant expansion, and natural gas systems.

0.3 REPORT OVERVIEW

The various utility systems discussed within this report are broken into discipline specific sections. Corresponding figures and some supporting data tables are located at the end of each section.

The following information for each utility system is presented in discipline specific sections, Section 1 through 10, of this report.

- Description of the existing utility system, including existing conditions and identified problems. Information on each utility system was obtained through field surveys, existing documents, record data, and discussions with campus facility staff knowledgeable of specific utility systems.
- Description of methodology for analyzing the utility system for present conditions and to accommodate future growth.
- Analysis of the existing and proposed utility systems.
- Recommendations and modifications to accommodate present and future needs of the campus.
- Figures illustrating the existing utility system layout and proposed utility alignments based on future conditions presented.

0.4 PROJECT BACKGROUND AND SCOPE

Psomas' services included review of existing infrastructure study materials along with and Long Range Facilities Master Plans.

Initial workshop meetings were conducted for this campus to determine project scope, objectives, design criteria, project schedule, condition of existing facilities, deficiencies of systems, and future needs based on the Long Range Facilities Master Plans. Determinations were made relative to current and future utility needs for each campus.

Scope of work included research, review of maps, and evaluation of the existing on campus utility infrastructure. The report also provides general recommendations for improvements to each of the utility systems that will serve the future development as shown in the Proposed Future Building Layout.

The utility research was completed via coordination with the on-site facilities manager to collect record documentation regarding the location of recently constructed underground utilities throughout the Campus. Psomas received utility records and reviewed as-built mapping as provided by RCCD.

Existing utility information included herein is based upon drawings and information supplied by RCCD, and various architects. Using this information, Psomas modified the provided utility base maps for the following existing utility systems:

- Sanitary Sewer
- Domestic and Fire Water
- Irrigation Water
- Storm Drain
- Chilled Water
- Hot Water
- Electrical
- Telecommunications
- Central Plant Expansion
- Natural Gas

The utility alignments shown in the report figures included herein represent the most practical layout based on all information available. Changes in building layouts, locations, and miscellaneous other conditions may require alignment or utility size revisions.

As a subconsultant to Psomas, P2S Engineering has assisted with the utility mapping by updating the mapping for the existing, chilled water, electrical, telecommunication, central plant expansion, and natural gas utility systems.

The future building layout has been modified to reflect the priorities for the proposed campus buildings. Note that the ultimate build-out on the Campus is tied the ability to get a second point of public access for emergency access purposes. If a second point of access is not secured, the Campus will be limited to minor building expansion and renovations.

0.5 EXISTING AND PROPOSED BUILDING IMPROVEMENTS

The following table identifies the existing buildings on campus and corresponds to the various figures throughout the report. The listed building names and numbers are based upon the campus maps provided by RCCD and illustrated on Figure 0b, Overall Campus Map – Existing Building Layout, included herein. Buildings numbered with the prefix E currently exist but were not listed on the original information provided by RCCD.

Table ES-1: Existing Buildings

Bldg No.	Building Name
1*	Student Services
2*	Science/Technology
3*	Multi-Purpose Auditorium
4*	Humanities
5*	Tigers Den
6	F1 - Central Plant
7	Mechanical 1
8	Mechanical 2
9	Library
10	Technology
11	F2 - Central Plant
12*	Bookstore
13	CACT Building
14*	Multi-Purpose Building
15	Early Childhood Education Cntr.(a)
16*	Portable - 1
17	Portable - A
18	Portable - B
19*	Portable Complex
E-1	Industrial Technology
E-2	High School
E-3	Headstart
E-4	Early Childhod Education Center B
E-5	Student Success Center (Under Construction)

Figure 0c, Overall Campus Map – Building Demolition Plan, illustrates existing buildings to be demolished or renovated per discussions with RCCD. Their building names are identified with an asterisk (*) in Table ES-1 above.

Based on the Master Plan and discussions with RCCD, the following proposed buildings have been identified as part of the future development. The building names correspond to the Master Plan and have been numbered as illustrated on Figure 0d, Overall Campus Map – Future Building Layout.

Table ES-2: Proposed Buildings

Bldg No.	Building Name
P1	Physical Education Center (9)
P2	Facilities Warehouse, Central Receiving & Central Plant (8) and Network Operating Center (NOC) – S'ly Bldg
P3	Visual & Performing Arts (7)
P4	North Quad - Classrooms and Labs 1
P5	North Quad - Classrooms and Labs 2
P6	North Quad - Classrooms and Labs 3
P7	N/E Parking Structure
P8	S/E Parking Structure
P9	South Quad - Classrooms and Labs 1
P10	South Quad - Classrooms and Labs 2
P11	Student Center
P12	West Quad - Classrooms and Labs 1
P13	West Quad - Classrooms and Labs 2
P14	West Quad - Classrooms and Labs 3
P15	North West Parking Structure

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0.6 REVISION BLOCK SUMMARY

Table R: Revision Block

A Revision Block as been added (below) to document the changes as the report has been re-issued and updated. Detailed discussions and descriptions are identified in the Meeting Minutes in Appendix B.

Revision No.	Date	Description
1	Oct. 23, 2009	Initial DRAFT provided.
2	March 22, 2010	Re-issued DRAFT, w/ new Future Bldg Exhibits
3	May 13, 2010	Re-Issued DRAFT, with Prioritized Summary Table, and graphic updates
4	June 14, 2010	Final Utility Program Study Report with Conceptual Costs included.

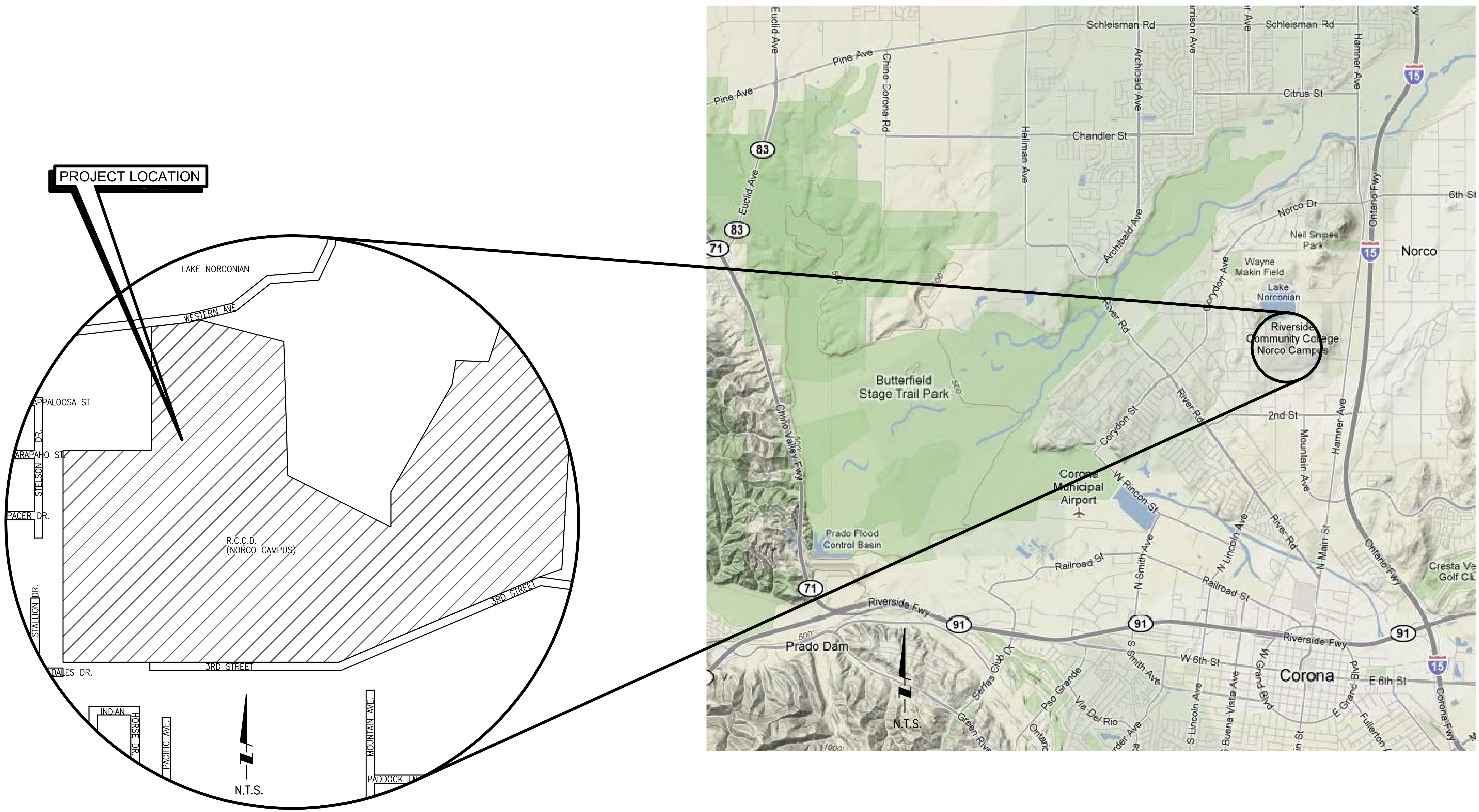


FIGURE 0A
LOCATION MAP

FIGURE 0B
OVERALL CAMPUS MAP - EXISTING BUILDING LAYOUT

FIGURE 0C
OVERALL CAMPUS MAP - BUILDING DEMOLITION PLAN

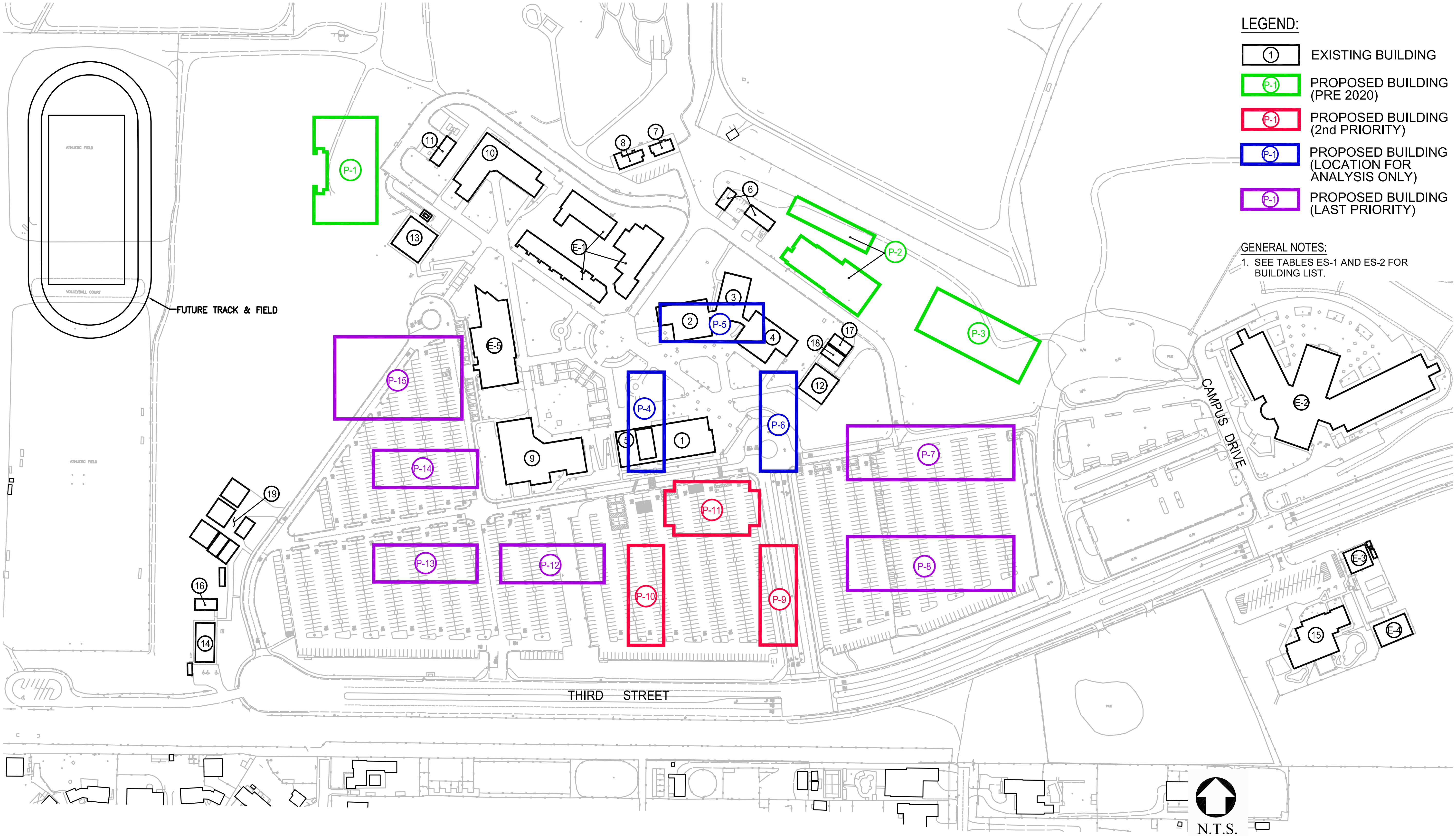


FIGURE 0D
OVERALL CAMPUS MAP - FUTURE BUILDING LAYOUT

SECTION 1 – SANITARY SEWER SYSTEM

1.1 SYSTEM DESCRIPTION

The existing campus is served by two separate sanitary sewer systems.

The first main system flows to the east in Third Street through a 10-inch sewer main. An 8-inch sewer main connects to the Third Street 10-inch main at Campus Drive (in front of the High School.) This 8-inch main line extends north and west through the campus and serves approximately 60% of the existing buildings.

The second main system flows south to Third Street. This system flows through an 8-inch sewer main located near the cul-de-sac at the end of Third Street. An 8-inch sewer main connects at Third Street approximately 400-ft from the cul-de-sac and extends north through the main parking lot and onto the campus. This 8-inch main line extends north through the campus and serves approximately 40% of the existing buildings.

The existing on-site sanitary sewer system mainline includes 8-inch PVC pipe with building laterals ranging between 4-inches and 6-inches in diameter. The (2) on-site sewer systems are independent and isolated and do not accept offsite upstream flows from other developments.

1.2 METHODOLOGY

The average day flow generation rates based upon standard design criteria have been used for evaluating the campus sewer system. Standard Sewer Manual guidelines were used for determining the average daily flow and peak flow for the campus buildings. The total flow was established using sewerage generation factors allocated to each building based upon building area. Sewerage generation factors were adjusted to address academic and non-academic buildings

The standard Engineering criteria for new sewer design limits the flow depth to one-half the pipe diameter (i.e. d/D =< 0.50), and requires a minimum velocity of 3 feet per second (fps) at maximum flow. A minimum velocity of 2 fps is typically used in general practice as it is considered to be self-scouring; that is, it prevents deposition of solids.

Per Sewer Manual standards, a peaking factor of 3.0 was used to determine the peak flow rates.

1.3 ANALYSIS OF EXISTING SYSTEM

We summarized the existing campus buildings' square footage, occupancy type, and flow allocation used to determine the average daily flow generated on campus. The existing system analysis includes the existing campus buildings listed in ES-1 of the Executive Summary.

The input and output data from the existing sanitary sewer system model using Manning's equation, provided a calculated maximum velocity and flow for the existing sanitary sewer system. The maximum flow at d/D = 0.5 reviewed against the minimum velocity was used to determine and discuss the capacity of the existing system. The average daily flow is derived from the existing building allocation.

1.4 ANALYSIS OF FUTURE NEEDS

The sanitary sewer system was evaluated with the addition of the proposed buildings listed in Table ES-2 of the Executive Summary. Based on the future development presented in the Master Plan Update and 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 Figure 1b, Future Conditions Sanitary Sewer Map.

The proposed system analysis includes the proposed buildings illustrated in the Master Plan Update and listed in Table ES-2 of the Executive Summary and summarizes the proposed campus buildings' square footage (based on the Master Plan Update), occupancy type, and flow allocation used to determine impacts to the average day flow expected to be generated on campus.

1.5 FINDINGS AND RECOMMENDATIONS

Findings

The depths of flow in the existing sewers generally conform to the design criteria. Flow velocities for many of the existing sewers are also within the criteria and the various existing pipelines conform to the standards. Due to the existing topographic elevation fall across this campus the minimum flow velocities are reached in most cases. At the few areas with minimum adequate line flushing velocities will increase once the proposed buildings are added to the system.

The total sanitary sewer flow enters the same city sewer system downstream of the campus at both existing and proposed conditions.

The sanitary sewer system maximum flow rate (or capacity), average daily flow rate, and peak flow rate for the existing system appears adequate. Also, we reviewed the conceptual impacts to the existing system from the proposed sanitary sewer systems at each pipe segment. Due to increased sewer demand from the future buildings, the peak flow rate in various pipe segments is maintained below the 50% maximum capacity.

- The existing segments between building 9 and 13 are currently at minimum velocity, but should increase with the addition of building P1.
- The City of Norco has recently approached the Campus to discuss a potential connection to the Campus from the North, between Bldgs 6 and 7. This will need to be analyzed before acceptance.

Recommendations

Since no historical sewer flow concerns were expressed by the campus representatives, and our analysis was favorable, we recommend for continued maintenance and inspection of the sewer system to ensure its service in the future.

The recommendations presented herein include: a) extension of the sanitary sewer system to serve proposed buildings presented in the Master Plan Update, b) removal of existing sanitary sewer service laterals which serve existing buildings planned to be demolished to provide a clear site for future development, c) removal and replacement of existing sanitary sewer pipe segments, and d) further investigation of existing sanitary sewer main lines during the campus expansion to ensure it does not exceed maximum capacity.

The following are recommendations for improvements to the existing sanitary sewer system:

1. Relocate existing mainline segment through the middle of campus for new Buildings P9, P10, and P11.
2. Extend the mainline in Third Street to serve the proposed building in the middle of the campus.
3. In order to provide a clear site for future development, remove the existing sanitary sewer mains currently serving any existing facilities to be demolished. Existing mainline systems can be cut and capped at the existing manholes.
4. Remove the existing 4-inch sanitary sewer service laterals currently serving any existing buildings to be demolished.
5. It is recommended that the college continue to further investigate the existing pipe condition and capacity to provide further recommendations for improvements as the campus expands.

Based upon information provided in the Master Plan Update, the findings and recommendations presented in this report are determined from sanitary sewer design criteria and standard planning guidelines. 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.

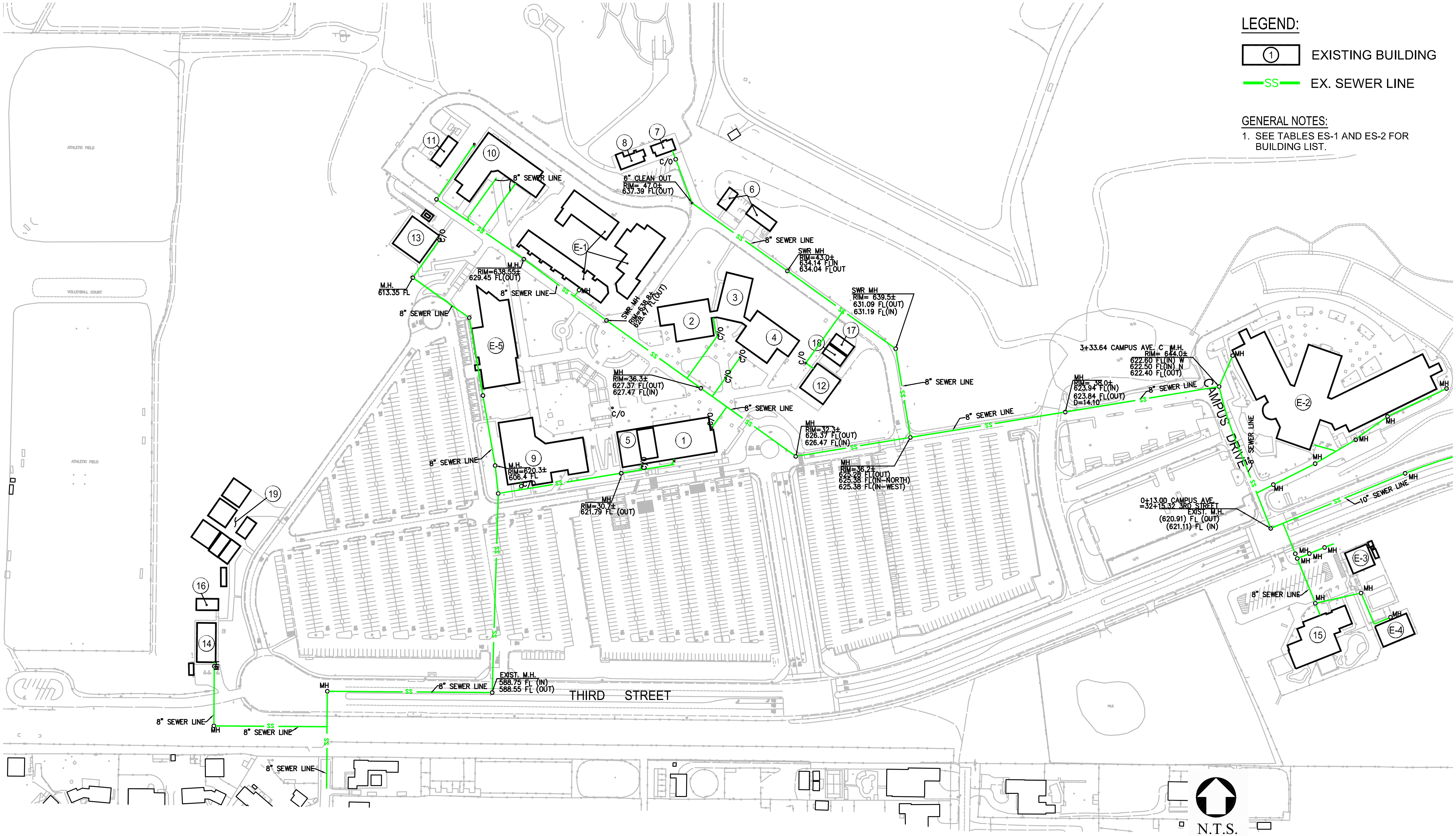


FIGURE 1A
EXISTING SANITARY SEWER SYSTEM

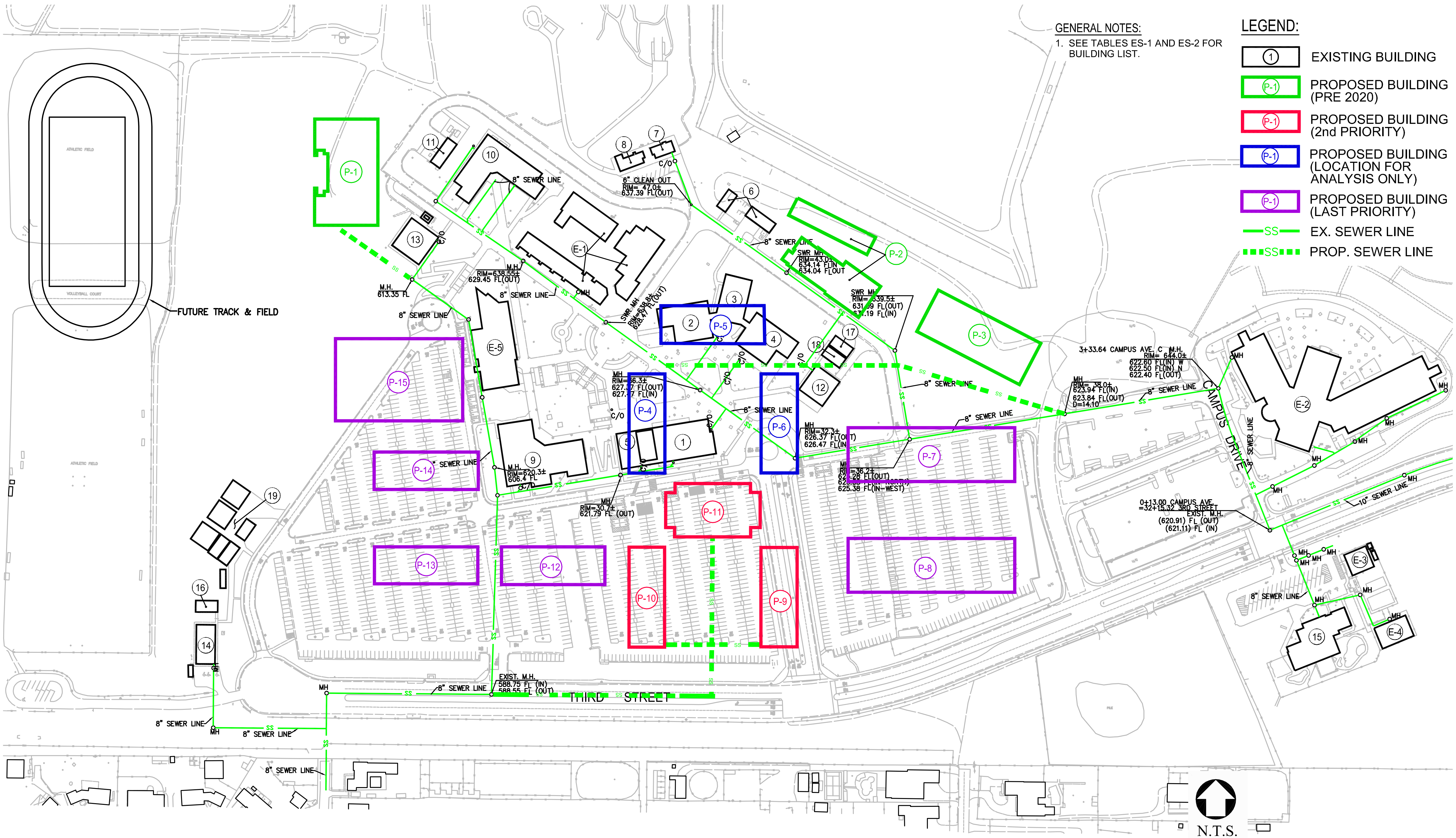


FIGURE 1B
PROPOSED SANITARY SEWER SYSTEM

SECTION 2 – WATER SYSTEM

2.1 SYSTEM DESCRIPTION

The existing water distribution system serving the campus buildings operates as a separate domestic and fire water distribution system. The campus uses the domestic water system to supply water for landscape irrigation and is discussed in Section 3 – Irrigation Water System.

The City of Norco Water Department provides water to both the domestic and fire water distribution systems. The main campus domestic system is served by one meter and the fire water system is served by two meters.

1. The first existing domestic service enters the campus at the mid-point from Third Street, approximately 1200 feet east from the cul-de-sac. This 12-inch service originates at the 12-inch main in Third Street. After passing through a 12-inch meter and reduced pressure principle valve backflow preventer, the water is conveyed north to the campus distribution network via a 12-inch PVC pipe along the campus entry and through the Parking Lot.

2. The first existing fire service is located parallel to the 12-inch domestic water line (described above.) This 8-inch service originates off the same 12-inch main in Third Street. After passing through an 8-inch meter and double check backflow preventer, the water is conveyed north to the campus distribution network via an 8-inch PVC pipe.

3. The second existing fire service enters the campus at Campus Drive in front of the High School. This 10-inch fire line originates from the 12-inch water line in Third Street. After passing through a 10-inch meter and double check backflow preventer, the water is conveyed west to the campus distribution network via a 10-inch PVC pipe.

4. The Childcare complex south of Third Street is served by separate independent domestic and fire laterals directly from Third Street mainline.

Per the our recent Fire Flow Data (dated September 24, 2009), the Fire Hydrant located on Third Street and 1450 LF east of cul-de-sac indicate that the 12-inch service has a minimum static pressure of 100 psi. Individual pressure reducing valves are located at each building.

The campus domestic water distribution network consists almost entirely of (2) 6-inch PVC pipe loops. The existing domestic water distribution system and locations of each connection is shown on Figure 2A, Existing Water Map – Water Distribution.

The campus fire water distribution network consists almost entirely 8-inch PVC pipe loops. The existing fire water distribution system and locations of each connection are also shown on Figure 2A, Existing Water Map – Water Distribution.

2.2 METHODOLOGY

Psomas defined the fire flow requirements based upon California Building Code requirements for Fire service. These requirements are consistent with industry standards and indicated that the current and proposed fire water systems shall meet the following criteria for new construction:

- Fire hydrants shall be spaced at a maximum of 300 feet along fire lanes. Buildings shall be within 300 feet of a fire hydrant.
- Fire water system shall have a minimum fire flow of 2,000 gpm from fire hydrants flowing simultaneously.
- Fire Water system shall have a minimum residual water pressure of 20 psi with the required 2,000 gpm flowing.

Existing domestic water usage for the campus was provided by RCCD.

For the preliminary analysis purposes of this report, and since on this campus the fire flows and domestic flows are provided by the same source, our analysis focused on the maximum fire flows taken at a node located adjacent to the largest building on campus. Based upon this most conservative combined method, if minimum pressures were maintained, then we concluded that both the fire and domestic systems were adequate.

2.3 ANALYSIS OF EXISTING SYSTEM

A computer model of the existing fire water network was created with H20Net Version 8.0 to represent the existing conditions on campus. This model was run to test the existing system's ability to satisfy the fire flow criteria set forth by the Fire Flow requirements using data as measured in the fire flow tests.

The same computer model above incorporated the existing domestic water network by using the critical node locations adjacent to the largest buildings on campus.

2.4 ANALYSIS OF FUTURE NEEDS

The water system was evaluated with the addition of proposed buildings listed in Table ES-2 of the Executive Summary. Based on the future development presented in the Master Plan Update as discussed in the Executive Summary, recommendations have been made to construct new water pipes, relocate and demolish various existing water lines in order to accommodate the future development. This is conceptually illustrated in Figure 2b, Future Conditions - Water Distribution Map.

A second computer model was not required for the proposed condition since the integrity of the existing system was maintained and segments were only relocated around proposed buildings that interfered with the existing system. Also, new loops were added when needed to expand the system and maintain redundancy.

2.5 FINDINGS AND RECOMMENDATIONS

Findings

An evaluation of the existing domestic water system revealed that the existing water system adequately supports the demand for existing buildings with no significant pipe losses due to pipe size or elevation. In addition, the computer model shows that the existing water pressures throughout the campus satisfy a minimum requirement of 20 psi.

Conceptual review of the proposed conditions indicates that the existing domestic water system can also adequately support the demand for proposed buildings.

An evaluation of the existing fire water system revealed that the existing fire water system adequately supports the demand for existing buildings with no significant pipe losses due to pipe size or elevation and with adequate fire flows at hydrants. In addition, the computer model shows that the existing fire water pressures throughout the campus satisfies the minimum pressure / flow requirements

Conceptual review of the proposed conditions indicates that the existing fire water system can also adequately support the demand for proposed buildings.

Recommendations

Based on the findings above, recommendations include providing new services to proposed buildings, re-routing water lines that are in conflict with proposed buildings, as depicted in the Master Plan Update. As illustrated in Figure 2b, Future Conditions– Water Distribution Map, the following are recommendations for improvements to the existing domestic and fire water system:

1. Install new 6-inch domestic water service loops to serve the future buildings, as needed. It is recommended that a second 12-inch domestic connection from the existing 12-inch water main in Third Street (near the cul-de-sac) be added during the next major expansion to provide redundancy and provide a secondary water source for maintenance or repair.

2. Remove and/or relocate existing domestic water or fire water pipes that may be in conflict with new building footprints. Mainline water systems can be cut and capped at the proposed project limits.

3. Install new fire hydrants as needed within 300 feet of proposed buildings per requirements.

4. Review the California Building Code requirements for Fire service with the addition of each proposed building, since the requirements are based upon final building type, size, height, and occupancy use.

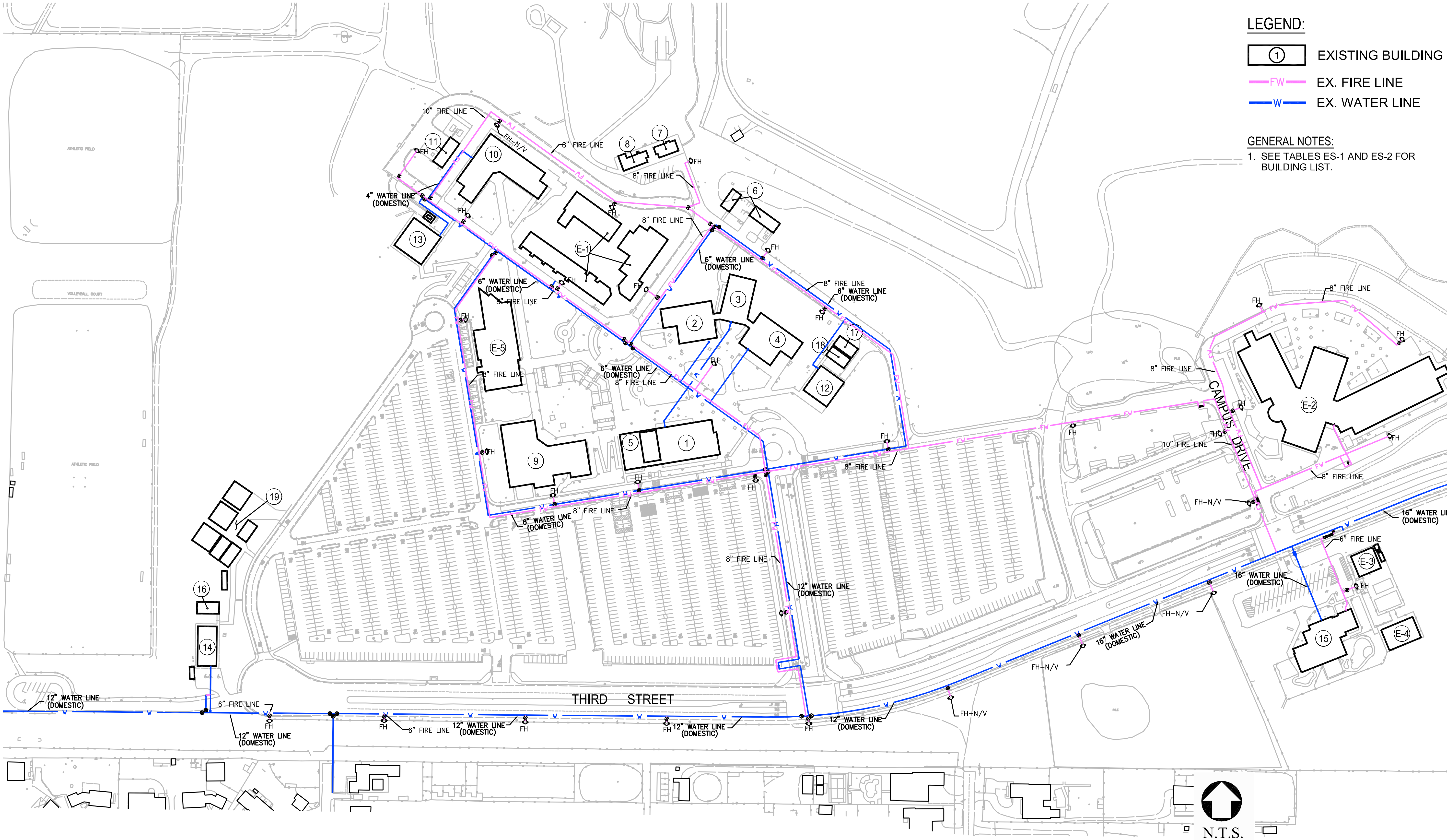


FIGURE 2A
EXISTING WATER DISTRIBUTION

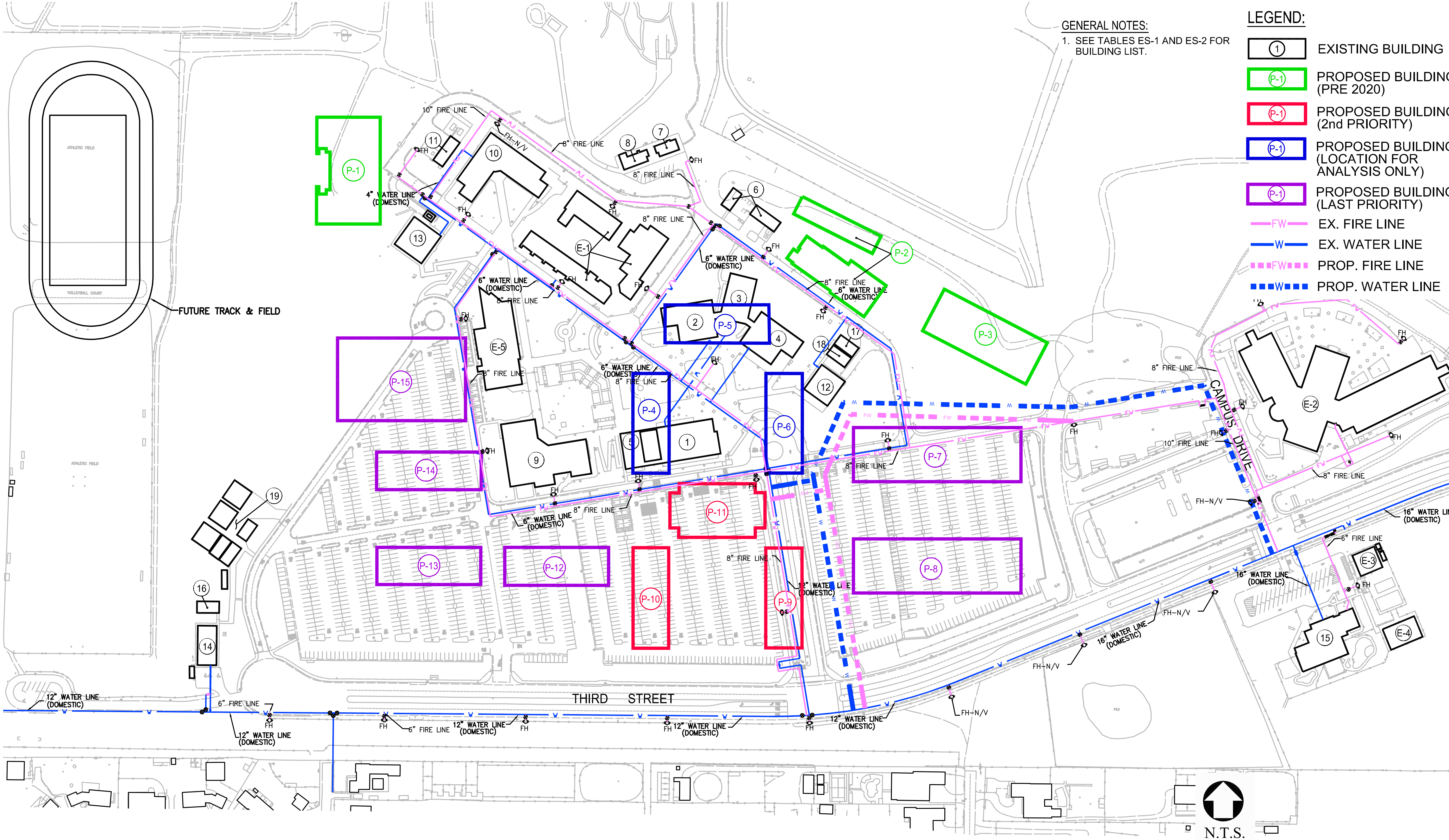


FIGURE 2B
PROPOSED WATER DISTRIBUTION

SECTION 3 – IRRIGATION WATER SYSTEM

3.1 SYSTEM DESCRIPTION

The campus uses domestic water for landscape irrigation. The single domestic meter to the campus provides provides water to the irrigation system. During the on-site review of the water system, no irrigation concerns were documented related to pressure or availability.

There is no existing reclaimed water system available to serve the campus at this time, but there has been discussion for a future reclaimed water system to be provided by Norco Water Department.

The existing small (2-inch or less) PVC irrigation water distribution system is a campus network of lines that gets relocated, modified, lengthened, and abandoned, as required to accommodate Campus expansion projects. Backflow prevention is provided and installed during modification projects.

3.2 METHODOLOGY

Existing irrigation water flows for the campus can be estimated based on a percentage of the overall domestic use. The average day usage is the average annual amounts divided by 365 days. The peak month average day considers only the higher meter readings for the dry months between June and November. Irrigation is typically performed between 10pm and 6am, seven days per week, so these peak month amounts were multiplied by 3 (8 hrs./24 hrs.) to get an 8 Hour Irrigation Average Use. The 8 Hour Irrigation Peak Use is twice the previous average to account for the maximum day during those summer months and the fact that the irrigation system cannot be fine-tuned to completely average out the demands over an eight-hour period. The percentage of campus water use dedicated to irrigation use is typically based upon similar campuses of similar sizes located in Southern California.

3.3 ANALYSIS OF EXISTING SYSTEM

An analysis described above provides a conceptual model of the existing irrigation water network and represents the existing condition on campus. The campus currently uses standard water preservation methods to minimize runoff and avoid overwatering through observation and regular maintenance programs.

3.4 ANALYSIS OF FUTURE NEEDS

The irrigation water system can be evaluated with the addition of proposed buildings listed in Table ES-2 of the Executive Summary. Based on the future development presented in the Master Plan Update as discussed in the Executive Summary, recommendations will include relocation and demolition of various existing irrigation water lines in order to accommodate the future development.

A second estimate was not needed to represent the future conditions on campus since additional proposed buildings will reduce the amount of landscape area available for irrigation. Maximum daily flow demands will decrease by the relative percentage of buildable area that replaces the current open landscaped areas.

3.5 FINDINGS AND RECOMMENDATIONS

Findings

An evaluation of the existing irrigation water system revealed that the existing irrigation water system adequately supports the demand of existing buildings and landscape areas with no significant pipe losses due to pipe size or elevation. The existing irrigation system can also adequately support the demand for proposed buildings and landscape areas as depicted in the Master Plan Update.

- No figures and illustrations are provided in this section since the detailed network of small piping is not readable at the scale illustrated on a single sheet overall campus map.

Recommendations

Based on the findings above, recommendations include providing re-routing irrigation lines that are in conflict with proposed buildings, and replacing old irrigation pipes as needed during campus improvement expansion over parking areas and roadway improvements.

It is also recommended that the college pursue its efforts in finding a potential source for future reclaimed water service.

1. Proposed new irrigation piping shall be purple PVC pipe and maintain minimum horizontal and vertical clearances with adjacent potable water lines.
2. Upgrade water sensor technology, as needed, during expansion projects to stay up to date on water saving technological advances.
3. Install and maintain back flow prevention devices as needed to ensure water quality safety.

SECTION 4 – STORM DRAIN SYSTEM

4.1 SYSTEM DESCRIPTION

The existing campus storm drain mainline system consists of a Riverside County Flood Control District mainline (varies from 36-inch RCP to 72-inch RCP) made of reinforced concrete pipe.

The following is a summary of the existing on-site storm water collection system:

- Off-site storm water from the north is captured upstream in a 42-inch County maintained main line and flows through the campus to a 72-inch outlet pipe and continues in a pipe into the adjacent downstream residential neighborhood.
- Off-site storm water from the northeast is captured upstream in a 36-inch County maintained main line and flows through the campus to a 72-inch outlet pipe and continues in a pipe into the adjacent downstream residential neighborhood.
- The campus building roof drains and landscape areas are drained though a system of small (6”, 10”, 12”) pipes and area drains that connect to one of the mainlines - described above.
- A series of low flow water quality swales are provided in landscaped areas between buildings to provide water quality opportunities.
- The existing parking lots sheet flow to catch basins and then into the Third Street storm drain mainline.
- While no large on-site storm water detention basins are provided on-site, small on-site detention is provided in the swale areas between buildings to treat roof drainage and storm water runoff. Treated storm water is recollected by areas drains and discharged into the County main line system.
- Large off-site detention basins exist upstream of the campus in two locations.

4.2 METHODOLOGY

The existing storm drain system was evaluated using concept level hydrology (existing and proposed conditions) by identifying major sub-areas and using County flood control data when needed.

4.3 ANALYSIS OF EXISTING SYSTEM

The existing conditions have been evaluated using concept level hydrology using simplified Riverside County Flood Control Hydrology Methods. Storm flows have been routed to the existing backbone on-site drainage systems using a series of surface flows and pipe flows. This includes:

- Delineate primary drainage sub-areas for on-site and off-site tributary areas.
- Prepared existing condition hydrology model and estimated peak flow runoff rates for 100-year design storms.
- Verified on-site pipe capacity.

4.4 ANALYSIS OF FUTURE NEEDS

The proposed re-alignments do not require major horizontal re-routing and the tributary areas are constant with the current condition.

Therefore, a conceptual review of the hydrology analysis for the proposed campus conditions were reviewed to determine if the proposed system is in conformance with the existing simplified Riverside County Flood Control Hydrology Methods and if pipe sizes for relocations would match the existing conditions. This is based upon the following review.

- Overlay of the proposed campus master plan onto the existing condition base map.
- Review of the developed condition hydrology analysis for the 100-year storm events.
- Review of potential storm water quality detention facilities to reduce developed peak flows to pre-master plan conditions.
- Review of on-site storm drain mainline system with pipe sizes necessary to convey run-off for the proposed conditions.

4.5 FINDINGS AND RECOMMENDATIONS

The existing storm drain mainline systems are adequately sized to address the current design storm conditions. No immediate concerns were identified.

The proposed campus development will impact many of the existing mainline alignments and will require relocations to avoid the planned building footprints. Additional storm water quality detention basins may be provided at the lower parking areas to address future water quality requirements.

The following is a summary of the modifications related to the proposed on-site storm water mainline system:

1. Relocation of the two mainlines from the confluence point (located at mid-campus), and upstream to each inlet point.
2. Extension of the existing storm drain mainline in Third Street to the east, to address proposed buildings.

Sufficient elevation change across the campus site also allows flexibility and opportunities for future storm drain alignments to avoid any significant design elements.

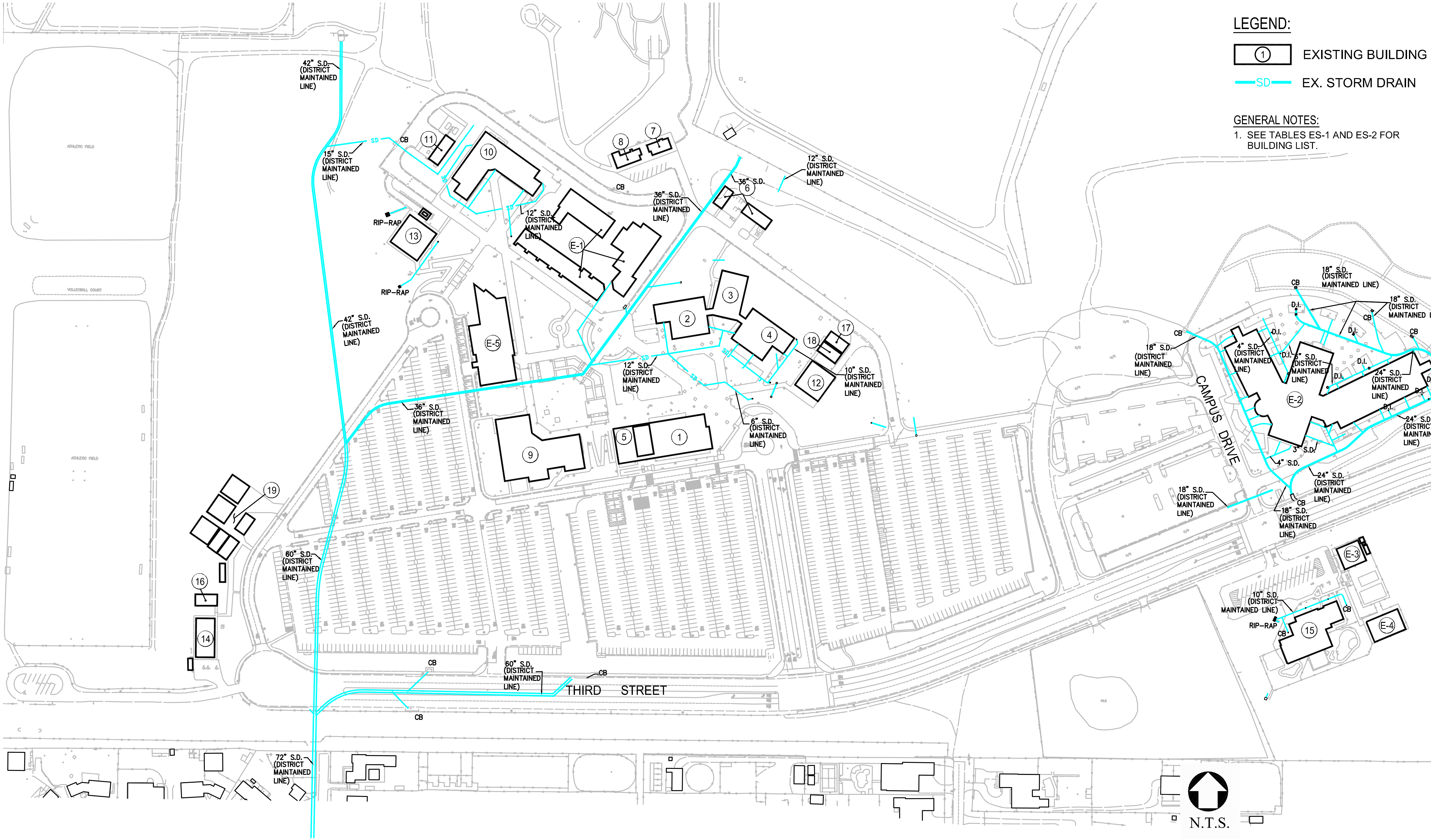


FIGURE 4A
EXISTING STORM DRAIN SYSTEM

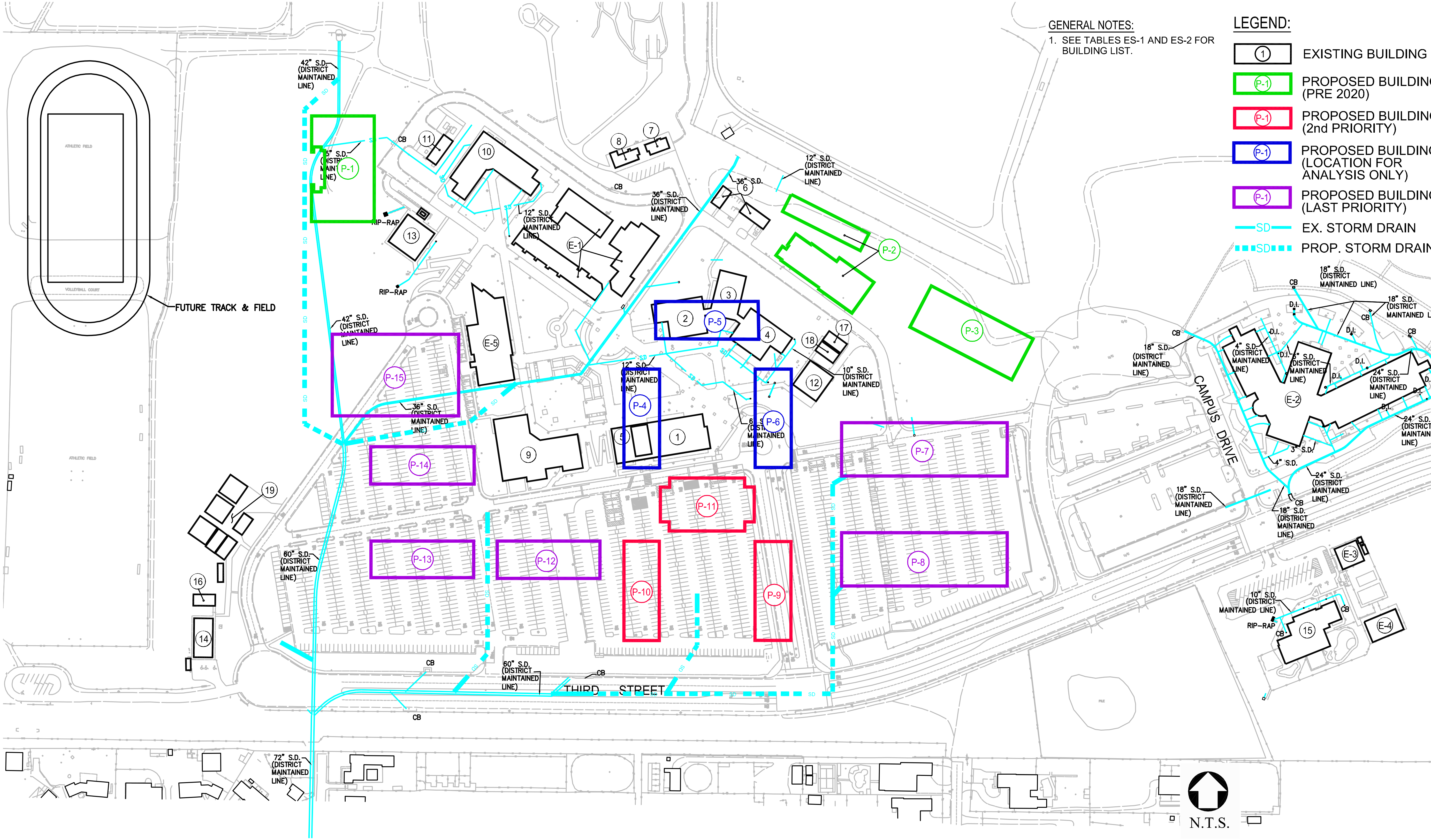


FIGURE 4B
PROPOSED STORM DRAIN SYSTEM

SECTION 5 – CHILLED WATER SYSTEM

5.1 SYSTEM DESCRIPTION

Objective

The objective of this report is to evaluate the existing cooling systems currently serving the Norco campus and provide recommendations to improve, modify and upgrade existing systems to support new buildings, major renovations, and building retrofits that form the proposed campus Facilities Master Plan. Currently the campus serves about 8,500 students. The Master Plan looks out to a future enrollment of 16,000 students.

The east side of the campus consists of five buildings. They are Student Services, the Corral, Humanities, Theater, and Science and Technology. The chillers that serve these buildings is in F1

The west side of the campus consists of the Applied Technology building and the Library. The chillers that serve these two buildings are housed in F2.

The new section of the campus is between the two earlier parts of campus. These three buildings together are referred to as Industrial Technology. They are served by two new air-cooled chillers that were located in an expansion of F1.

The building that is being built right now on the west side of the campus near the library, is called the Student Success Center. It will be served by two new chillers located in an expansion of F2.

In addition to the heating water systems, the Norco campus is served by some small local gas-fired packaged systems. The Child Development area at the far east of the campus has two small buildings that have packaged rooftop units. The bookstore at the east edge of the main campus has packaged rooftop units. On the west edge of the campus there is the Center for Applied Competitive Technologies that also has packaged rooftop equipment

5.2 METHODOLOGY

The following methodology was adopted in formulating our mechanical master plan for the campus:

A critical aspect in the evaluation of the existing systems serving a facility is a detailed and accurate field investigation of the current systems.

A detailed survey of the existing mechanical systems that currently serve the facilities at Norco College campus and existing conditions was undertaken and existing layout, capacity and potential problems were identified. The surveyed information was verified through available record drawings, field investigations and meetings with the campus facilities staff.

Alterations, upgrades, and modifications necessary to support the proposed buildings, major renovations and building retrofits that will form the proposed campus Master Plan are identified.

5.3 ANALYSIS OF EXISTING SYSTEM

This report provides an analysis of the present cooling systems currently serving the campus. It identifies potential problems associated with the systems, defines future requirements and outlines recommended solutions to support the proposed facilities master plan. Site plans showing existing and proposed cooling systems and distribution piping are provided at the end of section 9. Table 9A provides a summary of the existing buildings and their cooling loads and shows the type of cooling system that serves each building.

The campus is currently served by two central plant facilities. Each building is equipped with four air cooled chillers. The first plant in building F1 has two 140 ton Trane air cooled chillers. This set of chillers serves the five buildings on the east side of campus. The second set of chillers at this facility are two 80 ton York chillers. This set of chillers serves the group of three new buildings that is called the Industrial Technology complex. Chiller plant F1 has a total of 440 nominal tons of cooling capacity. These chillers are probably derated at peak load due to the high ambient temperatures. There is about 200 tons of cooling load on the Trane chillers and 120 tons of cooling load on the new York chillers. There is plenty of spare capacity on these two chilled water systems.

The second plant in F2, at the west side of campus has a set of 100 ton Carrier air-cooled chillers. These chillers serve the Applied Technology building and the Library. A second pair of 100 ton York air-cooled chillers at this plant serves the new Student Success Center. There is a total of 400 tons of capacity at this plant. The cooling load on the Carrier system is about 150 tons. The cooling load on the York chillers is about 65 tons. Again there is plenty of spare capacity.

All of the chillers and pumps use a constant flow rate scheme that is based on a relatively small temperature differential of 10 degrees. This is not an energy efficient pumping and distribution strategy. Distribution piping is not tied together, so piping carries chilled water to the buildings independently.

In addition to the chilled water plants there are some small split systems for telecom room and few specialized spaces. The far eastern part of the campus referred to as the Childhood Education complex is independent of the centralized campus chilled water systems. These two buildings have packaged rooftop equipment. The high school is also independent. The bookstore at the east edge of the main campus has packaged rooftop equipment. So does the Center for Applied Competitive Technology on the west edge of the main campus. There are also some relocatable classrooms with wall hung air conditioning units at the far western side of the campus.

East Campus

12 inch chilled water supply and return pipes leave the F1 central plant. This pipe then splits up to 6” pipe that goes south and a 10” line that goes east.

The south branch feeds the Science and Technology building and the Auditorium. It then continues south to the Student Services Building and the Corral.

The east branch goes to feed the Humanities Building and stays 10” to feed future buildings. This will be important when we discuss the future plans.

West Campus

The west campus is served by two 100 ton Carrier air-cooled chillers located at building F2. Two 4” chilled water mains provide service to buildings “G” and “N” respectively.

The buildings are heated and cooled by 4 pipe fan coils and are designed for approximately 10°F differential on the chilled water supply temperatures. For a campus environment this is a low temperature differential that leads to larger pipe sizes and larger pumping requirements compared to a larger temperature differential design.

A site plan showing existing chilled water piping distribution is included at the end of section 9, Central Plants.

The main conclusion that we come away with is that all chilled water is produced by air-cooled chillers. In the desert climate, on hot days, this type of chiller can be using as much as 1.5 kW per ton. The largest electrical load for the chiller is during the hottest part of the day, when the chiller is least efficient. It is also notable that the pumping is constant speed. Control valves at the fan coils are 3-way. There probably is no control scheme to reset supply water temperature during cooler weather.

5.4 ANALYSIS OF FUTURE NEEDS

The college has plans for many new buildings. However five of the buildings comprising the east campus will be demolished. The west campus buildings will remain. The chilled water requirements of the new buildings and the buildings that will remain, can be seen in Table 9B at the end of Section 9, Central Plants. The remaining buildings will require 325 tons of cooling. The new buildings will require about 1225 more tons of cooling load. That is a total of 1,550 tons of cooling.

5.5 FINDINGS AND RECOMMENDATIONS

1. Retrofit existing large buildings that are served by chilled water with BTU monitoring capabilities.

2. New buildings should be designed with air handlers instead of fan coils to make better use of air side economizers and also greater delta T's through the chilled water coils. This is essential for maximizing the cooling capacity of the chilled water TES tank while minimizing the size of the tank.

3. New buildings should be provided with DDC controls for better monitoring and controlling energy usage.

4. All new buildings should have BTU metering capabilities that tie into a central DDC system with robust energy management capabilities.

5. An analysis of the cooling loads for current and future buildings reveals that the peak cooling capacity will need to be about 1,550 tons. For energy efficiency reasons an evaporative cooled chilled water plant is proposed.

6. For maximum energy savings, peak demand reduction and reduced carbon footprint a chilled water Thermal Energy Storage (TES) tank is proposed. It would be located on the north side of the campus overlooking the campus. The TES can lower the required chiller capacity to about 1000 tons. During the peak cooling load of the day, cooling load can be partially or fully handled by the chilled water stored in the tank. The temperature of the chilled water in the tank will be lowered during off-peak hours when the ambient and wet bulb temperatures are lower, so the chillers operate more efficiently, and when electrical rates are lower.

7. Existing air-cooled chillers could also be run at night in conjunction with the Storage Tanks when the ambient temperatures are lower and electric rates are lower. This would make the existing overall system efficiency better, but it would not be as efficient as water cooled state of the art chillers.

8. Independent piping systems should be cross-connected and consolidated into a single piping system to take advantage of the thermal energy storage system sharing and shared pumping. Re-use as much of the existing buried piping as possible.

9. Piping distribution system will need to be relocated and upgraded to increase size and allow placement of new buildings over current pipe locations per our proposed site plan.

10. Piping distribution system will need to be expanded to new buildings per our proposed site plan. The expansion can be phased to coincide with the pace of new building construction.

A site plan showing existing and proposed chilled water piping distribution is included at the end of Section 9.

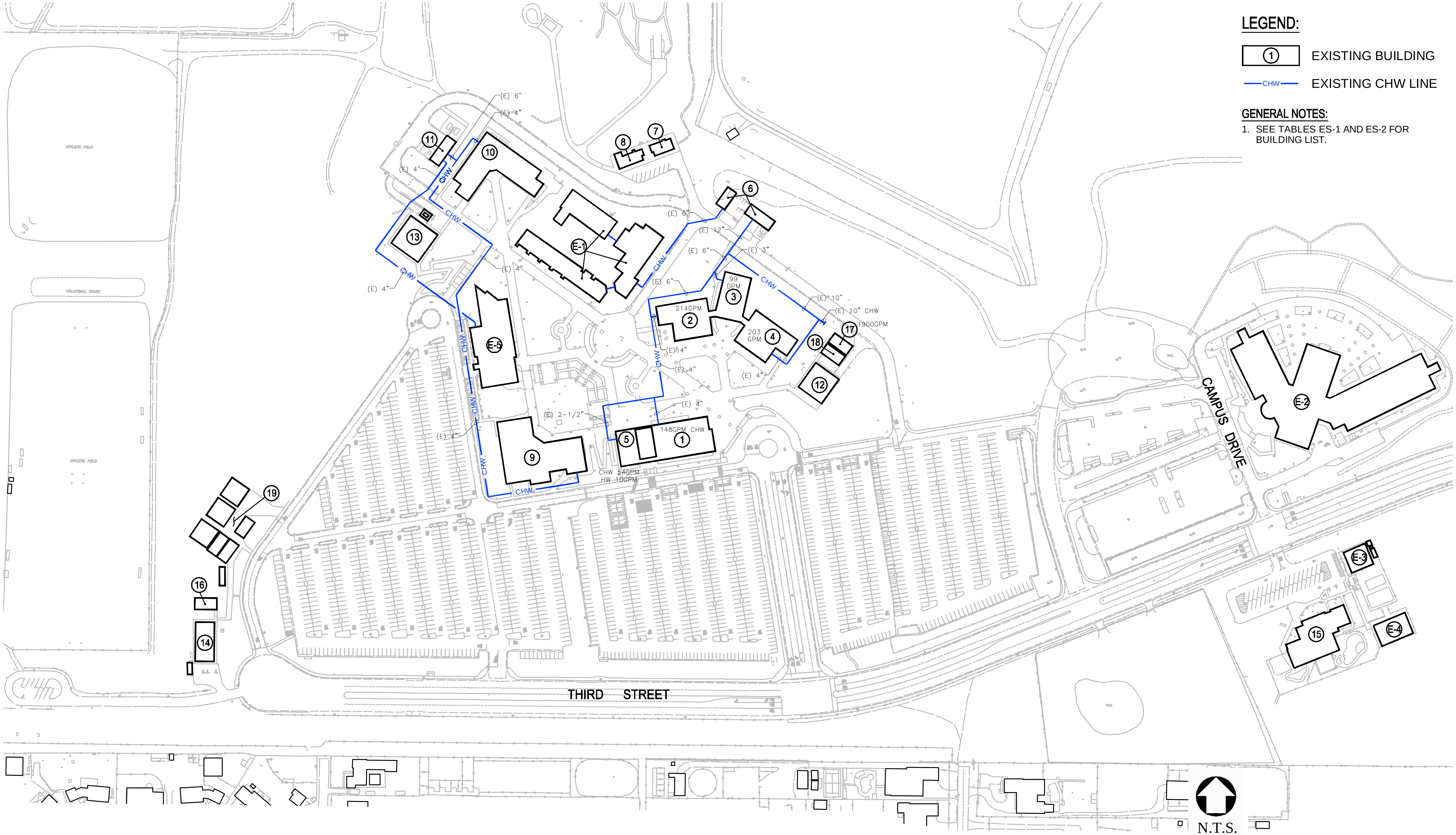


FIGURE 5a
EXISTING UTILITY MAP - CHILLED WATER

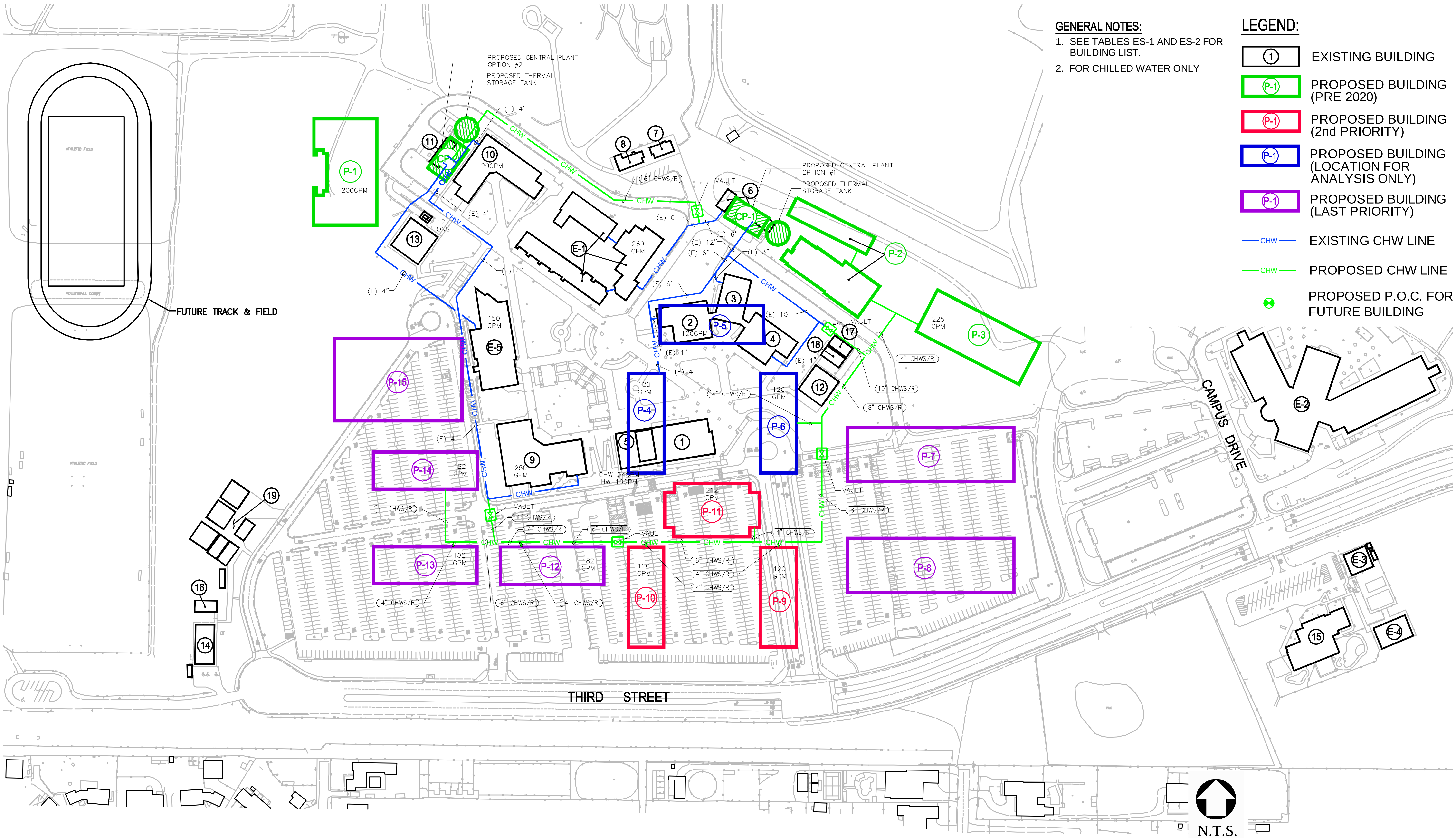


FIGURE 5b
FUTURE CONDITIONS UTILITY MAP - CHILLED WATER

SECTION 6 – HOT WATER SYSTEM

6.1 SYSTEM DESCRIPTION

Objective

The objective of this report is to evaluate the existing mechanical systems currently serving the Norco campus and provide recommendations to improve, modify or upgrade the existing systems to support new buildings, major renovations, and building retrofits that form the proposed campus Facilities Master Plan. The current enrollment is about 8,500 students. The master plan projects growth and expansion to serve 16,000 students.

6.2 METHODOLOGY

The following methodology was adopted in formulating our mechanical master plan for the campus:

A critical aspect in the evaluation of the existing systems serving a facility is a detailed and accurate field investigation of the current systems.

A detailed survey of the existing mechanical systems that currently serve the facilities at Norco College campus and existing conditions was undertaken and existing layout, capacity and potential problems were identified. The surveyed information was verified through available record drawings, field investigations and meetings with the campus facilities staff.

Alterations/upgrades/modifications necessary to support new buildings, major renovations and building retrofits that will form part of the proposed campus facilities will be identified.

6.3 ANALYSIS OF EXISTING SYSTEM

The following report provides an analysis of the present mechanical systems currently serving the campus. It identifies potential problems associated with the systems, defines future requirements and outlines recommended solutions to support the proposed facilities master plan. Site plans showing existing and proposed mechanical systems and distribution piping will be included at the end of section 9. See Figure 9A for existing facilities and piping.

The campus is currently served by two central utility buildings. Each building has two systems equipped with two boilers, each. The first plant in building F1 has two 80% efficient natural gas boilers. They are 1.2 million BTU input 'Raypak' copper fin tube boilers. They serve the east side of the main campus. The pumps provide a constant flow rate based on a 40 degree temperature differential and are therefore energy inefficient with regards to the distribution piping scheme. Distribution piping carries heating hot water to each of the five buildings at the east side of the campus. The second plant at building F1 has two 735 mbh input Ajax boilers and also uses the same approach of distribution. These boilers serve the three new buildings called Industrial Technology.

The heating plant at F1 serves the east side of the campus consists of five buildings. They are Student Services, the Corral, Humanities, the Auditorium, and Science and Technology. There are two 1,200 mbh boilers. The heating hot water loop has a 6" main and 4" branches that go south and east. The Student Services Building and the Corral is served by 2" heating hot water pipes that go south from the Science Building.

The west side of the campus consists of the Applied Technology building and the Library. These buildings are served by two 1 million BTU 'Raypak' copper fin tube boilers for providing the heating hot water requirements. The boilers are housed in F2. The heating hot water loop has a 4" main and two 3" branches that feed these two buildings.

The new section of the campus is between the two earlier parts of campus. These three buildings together are referred to as Industrial Technology. They are served by the two new 735 mbh input Ajax boilers that were located in an expansion of F1. This piping runs independently to these buildings.

The building that is being built right now near the Library is called the Student Success Center. It is served by two new boilers that are housed in F2. This piping runs independently to the new building.

When analyzing the heating water requirements of the five buildings of the east campus (phase 1), we see that the combined load of these buildings is about 900 mbh. Input for this heating load would be about 1,135 mbh. The boiler plant at F1 that serves these buildings has an input of 1,200 mbh each. So, one boiler can handle the load on a design day. The other boiler is 100% redundant.

The heating water pumps for this system are capable of providing 168 gpm at 120 ft of head. The load for the five buildings is 45 gpm. The pumps have plenty of spare capacity. They could be running at lower flow.

When analyzing the heating water requirement for the two buildings on the west side (phase 2), we see that the combined load is about 760 mbh. The input for this heating load would be 950 mbh. The boilers that serve these two buildings has an input of 1125 mbh each. So, one boiler can handle the load on a design day with about 18% to spare. The other boiler would be 100% redundant.

The heating water pumps for this system are capable of providing 60 gpm at 90 ft of head. The load for the two buildings is 50 gpm at 30 degrees temperature drop. one pump has plenty of capacity. The other is a spare.

When analyzing the heating load for the Industrial Technology complex, we see that the combined load for these three buildings is about 675 mbh. The input for this load would be 850 mbh. The two new boilers are 735 mbh each. Only on a cold day would both boilers need to be firing.

The capacity of the heating water pumps for this system are not known at this time. More investigation will need to be performed.

When analyzing the heating load for the new Student Success Center, we see that the load for this building is about 375 mbh. The input for this load would be 475 mbh. The capacity of the two new boilers are not known at this time. More investigation will need to be performed. Information on the pumps is not known either.

In addition to the heating water plants, the Norco campus is served by some small local gas-fired packaged systems. The Child Development area at the far east edge of the campus has two small buildings that have packaged rooftop units. The bookstore at the east edge of the main campus has packaged rooftop units. On the west edge of the campus there is the Center for Applied Competitive Technologies that also has gas-fired packaged rooftop equipment.

6.4 ANALYSIS OF FUTURE NEEDS

There are several new buildings proposed in the future and some existing buildings that are planned for demolition. Refer to Table 9B at the end of section 9 for a summary of future heating loads for the planned buildings, and the buildings that will remain.

Many of the existing buildings that are remaining will keep their existing heating systems. Some of the existing buildings that are connected to the central heating water system will remain connected.

All new buildings should be designed to have independent heating water systems housed within the building. There is no benefit to have new buildings fed from a central heating system. A local heating system is efficient without having heat loss from long runs of buried pipes. Plus you forego the cost of the long runs of buried piping.

The future buildings will require an additional 10 million Btuh of connected natural gas load for heating water. The buildings that will remain will require about 5 million Btuh of connected gas load.

6.5 FINDINGS AND RECOMMENDATIONS

1. The future buildings should be designed with local heating water systems. Those heating plants should have boilers that are 84% to 92% efficient with at least 4 to 1 turn down.
2. Our recommendations are to retain the existing heating water system as much as possible. There is no need to retrofit existing buildings that are connected to the existing central heating water system with new local heating water systems. We recommend cross connecting the existing heating water systems at each plant and possibly removing some pumps. There appears to be excess boiler and pumping capacity. The equipment should be tied together with DDC controls and an energy management system.
3. Existing remote buildings that have existing gas-fired heating equipment should remain as is. They are smaller loads and will not make much difference to the overall campus natural gas usage.

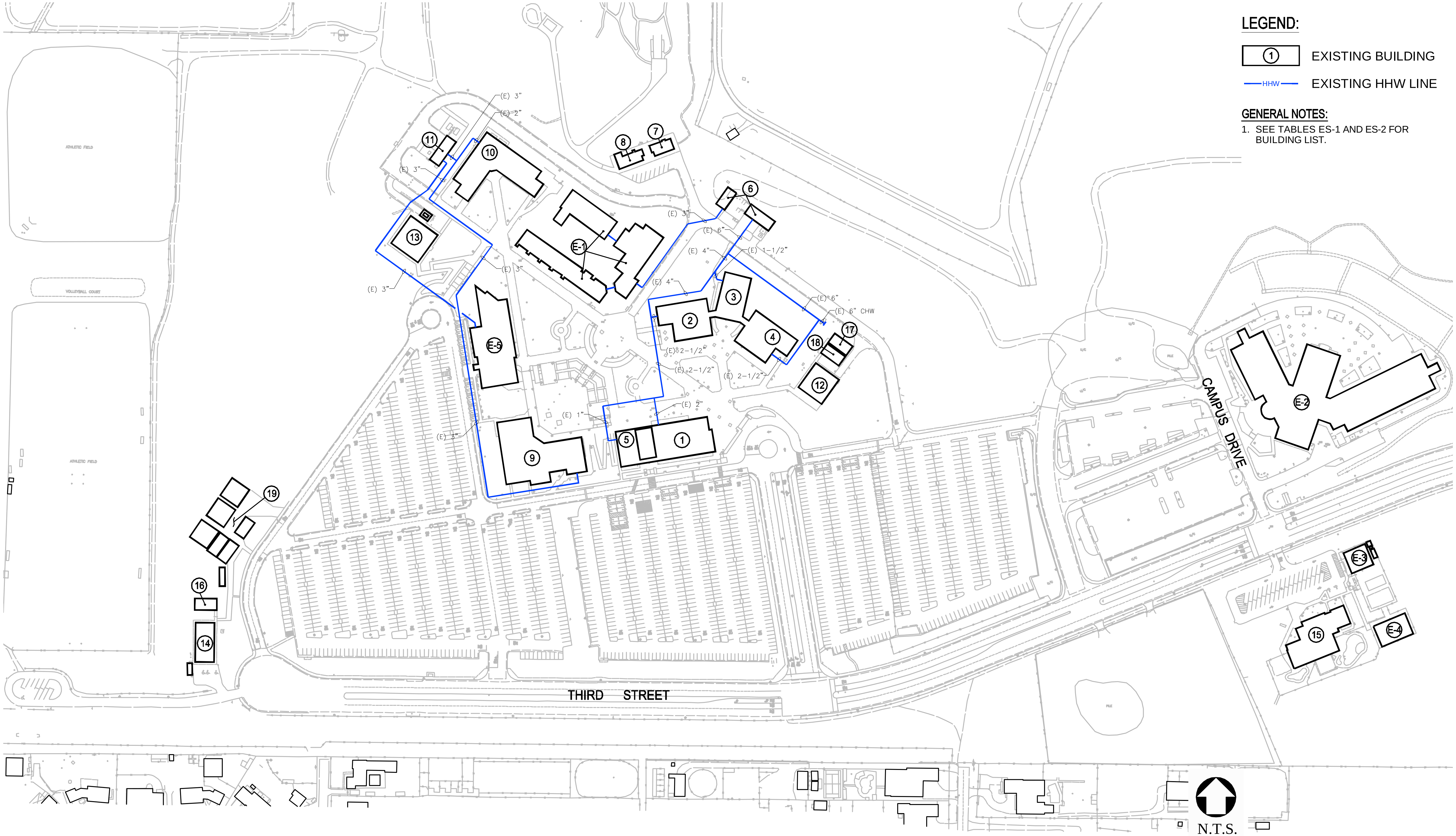


FIGURE 6a
EXISTING UTILITY MAP - HEATING WATER

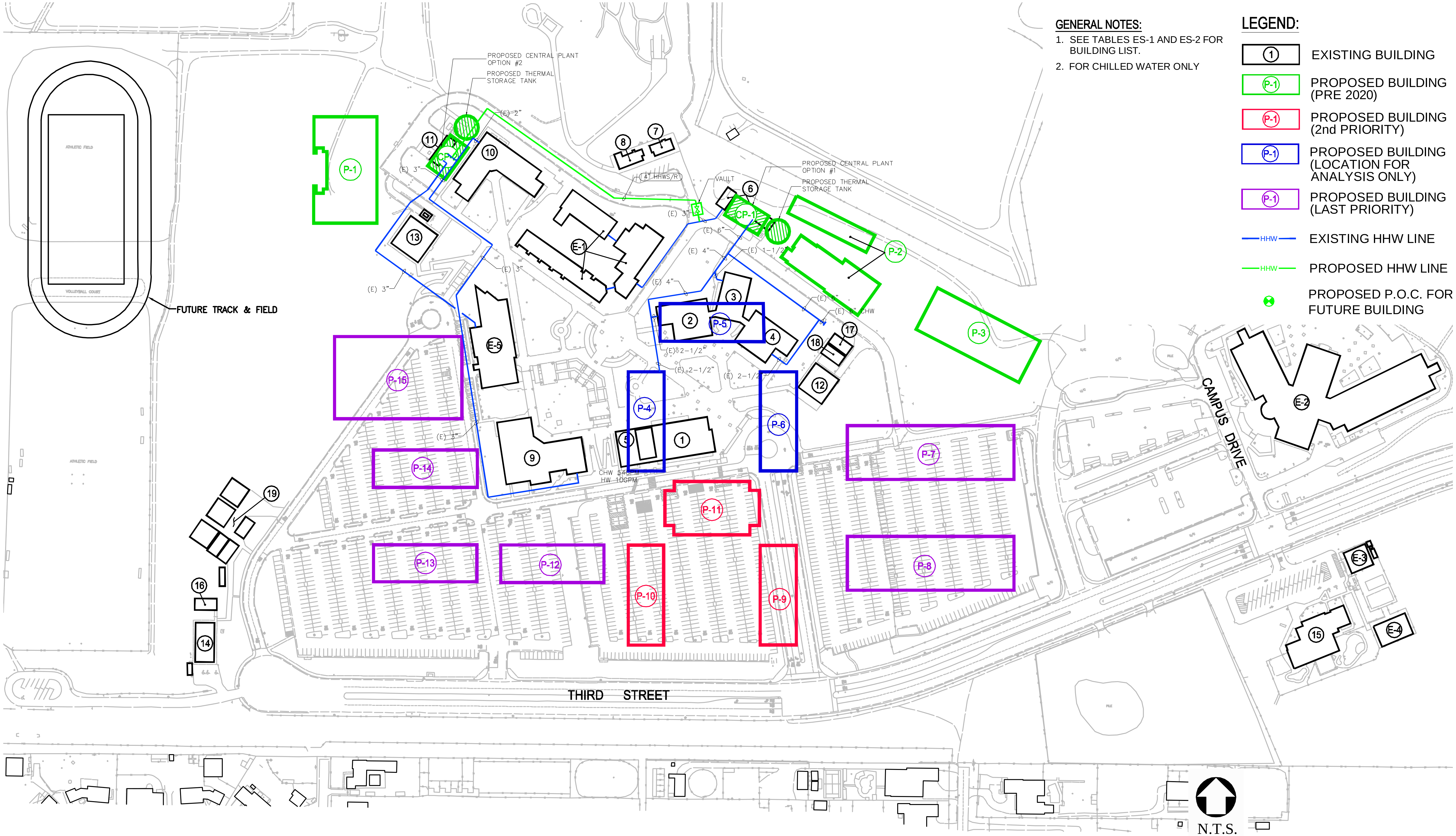


FIGURE 6b
FUTURE CONDITIONS UTILITY MAP - HEATING WATER

SECTION 7 – ELECTRICAL SYSTEM

7.1 SYSTEM DESCRIPTION

Background and Scope

Norco College, one of three colleges within the Riverside Community College District, is a two-year public community college situated in the suburban community of Norco, California. The campus was built in two phases and opened in 1991 with the majority of the buildings being built in phase one. The Norco campus is fast becoming the engineering and technology based education center of choice in the Inland Empire. Each semester more than 8,500 students pursue associate's degrees, transfer to a four-year college or university or receive career certificates that qualify them to enter their chosen field.

The campus derives its power from Southern California Edison via a 12kV high voltage primary distribution system. This power is then transformed down to low voltage where it is then metered and distributed throughout the site. P2S evaluated the existing power distribution system currently serving the existing Norco College campus.

Objective

The objective of this report is to evaluate the existing power distribution system and its adequacy to support new buildings, major renovations, and building retrofits that form part of the proposed campus Facilities Master Plan.

7.2 METHODOLOGY

The following methodology was adopted in formulating our power distribution master plan:

1. A critical aspect in the evaluation of the existing power distribution systems serving a facility is a detailed and accurate field investigation of the current systems. A detailed survey of the existing power distribution system that currently serves the facilities at Norco College campus and existing conditions, together with potential problems, are being identified. The surveyed information has been verified through available record drawings, field investigations and meetings with the campus facilities staff as well as discussion with the Southern California Edison service representative.

2. Alterations/upgrades/modifications necessary to support new buildings, major renovations and building retrofits that will form part of the proposed campus facilities were identified.

7.3 ANALYSIS OF EXISTING SYSTEM

Our following report provides an analysis of the present electrical distribution currently serving the campus.

The following are included in this survey submittal:

1. High voltage system description.

2. Low voltage system description.

3. AutoCAD drawings of the existing single line diagram and electrical site distribution system and also the proposed site distribution and optional single line diagrams 1 and 2.

High Voltage Distribution

The site is presently fed by Southern California Edison from a single overhead pole line located on Mountain Ave. opposite the campus parking access road. The 12KV conductors are then extended down the pole into an underground conduit. The underground 12kV XLP feeders and 5" conduit extend across 3rd Street and follows the curb line east to a high voltage manhole located approximately 80 feet west of Campus Drive. The 12KV XLP conductors are then extended underground through a 4" conduit and manhole located north of the rear access road to a Southern California Edison high voltage switch located adjacent to Mechanical Building No. F1. This 12kV high voltage switch then feeds a 500 KVA transformer located adjacent to Mechanical Building No.1. Additionally, this high voltage switch also protects a second 12 KV XLP underground feeder which extends through a 4" conduit and two SCE pull-boxes to a second 1000 KVA transformer located adjacent to Mechanical Building No. F2. The SCE transformers then transform the 12KV primary voltage to a 480Y/277 Volt 3-phase, 4-wire system with a 3000 Amp main switchboard at each location.

It should be noted that the two 3000 A 480/277 V switchboards were once each metered individually, however these meters have been removed and a single new meter has been installed in the 12KV high voltage switch enclosure.

The Head Start and Early Childhood center is fed by a secondary 12kV XLP feeder in a 4" conduit that extends from the high voltage manhole on 3rd Street through a small pullbox to an SCE 150 KVA transformer located adjacent to the Head Start Building. The SCE transformers connect the primary voltage to a 208/120 Volt, 3-phase, 4-wire system with an 800 Amp main switchboard and separate SCE meter. The maximum peak demand for this meter in 2009 was 61 KW or 170 amps.

Low Voltage Distribution System

East Campus

The Southern California Edison transformer presently feeds a 3000 A main switchboard (designated as 'MSB') located at Mechanical Building No.1. The main switchboard is protected by a 3000 A ground fault interrupter main circuit breaker. The primary voltage of 480/277 V is used to feed the chillers and the mechanical equipment as well as extending via manholes and pull-boxes throughout the campus to various other buildings. These buildings are listed as follows:

1. The Science Tech Building has a 300 Amp circuit breaker and feeder to a 400 Amp secondary 480/277 V distribution switchboard. The 480 Volts is then transformed to 120/208 for secondary distribution. It should be noted that this 300 Amp circuit breaker feeder indicated a maximum high leg conductor reading of 63 Amps at the time of this report.

2. The Student Services Building has a 300 Amp circuit breaker and conductors feeding a 400 Amp, 480/277 V, secondary distribution switchboard. The 480 Volts is then transformed to 120/208 for secondary distribution. It should be noted that this 300 Amp circuit breaker feeder indicated a maximum high leg conductor reading of 44 Amps at the time of this report.

3. The Bookstore is fed with a single 100 Amp circuit breaker and 100 Amp conductors from the Humanities building. This single feeder is then provided with a 600 Volt disconnect switch which feeds a 75 KVA transformer and secondary 208/120 Volt panel at each building. It should be noted that this 100 Amp circuit breaker feeder indicated a maximum high leg conductor reading of 15 Amps at the time of this report.

4. The Humanities building is fed with a 300 Amp circuit breaker and 400 Amp conductors to a 400 Amp secondary 480/277 V distribution switchboard. The 480 Volts is then transformed down to 208/120 Volts for secondary distribution. It should be noted that this 300 Amp circuit breaker indicated a maximum high leg conductor reading of 45 Amps at the time of this report.

5. The Multi-purpose Auditorium building is fed with a 300 Amp circuit breaker and 400 Amp conductors to a 400 Amp secondary 480/277 V distribution switchboard. The 480 Volts is then transformed down to 208/120 Volts for secondary distribution. It should be noted that, although the building was unoccupied, this 300 Amp circuit breaker indicated a maximum high leg conductor reading of 16 Amps at the time of this report.

6. The two portable trailers located adjacent to the Bookstore are fed with a 100 Amp circuit breaker and conductors at 480 Volts to a disconnect switch located on the portables. The 480 Volts is then transformed via a 37.5 KVA transformer to 120/208 Volts (phase, 4-wire) which then feeds each portable separately.

7. The new Industrial Technology Building has a 1200 Amp circuit breaker and feeder to a 1200 Amp, 480/277V secondary distribution switchboard. It should be noted that this building was originally supposed to be fed from the west campus switchboard with the 1000 KVA SCE transformer but is now fed from the east campus switchboard and the 500 KVA SCE transformer.

Low Voltage Distribution System

West Campus

The Southern California Edison transformer presently feeds a 3000 A main switchboard (designated as 'MSB2') located at Mechanical Building No. F2. The main switchboard is protected by a 3000 A ground fault interrupter main circuit breaker. The primary voltage of 480/277 V is used to feed the chillers and the mechanical equipment as well as extending via manholes and pull-boxes to various other buildings. These buildings are listed as follows:

1. The Library is fed with an 800 Amp circuit breaker and feeder to an 800 Amp secondary distribution switchboard. The 480 Volts are then transformed to 120/208 Volts for secondary distribution. It should be noted that this 800 Amp circuit breaker feeder indicated a maximum high leg conductor reading of 82 Amps at the time of this report.

2. The Tech Building is fed with a 600 Amp circuit breaker and feeder to a 600 Amp secondary 480/277 V distribution switchboard. The 480 Volts is then transformed to 120/208 for secondary distribution. It should be noted that this 600 Amp circuit breaker feeder indicated a maximum high leg conductor reading of 45 Amps at the time of this report.

3. The Soccer Building is being built at this time and is fed parallel to the West Quad feeder. The West Quad modular buildings are being fed from a 200 A circuit breaker to a 150 KVA weatherproof transformer to a 120/208 Volt, 3-phase, 4-wire distribution switchboard. This distribution switchboard also feeds the Activity Center. It should be noted that the 200 amp main circuit breaker has been tripping on hot days due to overloading.

4. The CACT Building is fed with a 600 Amp circuit breaker and feeder to a 600 Amp weatherproof distribution secondary distribution switchboard. The 480 Volts are transformed through a 225 KVA weatherproof transformer to 120/208 Volts for secondary distribution inside the building. The Activity Center was fed from a 100 amp circuit breaker that is now spare. The Activity Center is now being fed from the West Quad feeder.

Head Start /Early Childhood Center

The Southern California Edison transformer presently feeds an 800 Amp main switchboard and independent meter adjacent to the Head Start Building. This main switchboard is fed at 120/208 Volts, 3-phase, 4-wire. This switchboard then back-feeds the old 600 Amp main switchboard feeding the Head Start Building as well as feeding new distribution and secondary panels located in the Early Childhood Center.

Underground Distribution Network

The secondary distribution network throughout the campus is by a series of duct banks with 4" and 5" conduits and manholes. There are spare conduits throughout the system.

See Exhibits 7 for reference to the existing site electrical distribution system and existing campus single line diagram.

System Capacity Evaluation

The **highest peak demand load** for the campus recorded in September of 2009 for the Central Plant was 880 kilowatts. With a power factor of .85 the peak kVA is 1,035kVA. The total amps is low for the two 3000 amp distribution boards only 1246 amps, the two main switchboards are adequately sized to support the **existing** facilities at the campus. Together the two SCE transformers are well below their rated limit however dividing the load between the two transformers would put the 500 kVA transformer **at or near its rated limit**. The individual 500kVA SCE transformer at the Central Plant F1 could be over its rated limit with the new Industrial Technology Building and the Student Success Center coming on line. The 500 kVA transformer should be monitored before the peak demand months of August and September of 2010.

The total consumption for the whole campus for last year was approximately 2.9 million KW hours with a total electrical cost of $422,000 for the main switchboard. This excludes the Head Start Program.

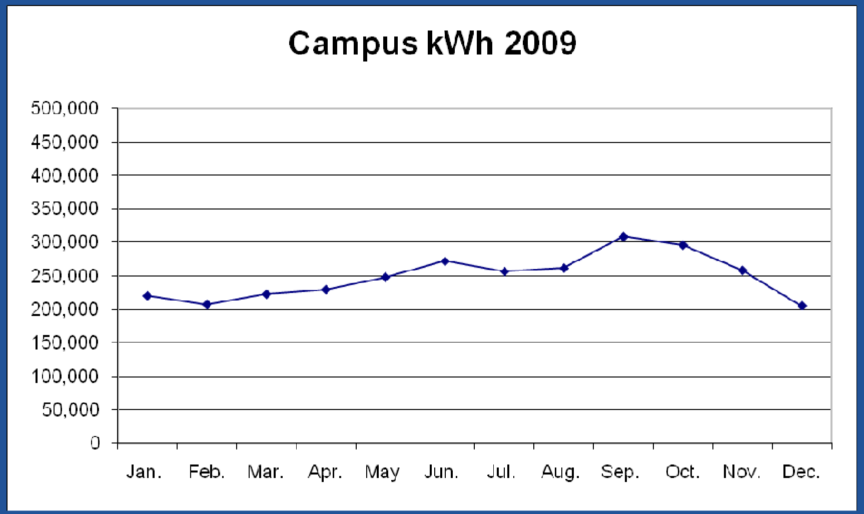
Table 7.1 below provides installed capacities by substations and feeders. Approximate demands of the buildings are calculated at 40% of the installed capacities in absence of a metered data available.

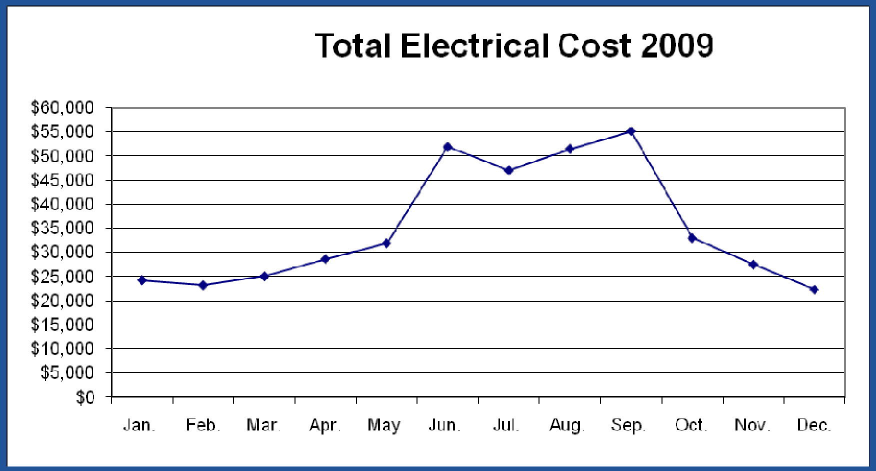
Bldg #	Building Name	Occupancy Type	Gross sqft	Load Factor w/sqft	Required Capacity in KVA	Demand in KVA @ 40% of Installed Capacity
P1	Physical Education Center (9)	Academic	54,000	12.0	648	259
P2	NOC, Central Receiving & Warehouse	Industrial	16,000	16.0	256	102
P3	Visual & Performing Arts (7)	Academic	60,000	12.0	720	288
P4	North Quad - Classrooms and Labs 1	Academic	32,000	12.0	384	154
P5	North Quad - Classrooms and Labs 2	Academic	32,000	12.0	384	154
P6	North Quad - Classrooms and Labs 3	Academic	32,000	12.0	384	154
P7	N/E Parking Structure	Parking Structure	200,000	0.5	100	40
P8	S/E Parking Structure	Parking Structure	280,000	0.5	140	56
P9	South Quad - Classrooms and Labs 1	Academic	32,000	12.0	384	154
P10	South Quad - Classrooms and Labs 2	Academic	32,000	12.0	384	154
P11	Student Center	Academic	48,000	12.0	576	230
P12	West Quad - Classrooms and Labs 1	Academic	48,000	12.0	576	230
P13	West Quad - Classrooms and Labs 2	Academic	48,000	12.0	576	230
P14	West Quad - Classrooms and Labs 3	Academic	48,000	12.0	576	230
P15	North West Parking Structure	Parking Structure	180,000	0.5	90	36
	Total Capacity Addition		1,142,000		6,178	2,471
E	Total Existing Buildings	Mixed Use	193,808	12.0	2,427	971
E	Total Existing to Buildings to be Removed	Mixed Use	65,957	12.0	799	320
E	Total Existing to Buildings to Remain	Mixed Use	127,851	12.0	1,628	651
	Total Campus Capacity		1,269,851		7,806	3,122

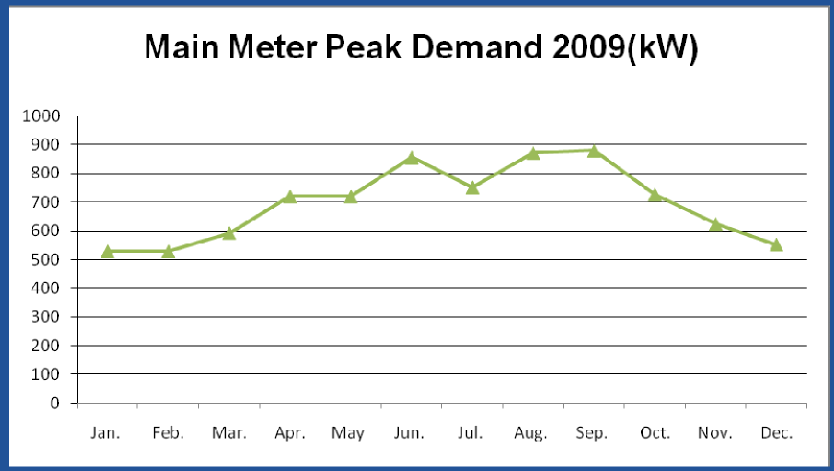
Graphs showing energy consumption in Kilowatt hours and costs for each month for last year are included below. The graph of the highest peak demand is also shown below.

Renewable Power

The campus will embarked on a renewable power project aimed at reducing the greenhouse gas emissions at the campus. The renewable solar power will be located at the Mechanical buildings 7 & 8. This renewable power will help the campus offset the campus greenhouse gas emissions and help the campus shield itself from the variation in the energy prices. The system would also help the campus offset its peak campus demands in the summer.







7.4 ANALYSIS OF FUTURE NEEDS

Our following report provides an analysis of the future needs of the electrical distribution system currently serving the campus. The following are included in this survey submittal:

1. Future building capacity
2. Review of the current power consumption
3. Available spare electrical capacity

Future Buildings

The estimated square footage of all the future buildings is 482,000 square feet and an additional 660,000 square feet of parking structure. That is two and a half times the size of the current campus and that includes the Student success Center and the Industrial Technology Buildings as existing.

Current Power Consumption

The total SCE Peak demand load for the campus it 880KW. This does not include the High school or the Early Childhood Center. Using a demand factor of .85 yields a maximum of 1035KVA of power being use at one time. The capacity of the two transformers is 1500 KVA and they are loaded to 70% of their combined capacity. The west campus buildings and the east campus buildings are evenly divided between the two transformers. Dividing the 1035kVA load evenly between the two transformers would put the east 500 kVA transformer at its rated capacity during peak demand in August and September. The west 1000kVA transformer would be at 50% of its rated capacity.

Available Spare Electrical Capacity

The available spare capacity of the main campus is 465 KVA. The existing campus distribution network is adequate to accommodate 66,000 square feet of expansion if it is placed on the west campus distribution board. SCE will need to replace their transformers with larger transformers prior to expanding more than 66,000 square feet.

The existing mechanical yards do not have enough capacity to handle any new buildings and additional electrical loads will be required to power any new mechanical equipment. See Central Plant Section 10.

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 in our proposed electrical site plan.

The following table 7.2 depicts projected installed capacities and demand of proposed facilities that are being added under the proposed facilities master plan. The capacities are calculated based on standard industry watts/sqft in absence of a design for these facilities.

Table 7.2 Installed Capacities/Demand of Future Facilities- 2020

Building Name	Building No.	Projected Construction Completion Year	Gross sqft	No. of Stories	Required Capacity in kVA	Demand In kVA @40% of Installed Capacity
Physical Education Center	P1		54,000	1	648	259
P2 Network Operations Center	P2		20500	1	256	102
Visual Performing Arts	*P3*		60,000	-	720	288
Total Capacity Addition			**134,500**		**1634**	**649**

Installed Capacities/Demand of Future Facilities- 2nd Priority

Building Name	Building No.	Projected Construction Completion Year	Gross sqft	No. of Stories	Required Capacity in kVA	Demand In kVA @40% of Installed Capacity
South Quad Labs 1	P9		32,000	-	384	154
South Quad Labs 2	P10		32,000	-	384	154
Student Center	*P11*		48,000	-	576	230
Total Capacity Addition			**112,000**		**1344**	**538**

Installed Capacities/Demand of Future Facilities- 3rd Priority

Building Name	Building No.	Projected Construction Completion Year	Gross sqft	No. of Stories	Required Capacity in kVA	Demand In kVA @40% of Installed Capacity
North Quad Labs 1	P4		32,000	-	384	154
North Quad Labs 2	P5		32,000	-	384	154
North Quad Labs 3	*P6*		32,000	-	384	154
Total Capacity Addition			**96,000**		**1152**	**462**

Installed Capacities/Demand of Future Facilities- Last Priority

Building Name	Building No.	Projected Construction Completion Year	Gross sqft	No. of Stories	Required Capacity in kVA	Demand In kVA @40% of Installed Capacity
East Parking Structures	P7 & 8		480,000	-	240	240
West Quad Labs 1	*P12*		48,000	-	576	230
West Quad Labs 2	*P13*		48,000	-	576	230
West Quad Labs 3	*P14*		48,000	-	576	230
North West Parking Structure	*P15*		180,000	-	90	90
Total Capacity Addition			**372,000**		**2058**	**1020**

7.5 FINDINGS AND RECCOMMENDATIONS

Electrical Power Distribution

Findings

The existing Edison substructure is in very good condition and is adequately sized for the campus' present needs. The existing 15 KV conductors have the capability of feeding all major additions. The Southern California Edison transformers have a combined capacity of 1500 KVA (1.5 MVA) or 1800 amps at 480 volts. Edison and all other utilities size their equipment for a 40% demand factor. At the present time there is 6000 Amps of capacity in the two main switchboards with a combined 12-month peak demand load of 880 KW or 1245 Amps at 480 volts, 3-phase.

The secondary distribution switchboards are all adequately sized for any additional loads, retrofits or remodels that may be required. The maximum connect load is 21% of the rated switchboard (This is for the Science Tech Building). All others are even more lightly loaded.

Recommendations

An evaluation of the primary closed loop 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.

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.

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.

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 primary closed loop configuration is recommended.**

Primary Closed 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.

1. **Primary closed loop system** with new 15kV isolation switches at each building to enable isolation of feeders during a fault condition.

2. It is recommended that a **new** campus owned primary 15kV metering section and **switchgear** be installed.

3. A **Short Circuit / Arc Flash** study be conducted to coordinate the proposed system.

4. Conduct a **coordination study** of the proposed system to effectively coordinate all protective devices in the campus.

5. We recommend that **SCE be notified** every time a new load or building is added to the system.

6. Southern California Edison has a very good reputation for maintaining their networks. The weak point in the distribution system is the single 5" conduit feeding the entire campus from a single substation. However, there have been not serious outages during the last 14 years of service. It would appear that based upon possible additional new buildings being added to the north of the service access road, the entire Edison feeder network may have to be relocated to clear this expansion. **We recommend** that planned **Buildings P2 and P3 on the north side of campus be relocated** to avoid the 12kV underground utility line that serves the campus. See future site plan.

7. We recommended that Southern California Edison be requested to **upgrade the 500KVA transformer**. If any future loads are to be added to the east side of campus.

8. If additional capacity (above 66,000 square feet) is required, it is recommended that Southern California Edison be requested to **upgrade the 1000KVA transformer**.

9. The existing Southern California Edison 15kV, 1/0, XLP conductors currently have a load of 50 amps and a capacity of 150 amps allowing for the campus to be more than doubled in size before new conductors are required. However Table 7.2 shows a projected load of 216 amps on the 12kV service feeder and we recommend SCE be requested to **change out the primary conductors** the next time a transformer is replaced.

10. We recommend the use of **proper digging equipment for trenching** any new electrical feeders as it is well known that the campus has a granite base. The amount of time and the rental of proper equipment should be included in the base bid of any job at Norco Campus where trenching is involved and not included in a change order as **"discovery"** after the fact.

11. We recommend the use of a **wireless multi-metering system**. The system should have an energy software package for energy analysis, 3 phase wireless meter transceivers for wireless metering and be capable of metering at 480 volts as well as 208 volts.

12. We recommend the use of **aluminum cables** rather than copper cables. Aluminum cables shall be used for all medium voltage cables and low voltage cables larger than 4/0 in an effort to save money.

Sample Arc Flash Warning

TABLE 7-3 INSTALLED CAPACITIES BY SUBSTATION/ FEEDERS

The following Table 7-3 depicts all the existing SCE meters currently on the campus and there locations. The total KW is given and the total kVA is factored in at the bottom.

Table 7-3 Electric Meter Locations Norco Campus

Address	Location	Meter #	Switchboard Rating	Voltage	Peak KW Demand	Amps
2001 3rd. Street	SCE Meter Cabinet near Building #6	V345E-001311	(2)3000A	12,000 3Ø	880	1246
1900 3rd. street	Head Start Building	349-010477	800A	120/208, 3Ø	72	200
	Street Lighting Meter	3-005-7827-45			200	
				Total kW	**1141**	
				Power Factor	**0.85**	
				Total kVA	**1342**	

Electrical Power Cost Breakdown

The SCE company has increased their transmission and their distribution charge effective Oct.1, 2009. These rates apply to Time Of Use Large users and taken from the Schedule TOU-8 for 2kV to 50kV meters.

(a) Summer Season on peak..$0.1746/kWH

(b) Winter Season on peak..$0.14906/kWH

(c) Customer Charge..$284.75/Meter

(d) Demand Charge Tranmission .... $2.10/kW of billing demand

(e) Demand Charge Distribution.. $8.32/kW of billing demand

(f) Time Related Summer on peak $22.71

7.6 SITE LIGHTING SYSTEM DESCRIPTION

Objective

The purpose of this study is to evaluate the existing exterior lighting system at Norco Campus of the Riverside Community College and provide recommendations to create a visually comfortable, safe, and aesthetically pleasing exterior environment. Our study references Illuminating Engineering Society Handbook (ninth edition) and IES RP-33 recommended practice as the reference documents in evaluating the exterior lighting system.

Summary of Scope

The following aspects of the exterior lighting system are addressed in this study:

1. Type and photometric distribution (Photometric distribution provides luminous intensity of luminaries in specified planes and angles) of existing exterior light fixtures.

2. Evaluation of fixture types with respect to energy usage, light output, quality of light, brightness, and maintenance.

3. Type of lamps, their color temperatures, and their wattages.

4. Existing lighting levels.

5. Glare.

6. Safety and Comfort.

7. Standardization of equipment. (Light fixtures and Lamp source).

Conclusion

A number of exterior light fixtures equipped with a range of lamp sources currently illuminate the walkways, roadways, parking lots and building exteriors of the Norco Campus.

Although a few areas meet or exceed the light levels currently recommended by the Illuminating Engineering Society (IES), the majority of the campus light levels fall below these recommended levels. Some of the contributing factors for the inconsistent exterior lighting throughout the Norco campus are:

1. Incorrect spacing and mounting heights of light fixtures

2. Use of different light sources (high pressure sodium, metal halide, and fluorescent) with different color temperatures and different wattages

3. Wrong application of fixtures (photometric distributions and light sources)

4. Inadequate light fixtures

5. Burned out lamps

Standardization of equipment coupled with its correct application and correct photometric distribution is recommended to improve the existing exterior lighting at the campus. Standardization of equipment would not only result in lower maintenance and inventory costs, but also would also reduce energy costs of the campus.

To accomplish the above, we recommend the following steps:

1. A single lamp source is selected for illuminating roadways, parking lots, and pathways leading to the campus buildings. Since a high-pressure sodium lamp has a lower color temperature and provides a warm color, we recommend that this lamp be standardized for campus exterior lighting.

2. All roadways and parking lots in the campus are illuminated with shoe box type fixtures equipped with full cutoff optics. We recommend replacement/addition of light fixtures as required in these parking lots to achieve IES recommended light levels.

3. All existing post top fixtures, and other decorative fixtures in the campus be replaced with a common cut off decorative fixture (A cutoff luminaire is defined by I.E.S as a luminaire that produces a luminous intensity of 10% or less at a vertical angle of 80 degrees above nadir) that will provide a visually comfortable environment and aesthetically blend with the architectural buildings in the campus. The cut off fixtures would also prevent glare. These new fixtures will be spaced to meet the current IES recommended light levels for pathways.

4. Bollard lights should be avoided as much as possible to illuminate pathways within the campus due to their narrow distribution and inability to illuminate wider pathways effectively. The bollards are also particularly vulnerable to vandalism because of their lower mounting heights,

5. Metal Halide lamps are recommended to highlight the architecture of buildings due to their high color rendering index and high color temperature

6. Illumination levels of all pathways, roadways and parking lots in the campus shall be designed to meet the current recommended light levels by IES (an average of at least 0.5fc with a uniformity ratio of 4:1. Uniformity ratios are a measure of luminance differences between surfaces or areas and are expressed as ratio of maximum or average illumination to minimum illumination for a given area. Higher uniformity ratios with in the field of view can reduce the ability to see a task, create a safety hazard and cause annoyance). This will not only provide a visually comfortable environment, but also a safe environment, since people often associate higher or greater luminance with safer surroundings.

The campus exterior lighting at RCCD Norco presently consists of a designed central theme of exterior light fixtures that currently illuminate the pathways, parking lots and roadways of the campus. However a high number of lights in the parking lot and walkways are burned out or turning on and off due to cycling. This is causing a large number of dark areas.

The majority of the exterior light fixtures currently lighting the parking lots are shoe box fixtures and have sharp cut off characteristics. Almost all of these fixtures are equipped with high pressure sodium vapor lamps. The walkways are illuminated with post top fixtures. These fixtures are equipped with high pressure sodium lamps.

The lighting levels around the campus vary extensively from almost .03 footcandle in some parking areas to as high as 19 fc directly under the shoe box fixtures with uniformity ratios (average foot-candles to minimum foot-candles in excess of 10:1 in certain areas). The footcandle readings were recorded using a digital light meter (model EA30 manufactured by Extech instruments) during the month of October 2009.

The following description provides type of fixture, existing footcandle levels and type of lamps being used in each area of the campus.

Pathways

Pedestrian walkways throughout the campus are illuminated with post top fixtures that offer some cutoff. The fixtures are mounted on 12' 4"square poles. The fixtures are equipped with 70 watt high pressure sodium lamps. Due to a visible reflector and the lamp source, these fixtures are not well shielded and contribute to glare. There are dark areas due to construction zones and many burned out lights. The walkway light levels ranging from .03 foot-candles to 4 fc in certain areas. The uniformity ratios (which are a measure of the (maximum or average footcandle/minimum footcandle) are high and are above the normally recommended (4:1) uniformity ratios by the Illuminating Engineering Society (IES) thus creating a high contrast environment.

Parking lots

Parking lot A is illuminated with modern shoebox light fixtures mounted on 25' high poles. The fixtures are equipped with high pressure sodium vapor lamps. The parking lot has footcandle readings ranging from 0.3 foot-candles at the edge of the lot and 19 foot-candles under the fixture. This parking lot has higher footcandle readings than other parking lots but does not have uniform spacing of the poles that could reduce the lower footcandle readings in the center of the parking lot. There were no burned out lights in lot A at the time of the survey. This lot is scheduled to be demolished to make room for the new South Quad Buildings. The uniformity ratios (average footcandle / minimum footcandle) are high and above the normally recommended (45:1) uniformity ratios by the Illuminating Engineering Society (IES).

Parking lot B is illuminated with modern shoebox light fixtures mounted on 25' high poles. The fixtures are equipped with high pressure sodium vapor lamps. The parking lot has footcandle readings ranging from 0.4 foot-candles between the fixtures 14 foot-candles under the fixture. There are dark areas where the foot-candles fall below .2 due to obstructions (trees). This lot is scheduled to be demolished to make room for two new parking structures. The uniformity ratios (average footcandle / minimum footcandle) here again are extremely high about 35 and are far above the normally recommended (4:1) uniformity ratios by the Illuminating Engineering Society (IES).

Parking lot C is illuminated with modern shoebox light fixtures mounted on 25' high poles. The fixtures are equipped with high pressure sodium vapor lamps. The parking lot has footcandle readings ranging from 0.2 foot-candles between the fixtures 21 foot-candles under the fixture. It was difficult to measure the lows between two pole mounted fixtures because there were so many light fixtures that were burned out or cycling on and off. The uniformity ratios (average footcandle / minimum footcandle) here again are extremely high about 105 and are far above the normally recommended (4:1) uniformity ratios by the Illuminating Engineering Society (IES).

Parking lot D is a well lit parking lot and is illuminated with modern shoebox light fixtures mounted on 25' high poles. The north half of the lot was fenced off during the survey due to construction. The fixtures are equipped with high pressure sodium vapor lamps. The parking lot has footcandle readings ranging from 2.7 foot-candles between the fixtures 13 foot-candles under the fixture. The perimeter has some areas where the footcandle readings are .5fc. The uniformity ratios (average footcandle / minimum footcandle) are high, about 18 to 1 and far above the recommended (4:1) uniformity ratios by the Illuminating Engineering Society (IES).

Parking lot-Early Childhood is illuminated with vandal resistant light fixtures mounted on 12' high poles. The fixtures are equipped with high pressure sodium vapor lamps. The parking lot has footcandle readings ranging from 1.8 foot-candles between the fixtures 4.4 foot-candles under the fixture. The uniformity ratios (average footcandle / minimum footcandle) are acceptable, about 3 to 1 within the recommended (4:1) uniformity ratios by the Illuminating Engineering Society (IES).

Roadways

Access road is illuminated with modern shoebox light fixtures mounted on 25' high poles however many of the fixtures are burned out some areas with little (0.06 fc) or no light at all.

7.7 SITE LIGHTING RECOMMENDATIONS

The Norco campus is currently designed with a central theme of exterior light fixtures that illuminate the pathways, parking lots and roadways of the campus.

Standardization of equipment coupled with its correct application and photometric distribution is recommended to improve the existing exterior lighting at the campus.

The following key exterior lighting design issues form part of a well designed exterior lighting system.

1. Appearance of Space and Luminaires
2. Direct Glare
3. luminance (vertical)
4. Light distribution on surfaces
5. Light Pollution/Trespass
6. Modeling of faces or objects.
7. Point(s) of interest
8. Reflected glare

The above issues have been kept in mind while providing our recommendations and selection of fixtures for each area on campus. In order to achieve our objective and have a well designed exterior lighting system in the campus, we prioritize our recommendations as follows:

1. All existing post top fixtures and other decorative fixtures in the campus be replaced with a common cut off decorative fixture that will provide a visually comfortable environment and aesthetically blend with the architectural buildings in the campus. The cut off fixtures would also prevent glare. These new fixtures will be spaced to meet the current IES recommended light levels for pathways.
2. A single lamp source is selected for illuminating roadways, parking lots, and pathways leading to the campus buildings. Since a high-pressure sodium lamp has a lower color temperature and provides a warm color, we recommend that this lamp be standardized for campus exterior lighting.
3. Illumination levels of all roadways and parking lots in the campus are designed to meet the current recommended light levels by IES (an average of at least 0.5fc with a uniformity ratio of 4:1). This would include addition/ deletion of light fixtures (based on footcandle readings) to achieve the IES recommended light levels. This will not only provide a visually comfortable environment, but also a safe environment, since people always associate higher or greater luminance with safer surroundings.
4. Provide a lighting control panel and photocells to control all light fixtures at the same time. If a control panel is not a viable solution then replace the existing time clocks with astronomical time clocks.
5. Metal Halide lamps are used to highlight the architecture of buildings owing to their high color rendering index and high color temperature.
6. Replace burned out lamps and ballasts.
7. Trim the trees and obstructions.

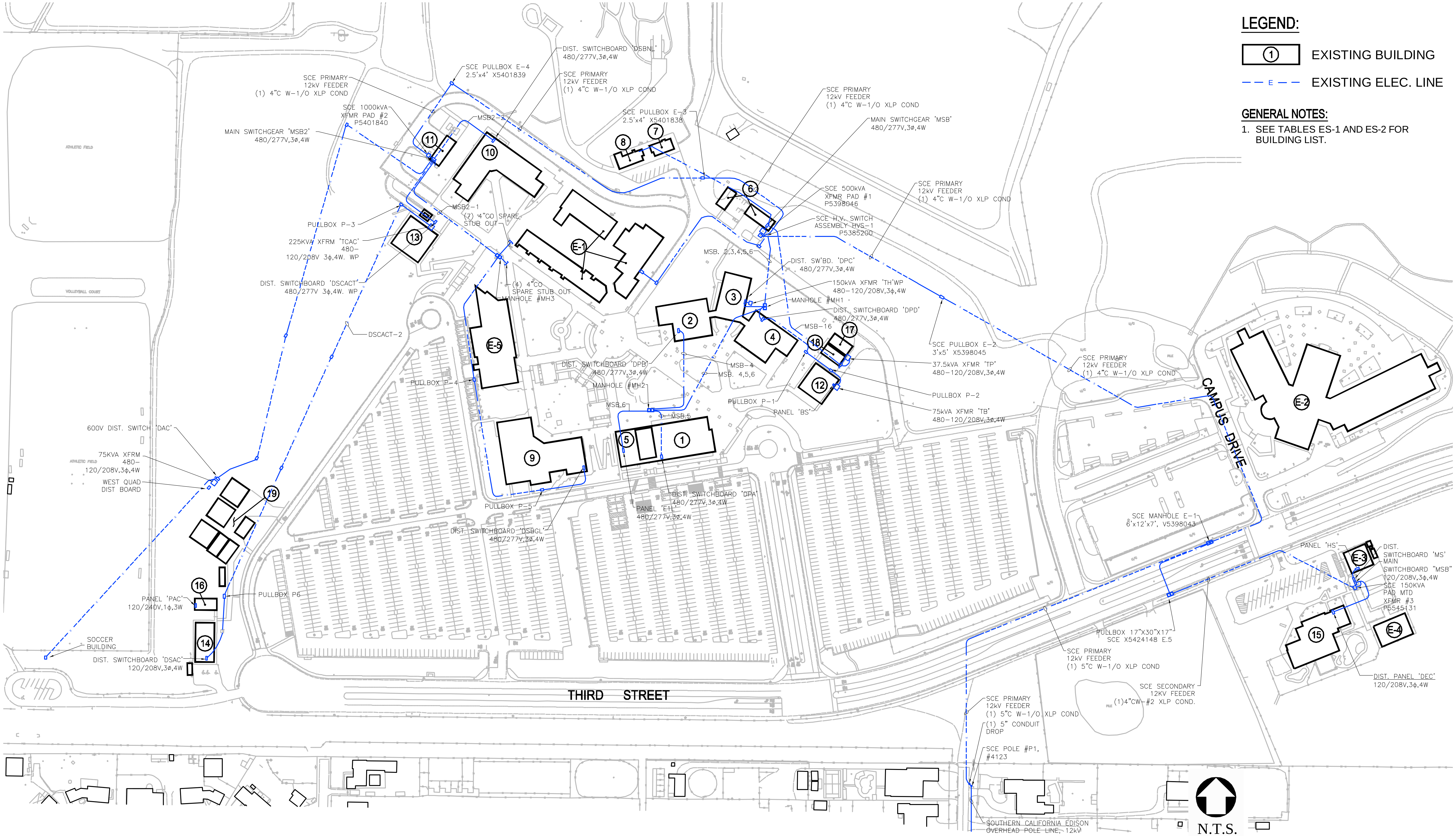


FIGURE 7a
EXISTING UTILITY MAP - ELECTRICAL

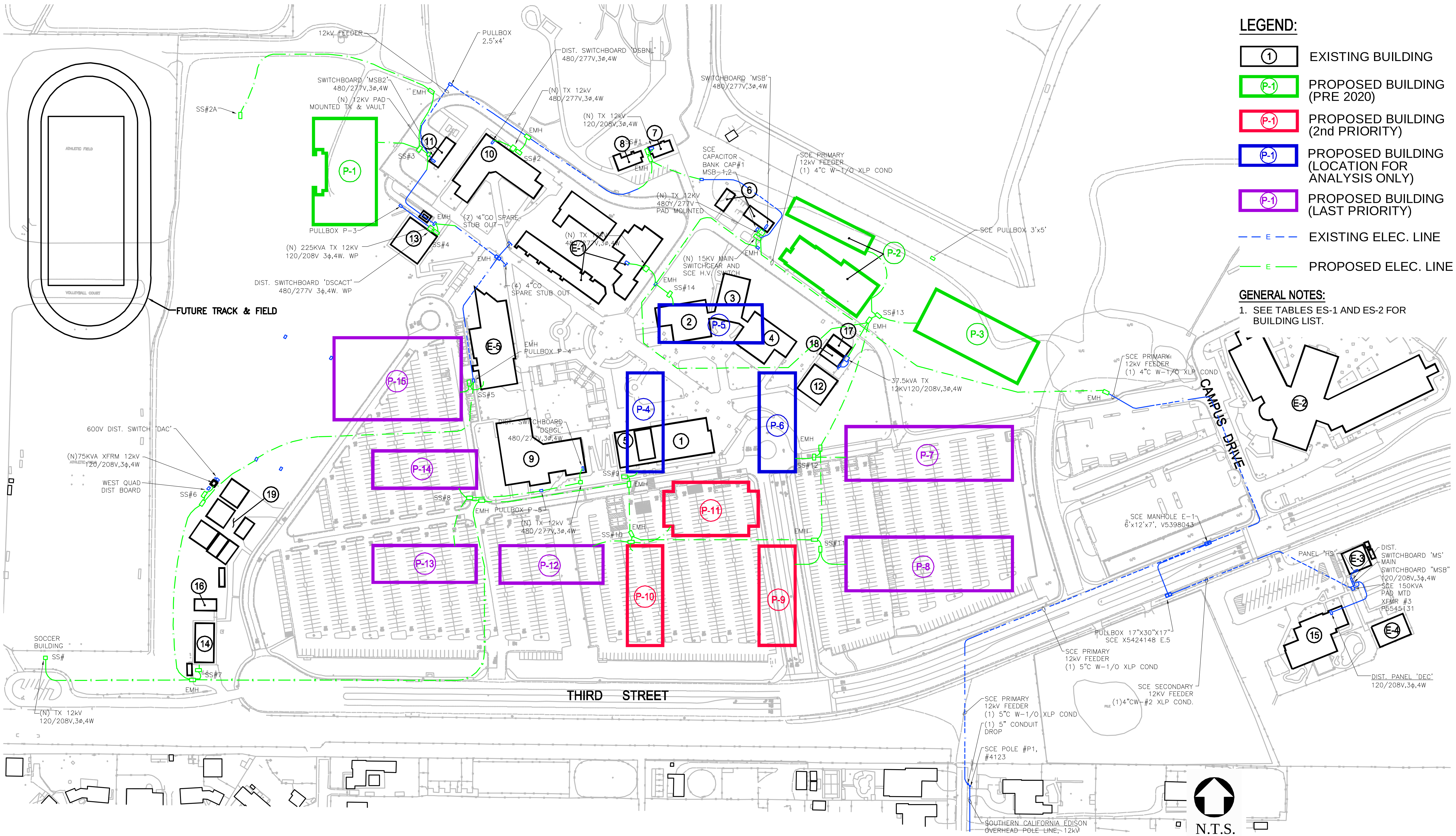


FIGURE 7b - OPTION #1
FUTURE CONDITIONS UTILITY MAP - ELECTRICAL
12kV SYSTEM

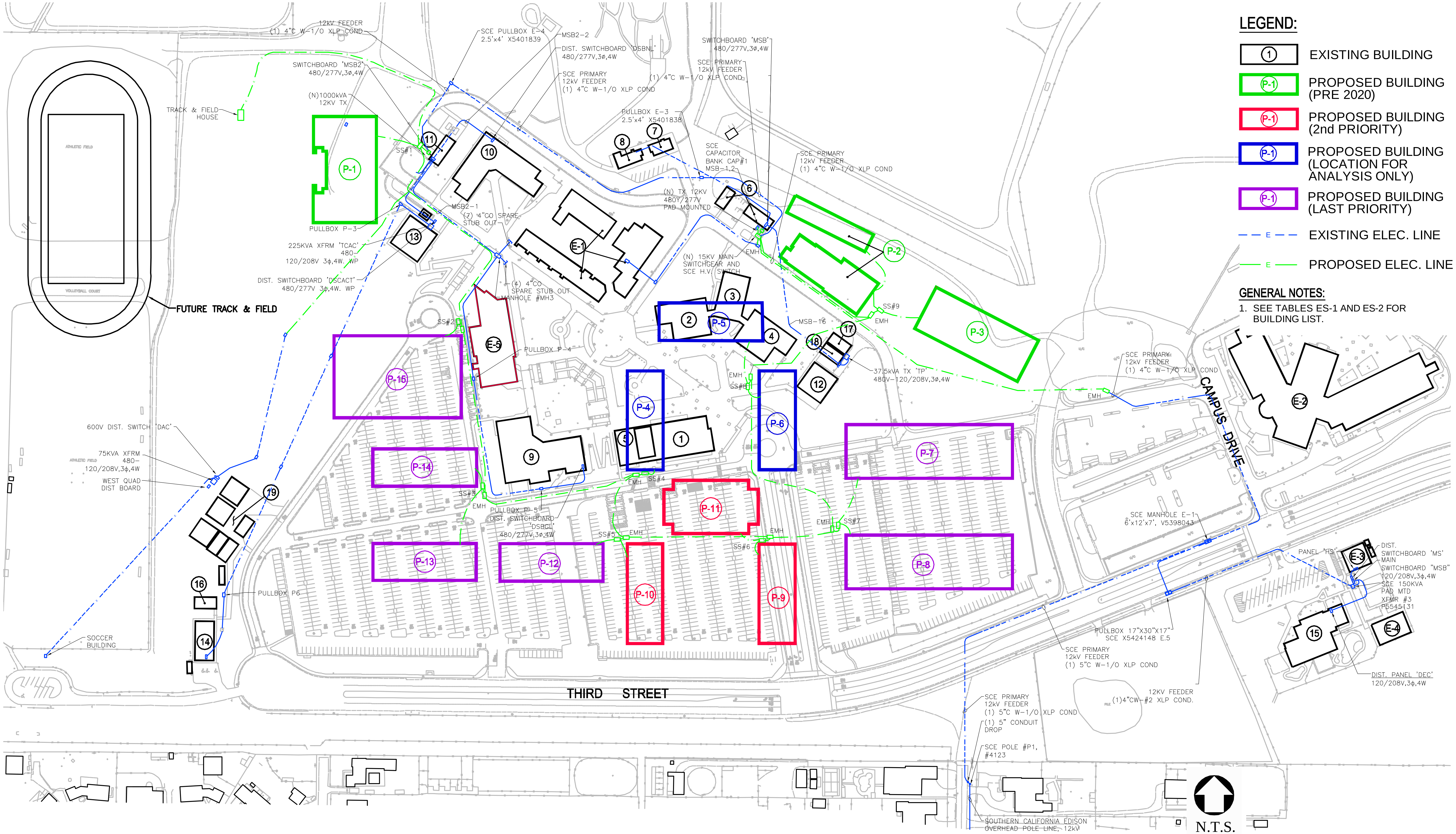


FIGURE 7b - OPTION #2
FUTURE CONDITIONS UTILITY MAP - ELECTRICAL
12kV & 480V SYSTEM

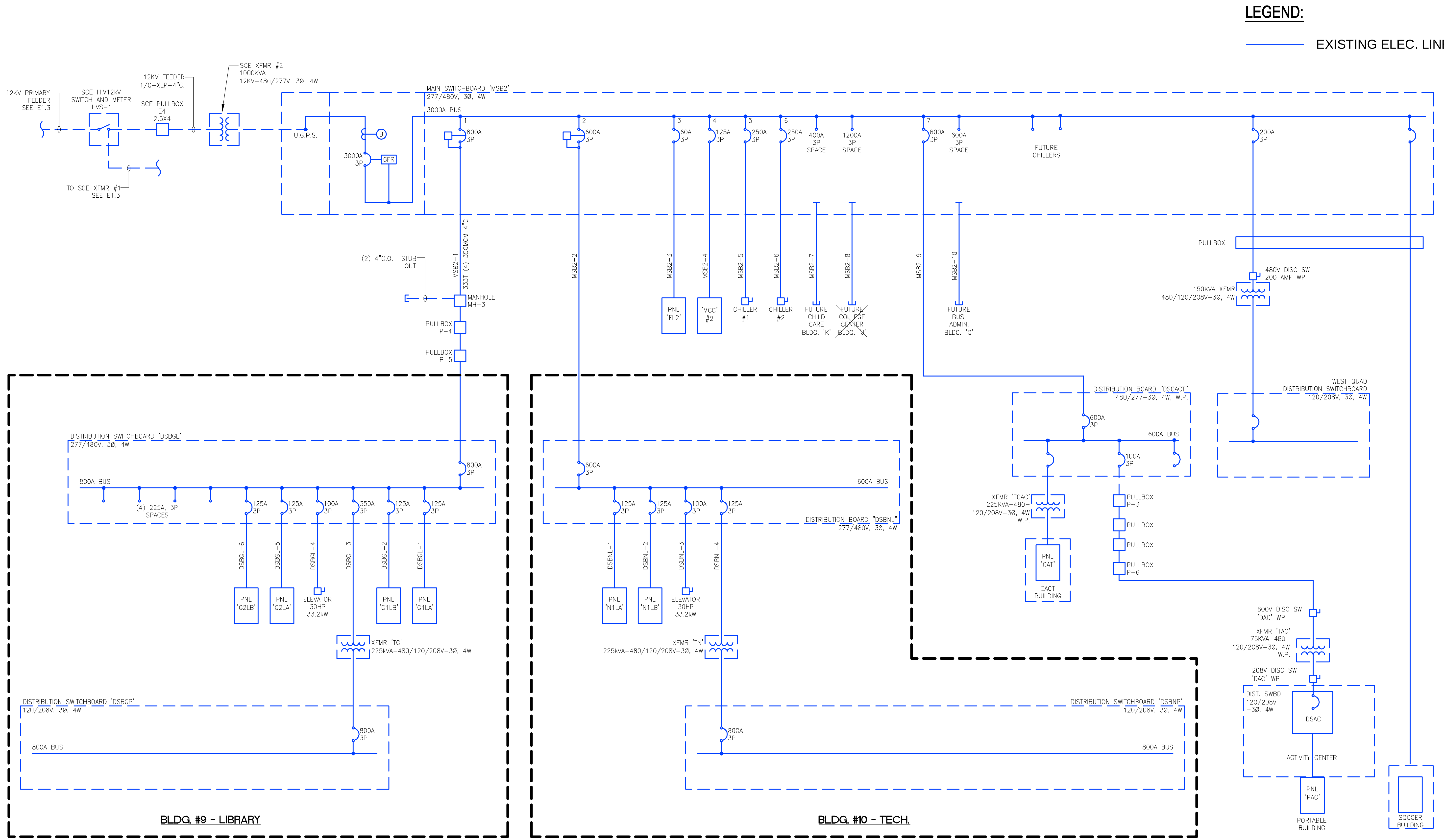


FIGURE 7c
EXISTING ELECTRICAL SYSTEM - WEST CAMPUS SINGLE LINE DIAGRAM

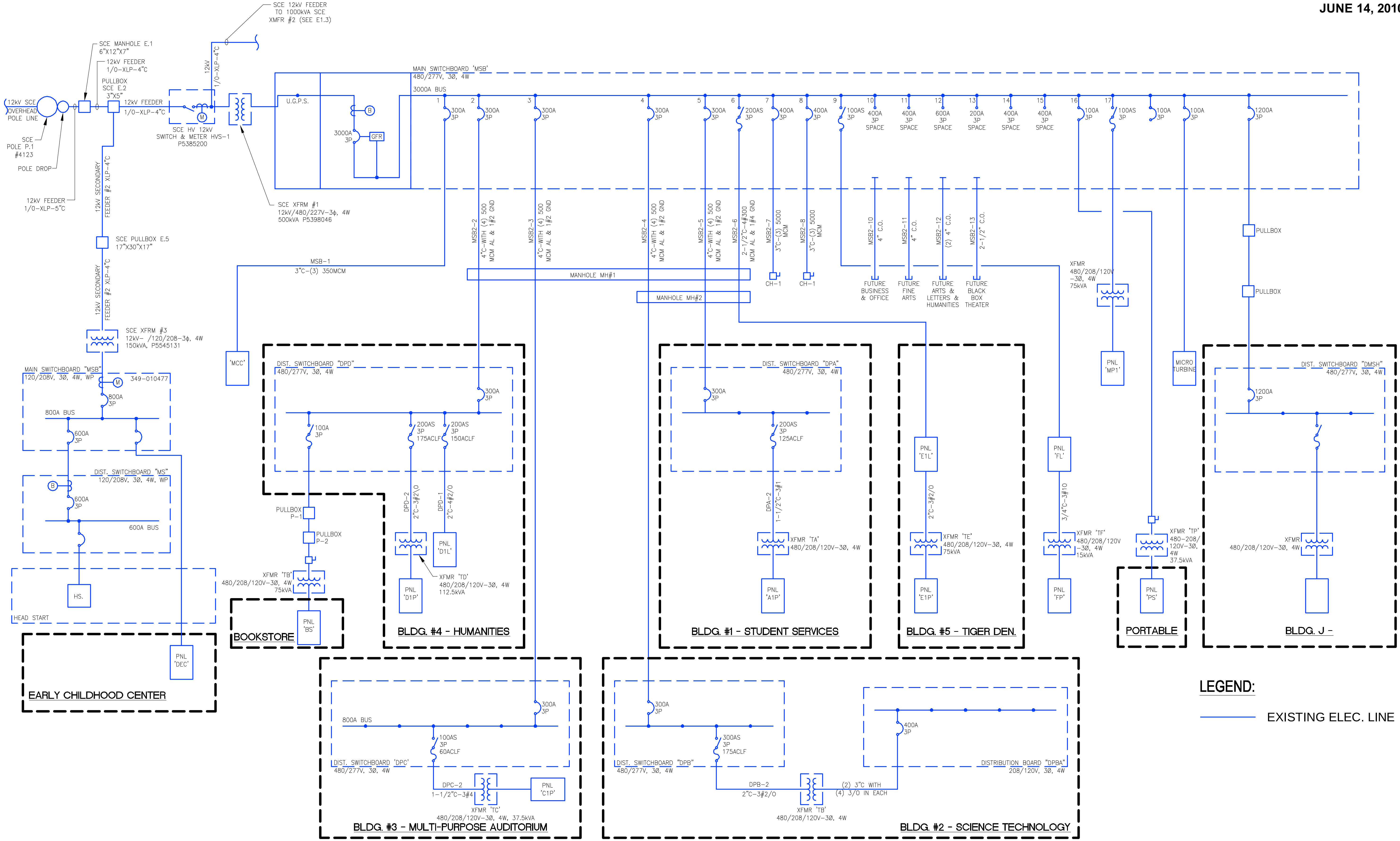


FIGURE 7d
EXISTING ELECTRICAL SYSTEM - EAST CAMPUS SINGLE LINE DIAGRAM

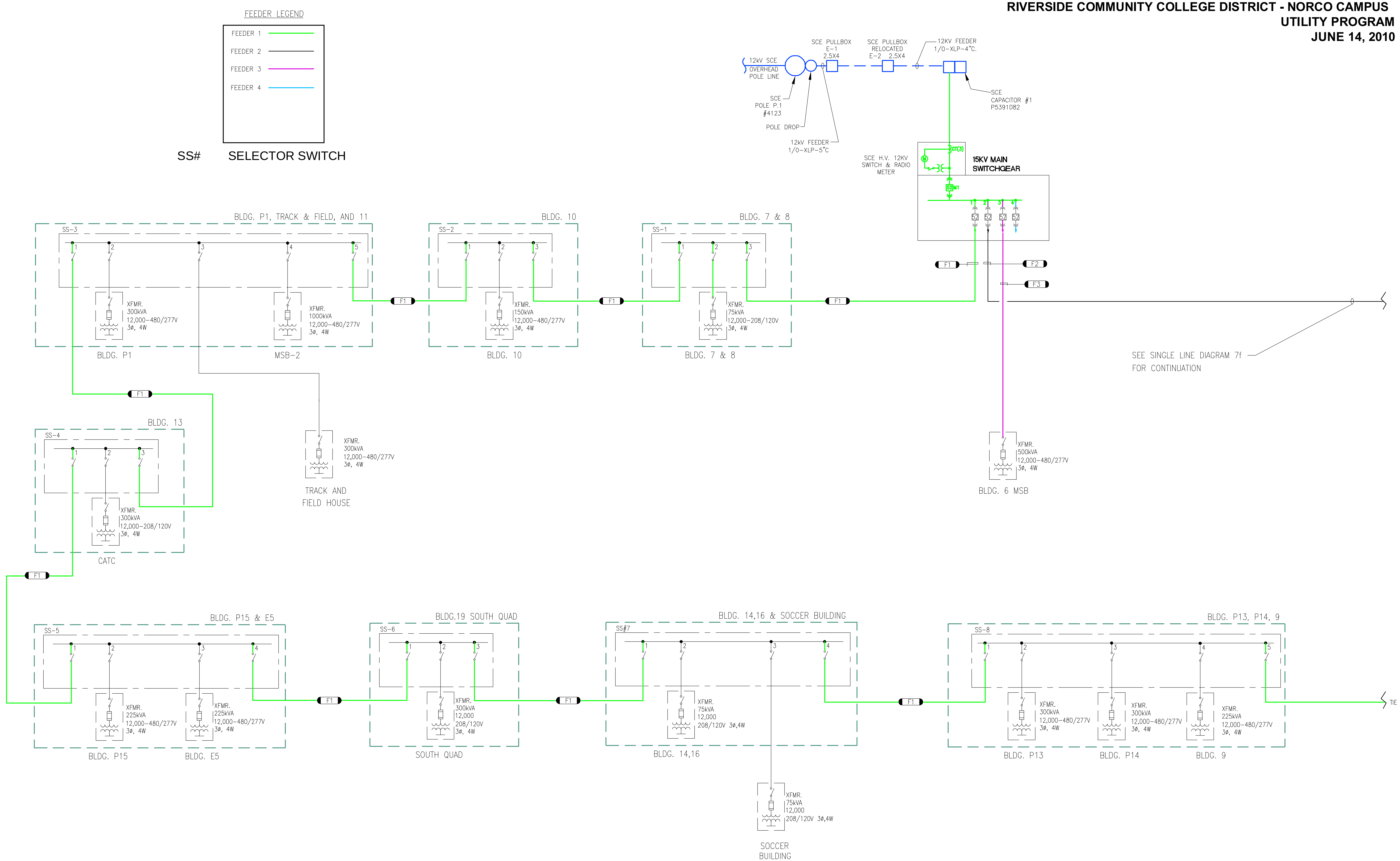


FIGURE 7e
PROPOSED ELECTRICAL SYSTEM - SINGLE LINE DIAGRAM
OPTION #1 12KV ONLY FEEDER-1

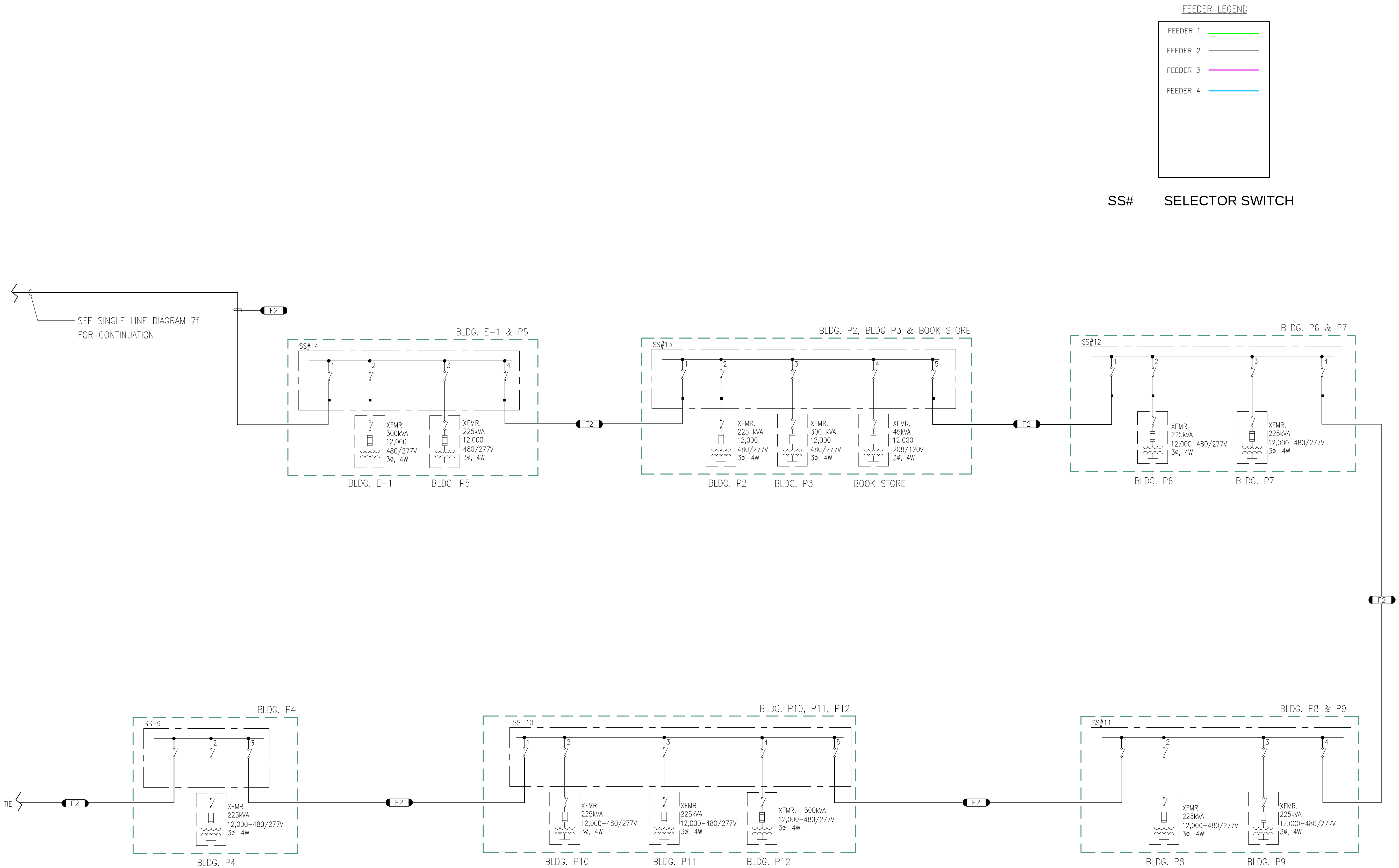


FIGURE 7f
PROPOSED ELECTRICAL SYSTEM - SINGLE LINE DIAGRAM
OPTION #1 12KV ONLY FEEDER 2

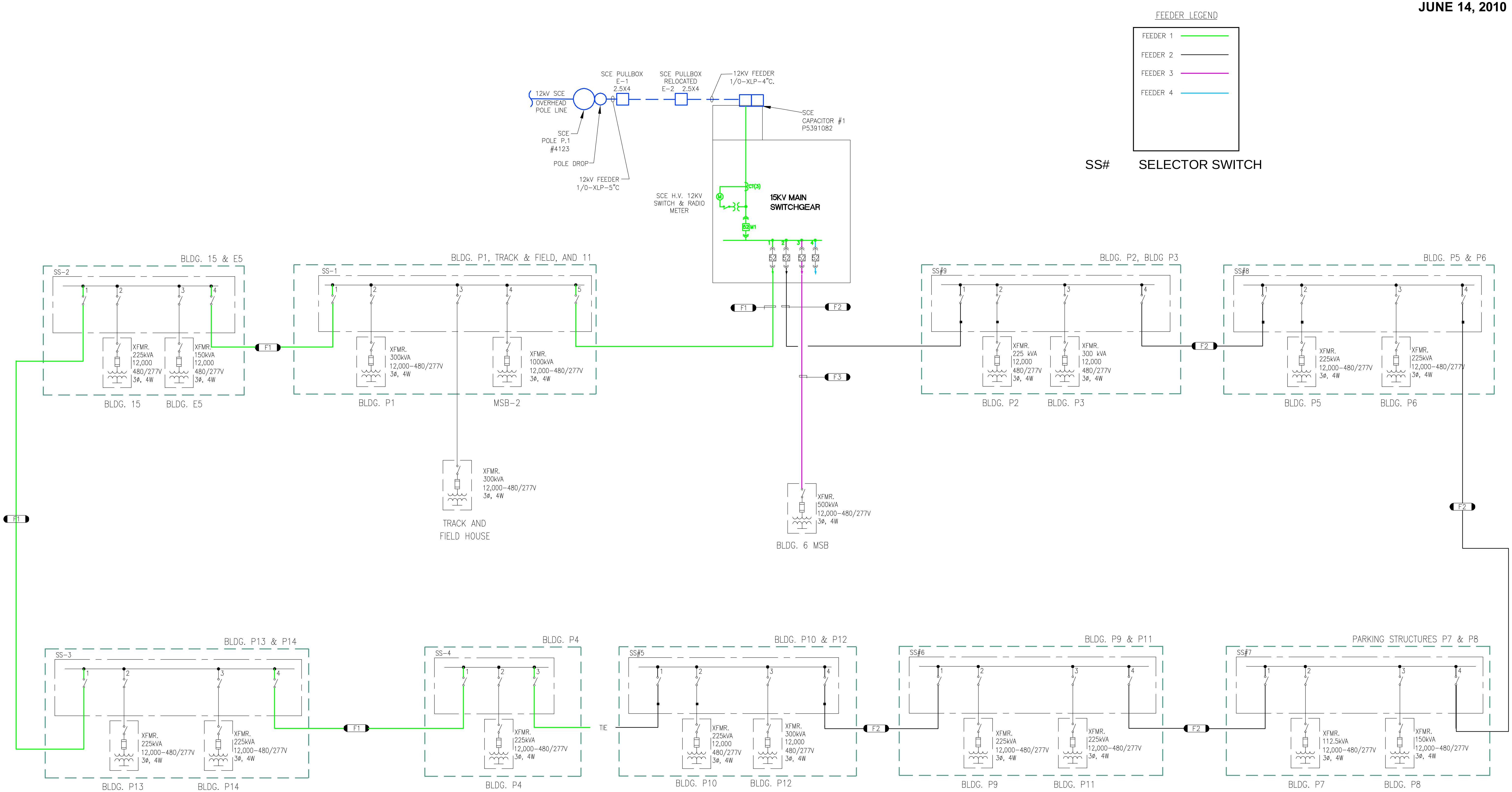


FIGURE 7g
PROPOSED ELECTRICAL SYSTEM - SINGLE LINE DIAGRAM
OPTION #2 12KV AND 480 V

SECTION 8 – TELECOMMUNICATIONS

8.1 SYSTEM DESCRIPTION

The local telecommunication services are currently provided by AT&T who is the Local Exchange Carrier (LEC) for the voice network. The (LEC) provides a 200 pair copper cable terminated on 4488 protector blocks. The Norco Center voice network consists of a NEC 2400 PBX Voice Switch. The main distribution facility (MDF) is located in the Humanities Building on the first floor.

The fiber optic service is also provided by the AT&T. The fiber optic cable consists of 12 single-mode and is terminated in the Humanities Building MDF room. The AT&T services are terminated in its own DDM 2000 equipment cabinet.

The existing MDF that serves the campus is in fair condition however, it lacks a proper security system. The MDF will require major upgrading and expansion to meet the needs of the new proposed buildings and the modernization of any existing buildings.

The campus Networking Operating Center (NOC) is located on the second floor of the Humanities building in room 207. This location is inadequate and a new NOC is being planned to provide for security and allow for expansion.

8.2 METHODOLOGY

The following methodology was adopted in formulating our telecommunication master plan for the campus:

A critical aspect in the evaluation of the existing systems serving the facility is a detailed and accurate field investigation of the current systems.

A detailed survey of the existing telecommunications systems that currently serve the facilities at Norco College campus and existing conditions was undertaken and existing layout, capacity and potential problems were identified. The surveyed information was verified through available record drawings, field investigations and meetings with the campus facilities staff as well as discussion with the utility company representatives.

Alterations/upgrades/modifications necessary to support new buildings, major renovations and building retrofits that will form part of the proposed campus facilities were identified.

8.3 ANALYSIS OF EXISTING SYSTEMS

The existing inter-building telecommunication pathways are found to be in fair condition for most existing buildings however, the Library building has no direct pathway to the MDF in the Humanities building. The Library building is severed by (6) 4 inch conduits from the Tigers Den.

The existing inter-building telecommunication pathways are found to be inadequate for the existing CACT building #13 and the Multi-Purpose building #14 at the west end of the campus. (1) four inch conduit feeds from the F2 building #11 to the CACT building via pull box CPB #02. The CACT provides both copper and fiber optic cables to the Multi-Purpose building #14.

The existing fiber optic cable backbone consists of traditional 12 strands of multi-mode 62.5mm fiber optic cables. Some of the inter-building fiber optic cables are rated of intra-building use and not recommended for outside use.

The Phase 3 construction projects are complete or under construction at time of field Investigation. The new Industrial Technology building has equated pathway backbone consisting of 4" conduits. The fiber optic backbone consists of 24MM/24SM cable and the copper backbone consist of a 200 pair copper cable terminated on the wall.

At the time of this survey there are plans for the construction of a new Network Operating Center (NOC) for the Voice, Data and Video Networks.

8.4 ANALYSIS OF FUTURE NEEDS

There is some consideration being made as to opening a new campus to the south of the Norco Campus. If a new campus is part of the overall master plan than future growth for the Norco campus will be limited. However there will continue to be more demand for wide area and local area networks that will require upgrades to the existing networks. As more and more systems (FA, EMS) merge on to the data backbone this will require upgrade to the fiber optic cabling.

8.5 FINDINGS AND RECOMMENDATIONS

1. Provide new fiber optic cables from the new MDF/NOC to each building. Recommend size to be 24 strands single mode and 24 strands of 50mu multi-mode fiber optic cable to all major building and 12 strands single mode and 12 strands of 50mu multi-mode fiber optic cable to the smaller buildings. Provide new copper cable from the new MDF/NOC to all new buildings the Copper cable to be sized per building requirements or minimum of 25 pair per building.

2. Provide fiber optic and copper tie cables from the new MDF/NOC to the existing MDF to allow for the use of the backbone cables feeding the existing building on campus.

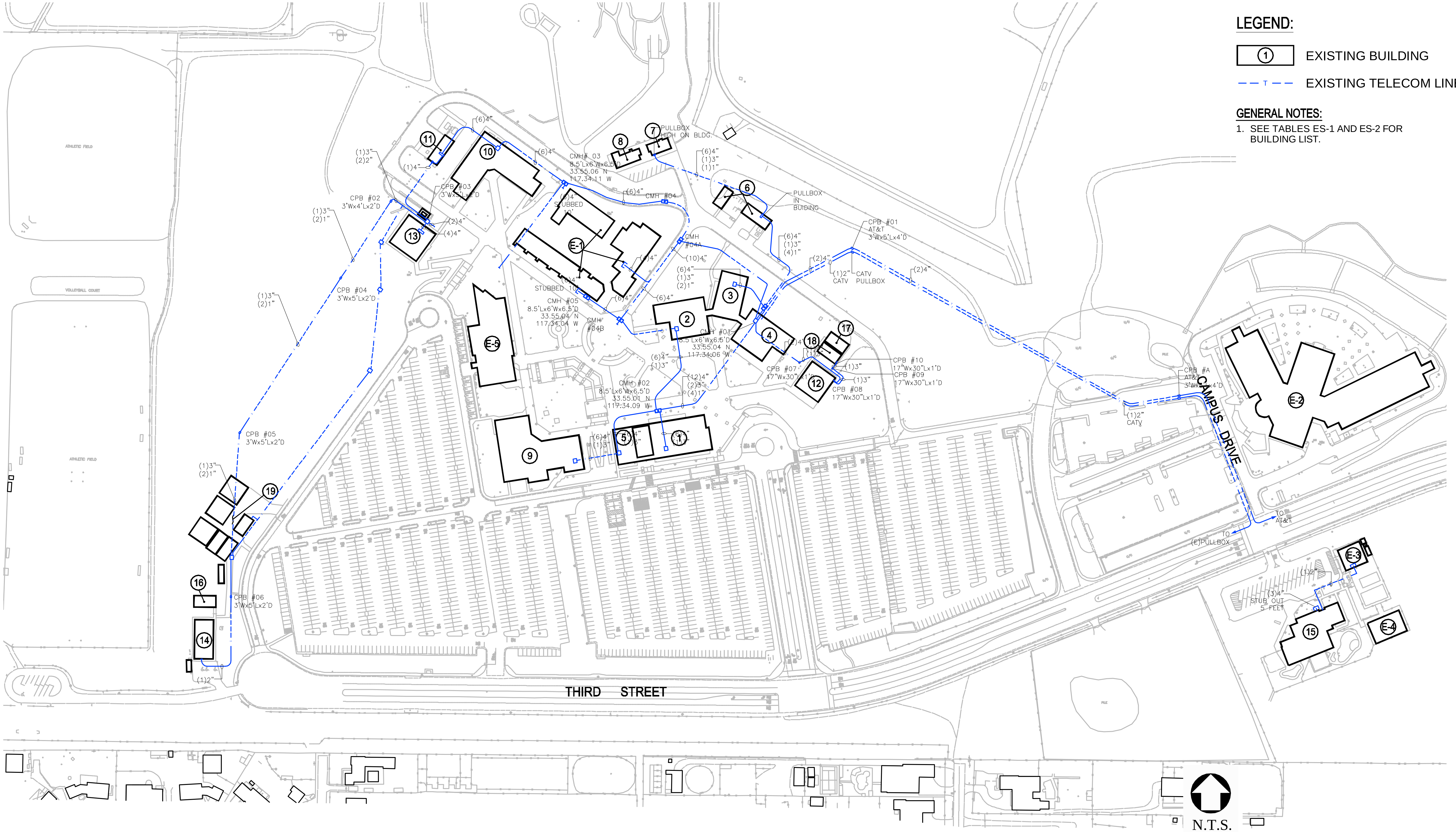


FIGURE 8a
EXISTING UTILITY MAP - TELECOMMUNICATIONS PLAN

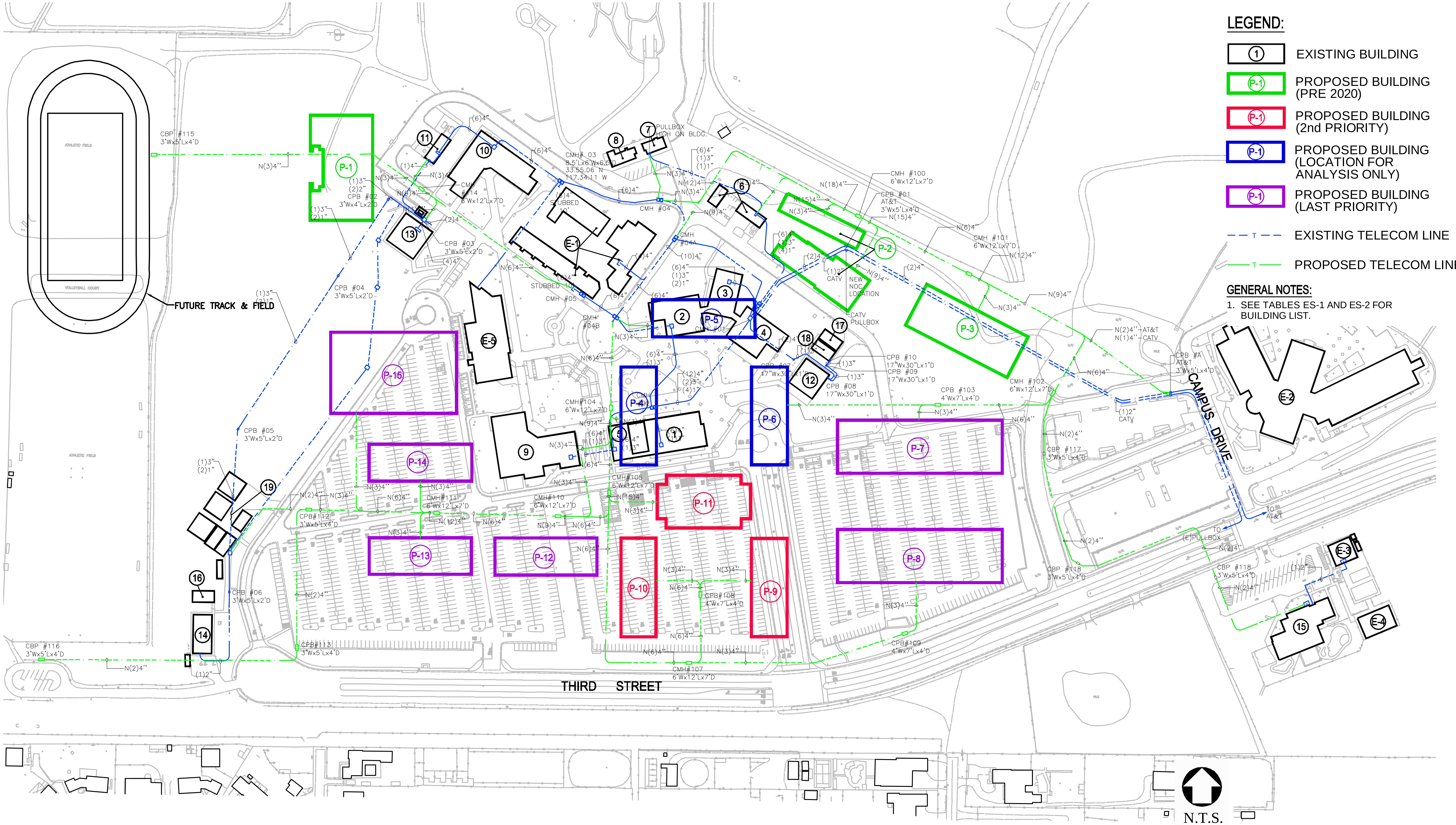


FIGURE 8b
FUTURE CONDITIONS UTILITY MAP - TELECOMMUNICATIONS CONDUIT PLAN

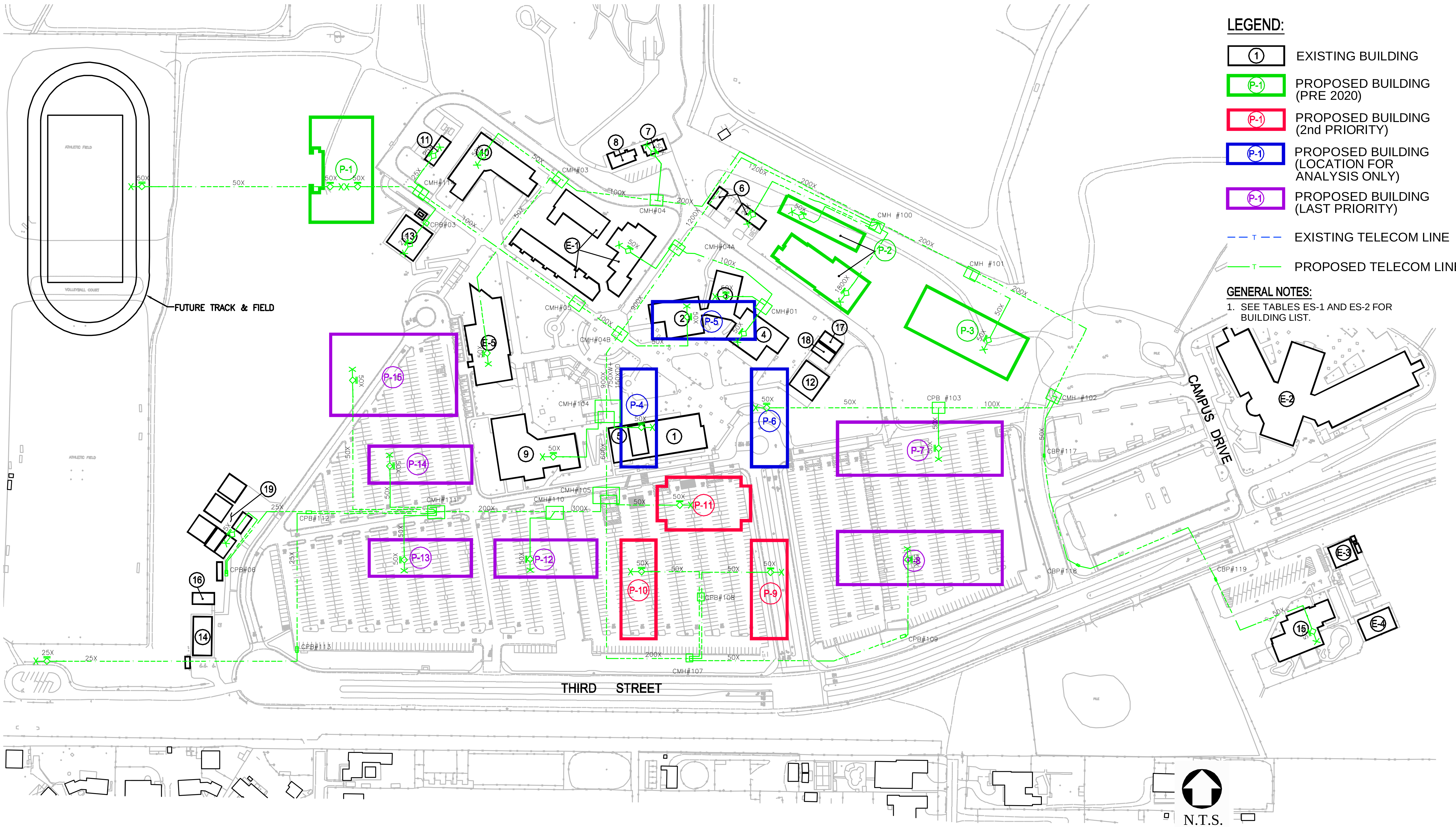


FIGURE 8c
FUTURE CONDITIONS UTILITY MAP - TELECOMMUNICATIONS COPPER PLAN

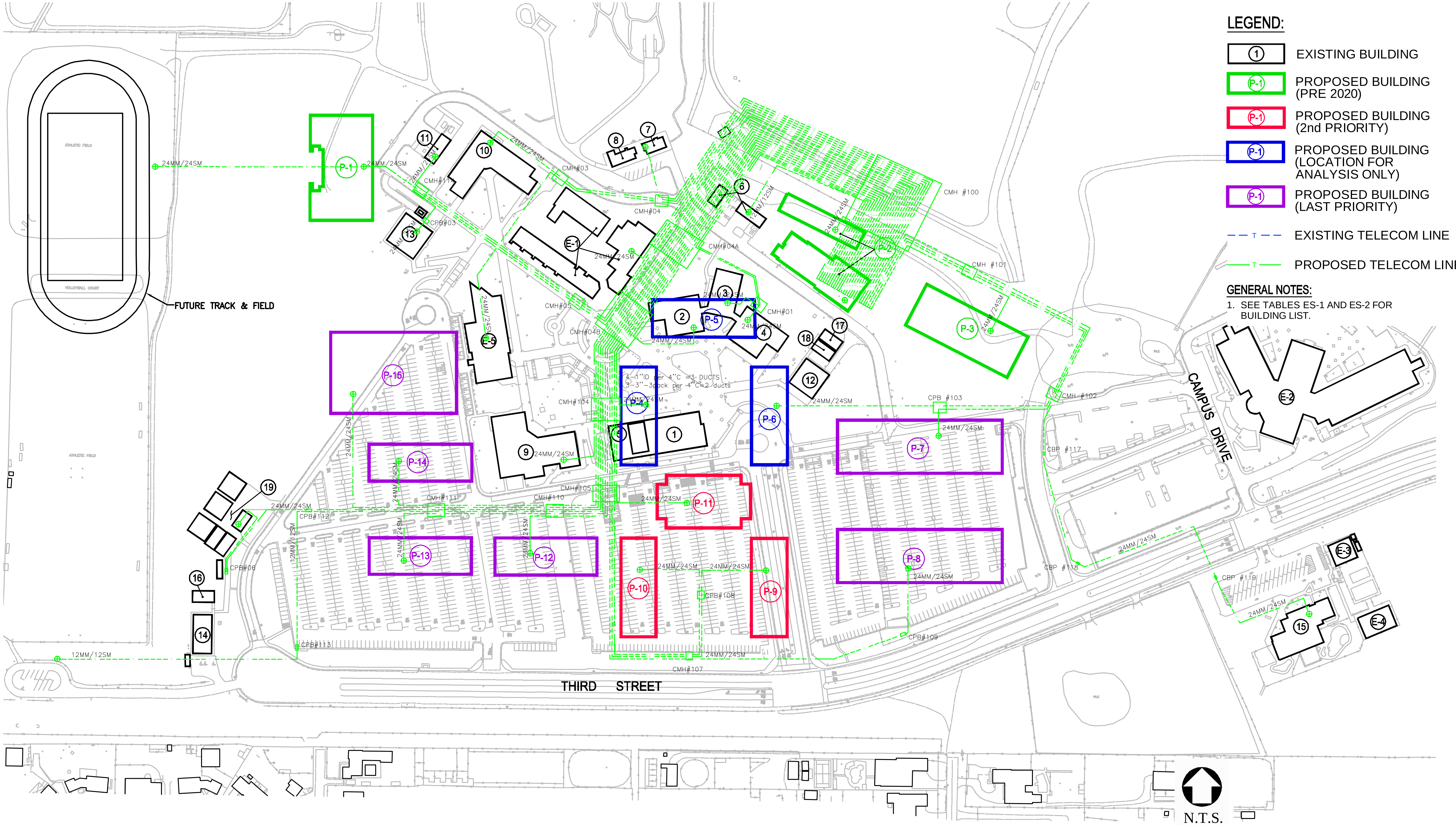


FIGURE 8d
FUTURE CONDITIONS UTILITY MAP - TELECOMMUNICATIONS FIBER PLAN

SECTION 9 – CENTRAL PLANTS

9.1 SYSTEM DESCRIPTION

Objective

The objective of this report is to evaluate the existing central plants currently serving the Norco campus and provide recommendations to improve, modify, or upgrade existing systems to support new buildings, major renovations, and building retrofits that form the proposed campus Facilities Master Plan. The campus currently serves 8,500 students. The master plan calls for 16,000 students in the future.

The campus is currently served by two central heating and cooling plants. For cooling, each plant is equipped with two sets of two air cooled chillers. For heating, each plant is equipped with two sets of two boilers.

As stated in section 5, the first set of chillers in building F1 has two Trane 140 ton air cooled chillers. The second set of chillers has two 100 ton York chillers. At building F2, the first set of chillers has two Carrier 100 ton chillers and the second set is two York 100 ton chillers.

The eight buildings on the east side of the campus are served by the chillers in building F1, and the three buildings on the west side of campus are served by the chillers in building F2.

As stated in section 6, there are two pairs of boilers at building F1. A pair of 1,200 mbh input boilers, and a pair of 735 mbh input boilers. At F2, there are two pairs of boilers. The first set is 1,125 mbh input, and the new set is not known at this time.

The chillers and chilled water pumps use a high flow rate and low temperature difference approach. As pointed out before, this is an energy inefficient distribution scheme. The second set of chillers at building F1 uses the same approach. Distribution piping carries chilled water and heating hot water to 11 of the buildings on the campus.

A set of twelve inch chilled water supply and return pipes leave the F1 central plant for the first five east side buildings. They split up to 6" lines going south, and 10" lines going east. The 10 inch lines have plenty of capacity for future loads.

The cluster of three new buildings in the center of the campus known as the Industrial Technology buildings are served by two new York 100 ton air-cooled chillers. They are also located in F1. The piping from these new chillers runs over to the new Industrial Technologies buildings independently. They are 6 inch lines.

The west part of the campus is served by the central plant at F2. There are two 100 ton air-cooled Carrier chillers and two new 100 ton air-cooled York chillers. The Carrier chillers serve the Applied Technology building and the Library. The new York chillers serve the new Student success Center. The piping to the new Student Success Center runs independently from the F2 central plant to the new building. See the existing site utilities map Figure 9a.

The Center for Applied Competitive Technologies is served by four packaged rooftop units and is not connected to the central heating and cooling lines.

9.2 METHODOLOGY

The following methodology was adopted in formulating our mechanical master plan for the campus:

A critical aspect in the evaluation of the existing systems serving a facility is a detailed and accurate field investigation of the current systems.

A detailed survey of the existing mechanical systems that currently serve the facilities at the Norco Campus and existing conditions was undertaken and existing layout, capacity and potential problems were identified. The surveyed information was verified through available record drawings, field investigations and meetings with the campus facilities staff.

Alterations, upgrades, and modifications necessary to support new buildings, major renovations and building retrofits that will form part of the proposed campus facilities will be identified.

9.3 ANALYSIS OF EXISTING LOADS

This report provides an analysis of the current heating and cooling systems that serve the campus. It identifies potential problems associated with the systems, defines future requirements and outlines recommended solutions to support the proposed facilities master plan. Site plans showing existing and proposed heating and cooling systems and distribution piping are provided at the end of this section. Table 9A provides a summary of the existing buildings and their cooling loads and shows the type of cooling system that serves each building.

Cooling

The campus is currently served by two central plant facilities. Each facility building is equipped with four air cooled chillers. The first plant in building F1 has two 140 ton Trane air cooled chillers. This set of chillers serves the five buildings on the east side of campus. The second set of chillers at this facility are two 80 ton York chillers. This set of chillers serves the group of three new buildings that is called the Industrial Technology complex. Chiller plant F1 has a total of 440 nominal tons of cooling capacity. These chillers are probably derated at peak load due to the high ambient temperatures. There is about 200 tons of cooling load on the Trane chillers and 120 tons of cooling load on the new York chillers. There is plenty of spare capacity on these two chilled water systems.

The second plant in F2, at the west side of campus has a set of 100 ton Carrier air-cooled chillers. These chillers serve the Applied Technology building and the Library. A second pair of 100 ton York air-cooled chillers at this plant serves the new Student Success Center. There is a total of 400 tons of capacity at this plant. The cooling load on the Carrier system is about 150 tons. The cooling load on the York chillers is about 65 tons. Again there is plenty of spare capacity.

All of the chillers and pumps use a constant flow rate scheme that is based on a relatively small temperature differential of 10 degrees. This is not an energy efficient pumping and distribution strategy. Distribution piping is not tied together, so piping carries chilled water to the buildings independently.

In addition to the chilled water plants there are some small split systems for telecom room and few specialized spaces. The far eastern part of the campus referred to as the Childhood Education complex is independent of the centralized campus chilled water systems. These two buildings have packaged rooftop equipment. The high school is also independent. The bookstore at the east edge of the main campus has packaged rooftop equipment. So does the Center for Applied Competitive Technology on the west edge of the main campus. There are also some relocatable classrooms with wall hung air conditioning units at the far western side of the campus.

Heating

The campus is currently served by two central plant facilities. Each facility building has two sets of boilers. The first heating system in F1 has two 1,200 mbh input boilers. This set of boilers serves the east side of campus. There are five existing buildings that have a heating load of about 900 mbh output, or 1,130 mbh input. You can see that one boiler can handle the load and one is redundant. The second system has two 735 mbh input boilers. This set of boilers serves the new group of buildings called Industrial Technology. These buildings have a heating load of 670 mbh output, or 835 mbh input. One boiler is close to handling the full load, but on days below 35 degrees, the second boiler may have to come on.

The second building, F2, has one set of boilers at 1,150 mbh input each, or 920 mbh output. This pair of boilers serves the Applied Technology Building and the Library. The load for these two buildings is about 760 mbh. So, one boiler can handle the load, and the other boiler is redundant. The second set of boilers is not known yet. It serves the new Student Success Building.

East Campus (phase 1)

12 inch chilled water supply and return pipes leave the F1 central plant for the east campus. This pipe then splits up to 6" pipe that goes south and a 10" line that goes east.

The south branch feeds the Science and Technology building and the Auditorium. It then continues south to the Student Services Building and the Corral. The east branch feeds the Humanities Building and stays 10" to feed future buildings. This will be important when we discuss the future plans.

The main heating water lines from F1 are 6". They split to 6" lines going east and 4" lines going south. The second set of heating water pipes that leave F1 is 3" that routes to the Industrial Technologies complex.

West Campus (phase 2)

The west campus is served by two 100 ton Carrier air-cooled chillers located at building F2. Two 4" chilled water branches provide service to buildings "G" the Library, and building "N" the Applied Technology building respectively.

The buildings are heated and cooled by 4 pipe fan coils and are designed for approximately 10°F differential on the chilled water supply temperatures. For a campus environment this is a low temperature differential that leads to larger pipe sizes and larger pumping requirements compared to a larger temperature differential design.

The heating water piping from building F2 is 3" to the Library and 2 " to the Applied Technology Building.

A site plan showing existing chilled water and heating water piping distribution is included at the end of this section.

The main conclusion that we come away with is that all chilled water is produced by air-cooled chillers. In the desert climate, on hot days, this type of chiller can be using as much as 1.5 kW per ton. This is not efficient compared to water cooled equipment, or water-cooled equipment that is teamed up with thermal storage tanks and runs during off-peak hours when ambient air is cooler, and electric rates may be lower . The largest electrical load for the chiller at present is during the hottest part of the day, when the chiller is least efficient. It is also notable that the pumping is constant speed. Control valves at the fan coils are 3-way. There probably is no control scheme to reset supply water temperature during cooler weather.

9.4 ANALYSIS OF FUTURE LOADS

The college has plans for many new buildings. However five of the buildings comprising the east campus will be demolished. The west campus buildings and the three Industrial Technology buildings will remain. The chilled water requirements of the new buildings and the buildings that will remain, can be seen in Table 9B at the end of this section. That is a total of 1,550 tons of cooling. It is assumed that all new buildings will be connected to the central plant for chilled water cooling.

The heating water requirements for the remaining buildings and the future buildings will be about 9,350 mbh output, or 11,700 mbh input. The remaining buildings will remain on their existing heating system. All future buildings will be designed with in-house heating systems.

9.5 FINDINGS AND RECOMMENDATIONS

Cooling

1. An analysis of the cooling loads for the buildings that will remain will require 325 tons of cooling. The new buildings will require about 1225 more tons of cooling load. The total cooling load of remaining buildings plus future buildings reveals that the peak cooling capacity will need to be about 1,550 tons. For energy efficiency reasons an evaporative cooled chilled water plant is proposed. A comparison of full load and part load efficiencies is shown in Figure 9 for current state of the art chillers.

2. For maximum energy savings, peak demand reduction and reduced carbon footprint, a chilled water Thermal Energy Storage (TES) tank is proposed. It would be located on the north side of the campus overlooking the campus. The TES can lower the required chiller capacity to about 1000 tons. During the peak cooling load of the day, cooling load can be partially or fully handled by the chilled water stored in the tank. The temperature of the chilled water in the tank will be lowered during off-peak hours when the ambient and wet bulb temperatures are lower, so the chillers operate more efficiently, and when electrical rates are lower.

3. (Alternate Option) Existing air-cooled chillers could also be run at night in conjunction with the Thermal Storage Tanks when the ambient temperatures are lower and electric rates are lower. This would make the existing overall system efficiency better, but it would not be as efficient as water cooled state of the art chillers.

Heating

1. The multiple heating systems of F1 and F2 could be cross-connected to create a single heating system, or the two heating systems at F1 could be combined and the two heating systems at F2 could be combined. This will make energy usage monitoring and control much easier and improve year round boiler plant efficiency.

2. An analysis of the heating loads for the buildings that will remain and building P-4 that will take the place of the current Student Services building shows that the peak heating load will be about 2,290 mbh output. The current combined heating capacity of the boilers in building F1 and F2 is 8,120 mbh input. Existing buildings that will remain and are currently served by the present heating system should retain that heating system. There is no need to demolish that system and retrofit those buildings with an in-house system. Obviously, there is excess capacity. The College could demo and relocate some of the existing boilers to new buildings.

3. Analysis of the heating loads for the future buildings reveals that the peak heating load will be 7,550 mbh output, or 9,000 input at 84% thermal efficiency. Future boilers should be located within each new building. Boiler redundancy should be reduced to 70 percent, instead of 100 per cent. We do not recommend extending or expanding the current heating systems to serve future loads. Some of the new buildings could re-use any of the existing boilers that are demoed.

Chiller Type	Chiller	Condenser Water Pumps	Cooling Tower	Total kW/ton	Notes
Air Cooled kW/ton (IPLV)	0.85	0	0	**0.85**	Ambient @ 95°F
Air Cooled kW/ton (full load)	1.40	0	0	**1.40**	Ambient @ 105°F
Smardt 400 ton Evap Chiller kW/ton (IPLV)	0.37	0.03	0.04	**0.44**	EWT @ 75°F
Smardt 400 ton Evap Chiller kW/ton (full load)	0.53	0.03	0.06	**0.62**	EWT @ 85°F
Trane 750 ton Evap Chiller kW/ton (IPLV)	0.39	0.03	0.04	**0.46**	EWT @ 75°F
Trane 750 ton Evap Chiller kW/ton (full load)	0.56	0.03	0.06	**0.65**	EWT @ 85°F

FIGURE 9

Comparison of kW Per Ton for Different Types of Chillers

Norco Building Load Data Summary - Existing (Table 9a)

BUILDINGS			Central Plant Service		COOLING					HEATING					
#	SYMBOL	NAME / DESCRIPTION	Loop	Cooling Heating	Calc'd (TON)	Installed (TON)	Demand on CP utilities Tons	Estimated Diversified CP Load Tons	Peak CHW Flow (GPM) 10°	Calc (MBH)	Inst (MBH)	Demand on CP utilities (MBH)	Estimated Diversified CP Load (MBH)	CP HHW Flow (GPM) 40°	Gross Area ft^2
	1	*Student Services*		CHW/HHW	35.9	40	35.9	28.7	86	287.1	352	287.1	229.7	14	*14,357*
	2	*Science/Technology*		CHW/HHW	36.5	62	36.5	29.2	88	218.8	575	218.8	175.1	11	*14,588*
	3	*Multi-Purpose Auditorium*		CHW/HHW	23.2	27	23.2	18.6	56	139.2	216	139.2	111.3	7	*9,277*
	4	*Humanities*		CHW/HHW	36.2	55	36.2	29.0	87	217.3	584	217.3	173.8	11	*14,486*
	5	*The Corral*		DX/Gas	6.4	18	6.4	5.2	15	44.2	163	44.2	35.3	2	*2,209*
	6	*F1 - Central Plant*		- /Gas	3.8	0	0.0	0.0	0	30.4	30	0.0	0.0	0	*1,518*
	7	Mechanical 1		DX/Elec	2.5	2.5	0.0	0.0	0	19.9	20	0.0	0.0	0	996
	8	Mechanical 2		DX/Elec	3.1	3	0.0	0.0	0	24.7	25	0.0	0.0	0	1,233
	9	Library		CHW/HHW	102.5	96	102.5	82.0	246	461.1	1017	461.1	368.9	23	30,740
	10	Technology		CHW/HHW	50.0	65	50.0	40.0	120	300.3	634	300.3	240.2	15	20,019
	11	F2 - Central Plant		- /Gas	3.8	0	0.0	0.0	0	30.4	30	0.0	0.0	0	1,518
	12	*Bookstore*		DX/Gas	10.5	12	0.0	0.0	0	72.0	75	0.0	0.0	0	*3,600*
	13	CACT Building		DX/Gas	12.6	12	0.0	0.0	0	75.3	100	0.0	0.0	0	5,020
	14	*Multi-Purpose Building*		DX/Gas	8.4	9	0.0	0.0	0	50.4	50	0.0	0.0	0	*3,360*
	15	Early Childhood Education Center - A		DX/Gas	20.6	20	0.0	0.0	0	123.5	150	0.0	0.0	0	8,235
	16	*Portable - 1*		DX/Elec	2.4	2.5	0.0	0.0	0	14.4	15	0.0	0.0	0	*960*
	17	Portable - A		DX/Elec	2.4	2.5	0.0	0.0	0	19.2	20	0.0	0.0	0	960
	18	Portable - B		DX/Elec	2.4	2.5	0.0	0.0	0	19.2	20	0.0	0.0	0	960
	19	*Portable Complex*		DX/Elec	16.8	18	0.0	0.0	0	100.8	100	0.0	0.0	0	*6,720*
	E-1	Industrial Technology		CHW/HHW	112.2	120	112.2	89.7	269	672.9	700	672.9	538.3	34	44,862
	E-2	High School		DX/Gas	225.0	250	0.0	0.0	0	1350.0	1500	0.0	0.0	0	90,000
	E-3	Headstart		DX/Gas	6.0	6	0.0	0.0	0	35.7	50	0.0	0.0	0	2,380
	E-4	Early Childhood Education Center - B		DX/Gas	8.6	9	0.0	0.0	0	51.8	75	0.0	0.0	0	3,450
					732	832	403	322	967	4358	6501	2341	1873	117	281,448

Buildings shown in red are scheduled for demolition.

Norco Building Load Data Summary - Future (Table 9b)

BUILDINGS			Central Plant Service		COOLING					HEATING					
#	SYMBOL	NAME / DESCRIPTION	Loop	Cooling / Heating	Calc'd (TON)	Installed (TON)	Demand on Central Utilities Tons	Estimated Diversified CP Load Tons	Peak CHW Flow (GPM) 10°F	Calc'd (MBH)	Inst (MBH)	Demand on CP utilities (MBH)	Estimated Diversified CP Load (MBH)	Peak HHW Flow (GPM) 40°	Gross Area sq ft
	6	F1 - Central Plant		- /Gas	3.8	0	0.0	0.0	0	30.4	35	0.0	0.0	0	1,518
	9	Library		CHW/HHW	102.5	96	102.5	82.0	246	461.1	1017	461.1	368.9	23	30,740
	10	Applied Technology		CHW/HHW	50.0	65	50.0	40.0	120	300.3	634	300.3	240.2	15	20,019
	11	F2 - Central Plant		- /Gas	3.8	0	0.0	0.0	0	30.4	35	0.0	0.0	0	1,518
	13	CACT Building		DX/Gas	12.6	12	0.0	0.0	0	75.3	90	0.0	0.0	0	5,020
	15	Early Childhood Education Center - A		DX/Gas	20.6	20	0.0	0.0	0	123.5	150	0.0	0.0	0	8,235
	17	Portable - A		DX/Elec	2.4	3	0.0	0.0	0	19.2	34.1	0.0	0.0	0	960
	18	Portable - B		DX/Elec	2.4	3	0.0	0.0	0	19.2	34.1	0.0	0.0	0	960
	E-1	Industrial Technology		CHW/HHW	112.2	120	112.2	89.7	269	672.9	700	672.9	538.3	34	44,862
	E-2	High School		DX/Gas	225.0	225	0.0	0.0	0	1350.0	1500	0.0	0.0	0	90,000
	E-3	Headstart		DX/Gas	6.0	6	0.0	0.0	0	35.7	50	0.0	0.0	0	2,380
	E-4	Early Childhood Education Center - B		DX/Gas	8.6	9	0.0	0.0	0	51.8	75	0.0	0.0	0	3,450
	E-5	Student Success Center		CHW/HHW	62.6	70	62.6	50.1	150	375.4	500	375.4	300.3	19	25,025
Remaining Buildings					**612**	**629**	**327**	**262**	**785**	**3545**	**4854**	**1810**	**1448**	**90**	**234,687**
									(GPM) 16°F						
	P1	Physical Education Center (9)		CHW/HHW	135.0	150	135.0	108.0	205	810.0		810.0	648.0	41	54,000
	P2	Facilities Warehouse, Central Receiving & Central Plant (8)		CHW/HHW	40.0	40	40.0	32.0	61	320.0		320.0	256.0	16	16,000
	P3	Visual & Performing Arts (7)		CHW/HHW	150.0	175	150.0	120.0	227	900.0		900.0	720.0	45	60,000
	P4	North Quad - Classrooms and Labs 1		CHW/HHW	80.0	100	80.0	64.0	121	480.0		480.0	384.0	24	32,000
	P5	North Quad - Classrooms and Labs 2		CHW/HHW	80.0	100	80.0	64.0	121	480.0		480.0	384.0	24	32,000
	P6	North Quad - Classrooms and Labs 3		CHW/HHW	80.0	100	80.0	64.0	121	480.0		480.0	384.0	24	32,000
	P9	South Quad - Classrooms and Labs 1		CHW/HHW	80.0	100	80.0	64.0	121	480.0		480.0	384.0	24	32,000
	P10	South Quad - Classrooms and Labs 2		CHW/HHW	80.0	100	80.0	64.0	121	480.0		480.0	384.0	24	32,000
	P11	Student Center		CHW/HHW	140.0	150	140.0	112.0	212	960.0		960.0	768.0	48	48,000
	P12	West Quad - Classrooms and Labs 1		CHW/HHW	120.0	135	120.0	96.0	182	720.0		720.0	576.0	36	48,000
	P13	West Quad - Classrooms and Labs 2		CHW/HHW	120.0	135	120.0	96.0	182	720.0		720.0	576.0	36	48,000
	P14	West Quad - Classrooms and Labs 3		CHW/HHW	120.0	135	120.0	96.0	182	720.0		720.0	576.0	36	48,000
Future Buildings					**1225**	**1420**	**1225**	**980**	**1856**	**7,550**	**0**	**7,550**	**6,040**	**378**	**482,000**
Total					**1,837**	**2,049**	**1,552**	**1,242**	**2,641**	**11,095**	**4,854**	**9,360**	**7,488**	**468**	**716,687**

SECTION 10 – NATURAL GAS SYSTEM

10.1 SYSTEM DESCRIPTION

Background and Scope

Norco College, one of three colleges within the Riverside Community College District, is a two-year public community college situated in the suburban community of Norco, California. The campus was built in two phases and opened in 1991 with the majority of the buildings being built in phase one. The east side of the campus consists of five buildings. They are Student Services, Police Services, Humanities, Theater, and Science and Technology. The west side of the campus consists of the Applied Technology building and the Library.

Objective

Natural Gas System master plan consists of evaluating the existing flow capacity available at the meters, the impact of the proposed facilities on the capacity of existing gas distribution system, identifying the required modifications/upgrades to the existing gas distribution system to support the future build out of the campus and to analyze the existing supply distribution for buried gas lines that will be in conflict with the proposed facilities that will require relocation.

10.2 METHODOLOGY

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

0. A critical aspect in the evaluation of the existing Natural Gas system serving a facility is a detailed and accurate field investigation of the current system. Meetings and discussions with the campus helped gather existing information and any potential problems faced with the system. A detailed survey of the existing Gas system that currently serve the facilities at the Norco 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.

1. A load flow study of the existing and future loads was developed and existing and proposed capacity requirements were developed. A BTUH/sq.ft. of proposed and existing facilities was assumed in our load studies. For some existing buildings where this information was available, existing installed capacities of the gas fired equipment were taken to estimate the total loads.
2. The Natural Gas 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

3. Alterations/upgrade/modifications necessary to support new buildings, major renovations, and building retrofits that form part of the proposed campus facilities master plan were identified.

4. Recommendations were developed to support new buildings, major renovations, and building retrofits that form part of the proposed campus facilities master plan were identified.
5. Costs associated with each of the required utility upgrades were developed and the most cost effective solution was recommended.

10.3 ANALYSIS OF EXISTING SYSTEM

The Norco Campus is currently served from a single gas meter located on the south-west side of the F1 Central Plant building which serves the F2 central plant, Humanities and Science Tech. buildings. The meter is fed from a 3 inch high pressure line deriving its service from a 3-inch gas company high pressure main running along Third Street.

Majority of the Campus gas infrastructure was installed in the early 1990's and is in good standing condition. Natural Gas service is derived from Southern California Gas Company's high pressure system. The distribution system throughout the campus has undergone extensions over the years to accommodate campus expansions, renovations and additions such as the addition of the F2 Central Plant and the Student Success building. Gas mains are believed to be plastic pipe and range from 1/2-inch to 3-inches in diameter.

Natural Gas downstream of the meters are distributed at medium pressure at approximately 5 psig throughout the campus. The medium-pressure gas is reduced to low-pressure gas at building connections via gas pressure regulators installed either above grade or in underground vaults. The low-pressure gas is then piped to serve hot water boilers that serve for Space Heating and water heaters that serve for domestic hot water needs to plumbing fixtures. Natural gas is used for domestic water heating and industrial hot water.

The total estimated gas load demand for the existing system is approximately 12,190 MBH (thousand BTU's per hour). At 1,000 BTU per cubic-foot-per-hour (CFH) natural gas conversion factor, the required gas flow demand is 12,190 CFH.

Figure 10a – Existing Utility Map – Natural Gas shows the existing natural gas distribution piping system throughout the campus.

Table 10-1 provides approximate Heating and Domestic connected load demands based on building square footage in absence of metered data in each building.

TABLE 10-1: EXISTING GAS DEMAND LOADS

Bldg. No.	Building Name	Occupancy Type	Area (Sq. Ft.)	Heating Load Factor (BTUH/sq.ft.)	Estimated Heating Load (CFH)	Estimated Domestic Load (CFH)	Total Gas Load (CFH)
01	Student Services	Office	14,357	30	*No gas service to this building*		
02	Science/Technology	Academic/Lab	14,588	35	540	270	810
03	Multi-Purpose Auditorium	Public Gathering	9,277	40	*No gas service to this building*		
04	Humanities	Academic	14,486	35	535	265	800
05	Tigers Den	Community	2,209	40	*No gas service to this building*		
06	F1 Central Plant	Industrial	2,500	N/A	*1,470 (B-1 & B-2 @ 735 CFH ea.)	**500	1,970
	F1 Central Plant	Industrial	-	N/A	*2,400 (B-1 & B-2 @ 1,200 CFH ea.)	-	2,400
07	Mechanical 1	Industrial	996	30	*Unknown if building derives gas service*		
08	Mechanical 2	Industrial	1,233	30	*Unknown if building derives gas service*		
09	Library	Library	30,740	30	*No gas service to this building*		
10	Technology	Academic	20,019	35	*No gas service to this building*		
11	F2 Central Plant	Industrial	1,518	N/A	*2,250 (B-1 & B-2 @ 1,125 CFH ea.)	-	2,250
12	Bookstore	Retail	3,600	20	*No gas service to this building*		
13	CACT Building	Academic	5,020	35	*No gas service to this building*		
14	Multi-Purpose Building	Public Gathering	3,360	40	*No gas service to this building*		
15	Early Childhood Ed. Center 'A'	Academic	8,235	35	*Unknown if building derives gas service*		
16	Portable 1	Academic	960	35	*No gas service to this building*		
17	Portable A	Office	960	30	*No gas service to this building*		
18	Portable B	Office	960	30	*No gas service to this building*		
19	Portable Complex	Office/Academic	6,720	35	250	125	375
E-1	Industrial Technology	Academic	44,862	35	1,650	825	2,475
E-2	High School	Academic	90,000	35	*Unknown if building derives gas service*		
E-3	Headstart	Academic	2,380	35	*Unknown if building derives gas service*		
E-4	Early Childhood Ed. Center 'B'	Academic	3,450	35	*Unknown if building derives gas service*		
E-5	Student Success Ctr.	Academic	20,025	35	740	370	1,110
	TOTALS						**12,190**

Indicated loads are estimated (based on square footage)
** Indicates Actual load (based on recent as-built drawings or field verification of Installed equipment)*
***Indicates Anticipated load (based on anticipated Installed gas fired equipment)*

10.4 ANALYSIS OF FUTURE NEEDS

An analysis of the current Natural Gas system was conducted to evaluate a) existing flow capacity available at the meters b) the impact of the proposed facilities on the capacity of existing gas distribution system and c) modifications/upgrades required to the existing gas distribution system to support the future build out of the campus. The current gas distribution was also analyzed for buried gas lines that will be in conflict with the proposed facilities and will require relocation. A campus site plan identifying piping that require demolition/relocation and extension of service lines to new facilities to serve the planned facilities is provided in our proposed gas site plan.

An evaluation of the facilities planned as part of the Utility Program master plan revealed that a net additional 1,148,500 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 combined load of 30,250 CFH to the existing metered system.

Figure 10b – Future Conditions Utility Map – Natural Gas shows the proposed natural gas distribution piping system throughout the campus.

Table 10-2 provides approximate Heating and Domestic load demands of the proposed facilities that are being added to the campus. The demands are calculated based on building square footage.

TABLE 10-2: FUTURE GAS DEMAND LOADS

Bldg. No.	Building Name	Occupancy Type	Projected Construction Completion Year	Area (Sq. Ft.)	Heating Load Factor (BTUH/sq.ft.)	Estimated Heating Load (CFH)	Estimated Domestic Load (CFH)	Total Gas Load (CFH)
P1	Physical Education Center (9)	Academic	Pre 2020	54,000	35	1,990	995	2,985
P2	Facilities Warehouse, Central Receiving & Central Plant (8)	Industrial	Pre 2020	22,500	45	**4,800	**1,500	6,300
P3	Visual & Performing Arts (7)	Academic	Pre 2020	60,000	35	2,210	1,105	3,315
P4	North Quad - Classrooms & Labs 1	Academic	location for analysis only	32,000	35	1,180	590	1,770
P5	North Quad - Classrooms & Labs 2	Academic	location for analysis only	32,000	35	1,180	590	1,170
P6	North Quad - Classrooms & Labs 3	Academic	location for analysis only	32,000	35	1,180	590	1,170
P7	North/East Parking Structure	Parking	Last Priority	200,000	N/A	*No gas service to this building*		
P8	South/East Parking Structure	Parking	Last Priority	280,000	N/A	*No gas service to this building*		
P9	South Quad - Classrooms & Labs 1	Academic	2nd Priority	32,000	35	1,180	590	1,170
P10	South Quad - Classrooms & Labs 2	Academic	2nd Priority	32,000	35	1,180	590	1,170
P11	Student Center	Community	2nd Priority	48,000	40	2,020	1,215	3,235
P12	West Quad - Classrooms & Labs 1	Academic	Last Priority	48,000	35	1,770	885	2,655
P13	West Quad - Classrooms & Labs 2	Academic	Last Priority	48,000	35	1,770	885	2,655
P14	West Quad - Classrooms & Labs 3	Academic	Last Priority	48,000	35	1,770	885	2,655
P15	North/West Parking Structure	Parking	Last Priority	180,000	N/A	*No gas service to this building*		
	TOTALS			1,148,500				**30,250**

Indicated loads are estimated (based on square footage)
*** Indicates Anticipated load (based on anticipated Installed gas fired equipment)*

10.5 FINDINGS AND RECCOMENDATIONS

An evaluation of the existing Natural Gas system was undertaken to study the modifications/upgrades required to support the future facilities planned at the campus. The study also evaluated the reliability and redundancy of the existing system.

A review of the load demands of the future facilities and current load demands with loads of the demolished buildings subtracted from the totals of the campus revealed that the existing main medium pressure distribution lines are adequately sized to meet the demands of existing and future facilities on the campus however the existing meter will require an upgrade to a higher capacity output meter. In addition, the installation of one additional meter will be required to serve most of the proposed buildings.

Following are our recommendations to upgrade the existing Natural Gas infrastructure at the campus to (a) Improve system reliability (b) provide ease of maintenance and isolation of lines either during a failure or during a regular maintenance without interrupting gas supply to other buildings on campus and (c) to provide adequate capacity service lines to accommodate existing loads and planned future loads resulting from new buildings addition as well as additions to existing buildings:

Table 10-3 provides a description of the impact of work involved with the proposed locations of each building in relation to the existing campus Natural Gas system.

The following is a summary of additional recommendations for improvements to the existing natural gas system:

1. Earthquake valves for emergency gas supply shut-off should be provided at each meter location on the downstream side of the regulator.
2. Meter 1: Replace existing meter with a higher capacity meter having a max CFH output of no less than 20,000 CFH. Southern California Gas Company shall provide this service.
3. Install new meter (#2) with a max. CFH output of no less than 20,000 CFH. Southern California Gas Company shall provide this service.
4. All buildings be sub-metered to monitor gas consumption and get a clear understanding of the total gas energy being spent at each of the buildings. This will help the campus better manage their energy budget and thus the operating costs at the campus.
5. We recommend the use of proper digging equipment for trenching as it is well known that the campus has a granite base. The amount of time and the rental of proper equipment should be included in the base bid of any job at Norco Campus where trenching is involved and not included in a change order as “discovery” after the fact.

TABLE 10-3: DESCRIPTION OF IMPACT

Bldg. No.	Building Name	Gross Area (Sq. Ft.)	Description
P1	Physical Education Center (9)	54,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P2	Facilities Warehouse, Central Receiving & Central Plant (8)	22,500	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the existing system fed from Meter #1.
P3	Visual & Performing Arts (7)	60,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the existing system fed from Meter #1.
P4	North Quad - Classrooms & Labs 1	32,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P5	North Quad - Classrooms & Labs 2	32,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the existing system fed from Meter #1.
P6	North Quad - Classrooms & Labs 3	32,000	The proposed building interferes with an existing underground city owned gas service line leading into the campus from Third Street serving meter #1. This line can be abandoned in place or capped and removed. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P7	North/East Parking Structure	200,000	The proposed building interferes with an existing underground city owned gas service line leading into the campus from Third Street serving meter #1. Re-routing of such line will be required. The proposed building will not require gas service.
P8	South/East Parking Structure	280,000	The proposed building does not interfere with the existing underground gas service lines. The proposed building will not require gas service.
P9	South Quad - Classrooms & Labs 1	32,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P10	South Quad - Classrooms & Labs 2	32,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P11	Student Center	48,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P12	West Quad - Classrooms & Labs 1	48,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P13	West Quad - Classrooms & Labs 2	48,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P14	West Quad - Classrooms & Labs 3	48,000	The proposed building does not interfere with the existing underground gas service lines. A supply line shall extend to serve this building. This service will be extended from the new system fed from Meter #2.
P15	North/West Parking Structure	180,000	The proposed building does not interfere with the existing underground gas service lines. The proposed building will not require gas service.

Table 10-4 below provides connected load demands of the existing, future facilities and facilities that are being demolished.

TABLE 10-4: EXISTING/FUTURE GAS DEMAND LOADS

METER 1 - Meter Upgrade

Bldg. No.	Building Name	Combined Gas Load Heating/Domestic (CFH)
01	Student Services	0
02	Science/Technology	0
03	Multi-Purpose Auditorium	0
04	Humanities	0
05	Tigers Den	0
06	F1 Central Plant	0
07	Mechanical 1	-
08	Mechanical 2	-
09	Library	-
10	Technology	-
11	F2 Central Plant	2,250
12	Bookstore	0
13	CACT Building	-
14	Multi-Purpose Building	0
15	Early Childhood Ed. Center 'A'	-
16	Portable 1	0
17	Portable A	-
18	Portable B	-
19	Portable Complex	0
E-1	Industrial Technology	2,475
E-2	High School	-
E-3	Headstart	-
E-4	Early Childhood Ed. Center 'B'	-
E-5	Student Success Ctr.	1,110
	FUTURE	
P2	Facilities Warehouse, Central Receiving & Central Plant (8)	6,300
P3	Visual & Performing Arts (7)	3,315
P5	North Quad - Classrooms & Labs 2	1,170
	TOTALS	**16,620**

RED *Indicates buildings to be Demolished. Demand loads are not considered.*

METER 2 - New System

Bldg. No.	Building Name	Combined Gas Load Heating/Domestic (CFH)
	Physical Education Center (9)	2,985
P4	North Quad - Classrooms & Labs 1	1,770
P6	North Quad - Classrooms & Labs 3	1,170
P7	North/East Parking Structure	0
P8	South/East Parking Structure	0
P9	South Quad - Classrooms & Labs 1	1,170
P10	South Quad - Classrooms & Labs 2	1,170
P11	Student Center	3,235
P12	West Quad - Classrooms & Labs 1	2,655
P13	West Quad - Classrooms & Labs 2	2,655
P14	West Quad - Classrooms & Labs 3	2,655
P15	North/West Parking Structure	0
	TOTALS	**19,465**

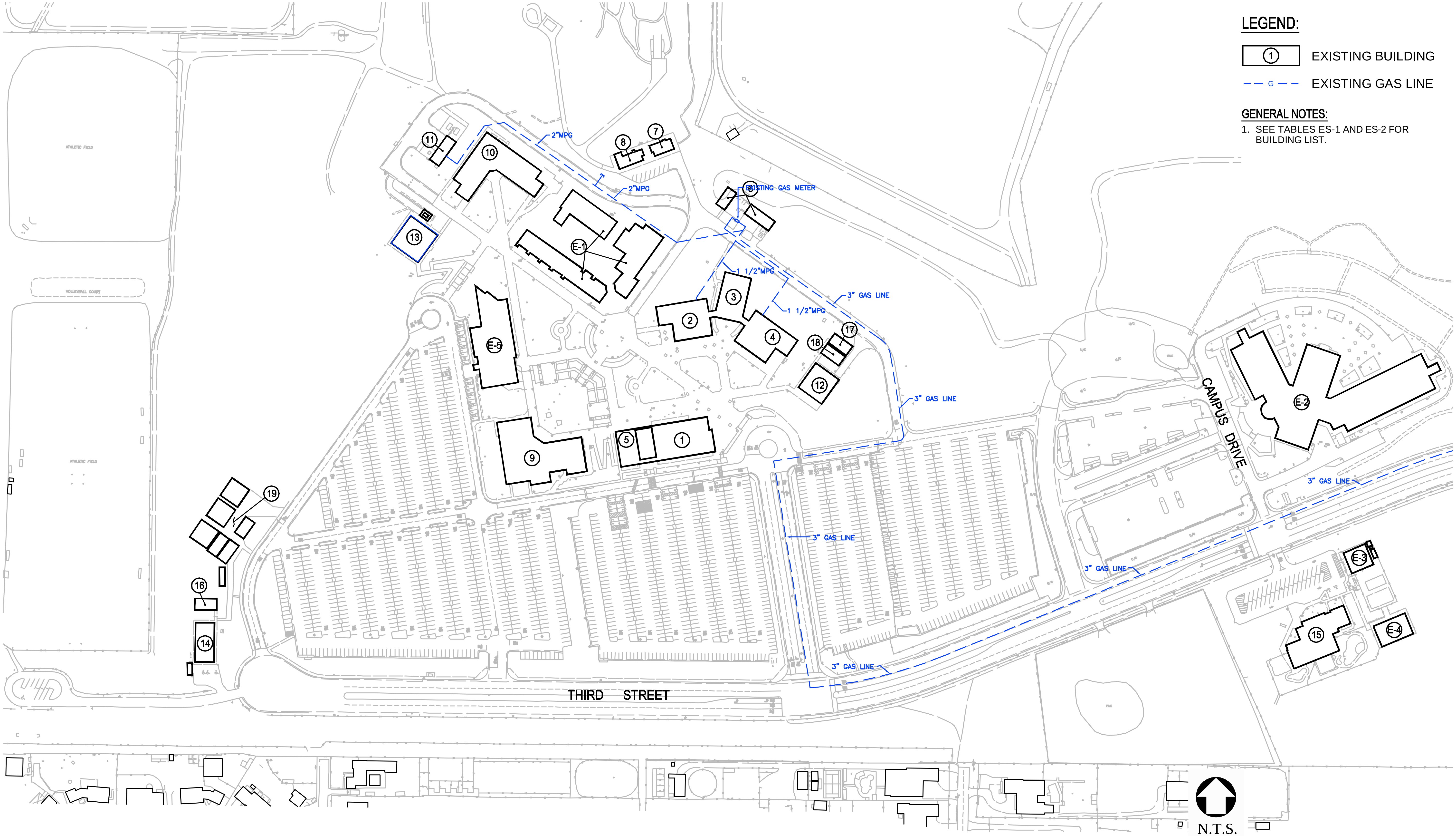


FIGURE 10a
EXISTING UTILITY MAP - NATURAL GAS

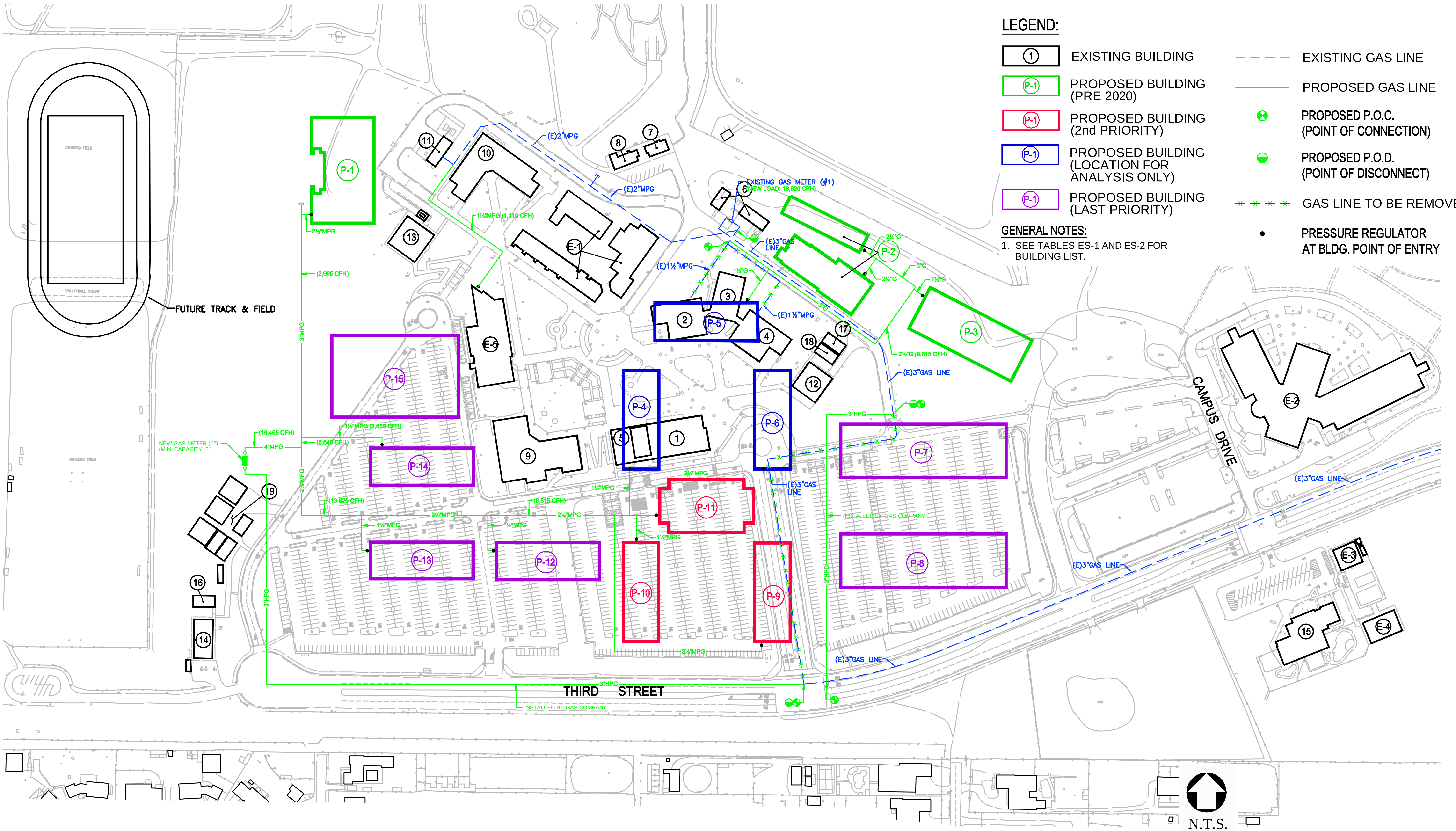


FIGURE 10b
FUTURE CONDITIONS UTILITY MAP - NATURAL GAS

APPENDIX A

Workshop Notes, Meeting Notes and

Campus Reviews and Annotated Drawings

Meeting Re: Riverside Community College District (RCCD) – LRDP Review

MEETING MINUTES

Mtg Date: September 3, 2009
Time: 8:30AM – 12:00 Noon
Location: RCCSO Building
Subject: RCCD Infrastructure – LRDP Review for each Campus
Project: Infrastructure Upgrade Projects

Attendees:

See Distribution below -
RCCD Representatives
Tilden-Coil Representative
PSOMAS Team

The purpose of the meeting was to discuss and review the current status of the existing Long Range Development Plans for each Campus. Topics discussed are described below:

TOPICS DISCUSSED	COMMENTS / ACTIONS REQUIRED
1. Overview of Infrastructure Projects Progress and Schedule.	a. An update overview of the Infrastructure project scope and schedule was discussed.
2. Master Plan Review of Each Campus	
a. Moreno Valley Campus (MV)	a. From RCCD: The MV Campus differs greatly from the 2007 MV - LRDP. The changes discussed were summarized on the Masterplan Mark-up (see attached.) Steinberg Architects can be contacted to obtain a progress print of latest Masterplan.
	b. From PSOMAS : a schematic Masterplan Working Exhibits will be prepared to reflect the target LRDP to be used for Infrastructure Review.
b. Norco Campus (NC)	a. From RCCD: The Norco Campus has minor changes and anticipated Phasing related to the Jan 2008 NC - LRDP. The changes were summarized on the redline

TOPICS DISCUSSED	COMMENTS / ACTIONS REQUIRED
	Masterplan mark-up (see attached.) Also, a secondary access outlet to Mountain Ave. will be needed prior to buildout of the LRDP.
	b. From PSOMAS : a schematic Masterplan Working Exhibits will be prepared to reflect the target LRDP to be used for Infrastructure Review.
c. Riverside City Campus (RC)	a. From RCCD: The City Campus has is consistent with the current March 2008 RC - LRDP. Minor alternatives were summarized on the Masterplan Mark-up (see attached.)
	b. From PSOMAS : The current Masterplan LRDP will used for Infrastructure Review.

Minutes Prepared: Bruce Kirby (PSOMAS) - September 11, 2009

The preceding minutes were prepared by Psomas and are interpretations of items discussed and decisions reached at the above referenced meeting. Any persons desiring to add or otherwise change the minutes, are asked to send their comments in writing to Vicky Cabangbang (Vicky.cabangbang@psomas.com) no later than one week following the date minutes were prepared; otherwise the minutes will stand as written.

DISTRIBUTION / Attendees :
Orin Williams, RCCD
Bart Doering, RCCD
Calvin Belcher, RCCD
Rick Hernandez, RCCD
Reagan Romali, RCCD MV
Dr. Gaither Loewenstein, RCCD NC
Norm Godin, RCCD RC
Jason Howarth, Tilden-Coil
Steve Bastian, P2S (Mech)
Ed Burtch, P2S (Elect)
Bill Leming, P2S (Tele)
Bruce Kirby PSOMAS (S/W/SD)
Jeff Chess, PSOMAS

ATTACHMENTs:
- Sign-In Sheet
- Meeting Agenda
- (3) Masterplan Mark-up (one for each Campus)

9/3/2009 - RCCD WORKSHOP - LRFMP's

Bill Leming	P2S ENG.	562-497-2999
CALVIN J. BELCHER	RCCD	951-453-5188
JEFF CHESS	PSOMAS	2152231491
BRUCE KIRBY	PSOMAS	951-300-2827
GAITHER LOEWENSTEIN	RCC-Norco	951-372-7199
JASON HOWARTH	RCCD-COFL	951-684-5901
BART DOERING	RCCD	951-201-2779
Steve Bastian	P2S	562-497-2999
ED BURTCH	P2S ENG	562-497-2999

PSOMAS

Balancing the Natural and Built Environment

Meeting Agenda

Date / Time : **September 3, 2009 - 8AM-12Noon**

Type of Meeting: **Development Plan Workshop - Validate LRFMP (Master Plan)**

Meeting Facilitator: **Jeff Chess - PSOMAS**

Invitees: **RCCD Representatives**

Items For Each Campus

I. Issues

a) **Progress Update / Schedule Review**

b) **Master Plan Review - as published**

- **2007 Moreno Valley Campus Long Range Educational & Facilities Masterplan (Jan 2008)**
- **Norco Campus Long Range Facilities Masterplan (Jan 2008)**
- **Riverside City College – Long Range Educational Masterplan (March 2008)**

c) **Identify All Build-out Facilities**

d) **Proposed Facilities – (Confirmation, Documented Changes, Pending Status)**

e) **Identify Known Phasing**

f) **Summarize any Impacts to Schedule**

g) **Next Steps**

II. Adjournment

2010 Iowa Avenue
Suite 101
Riverside, CA 92507-2465

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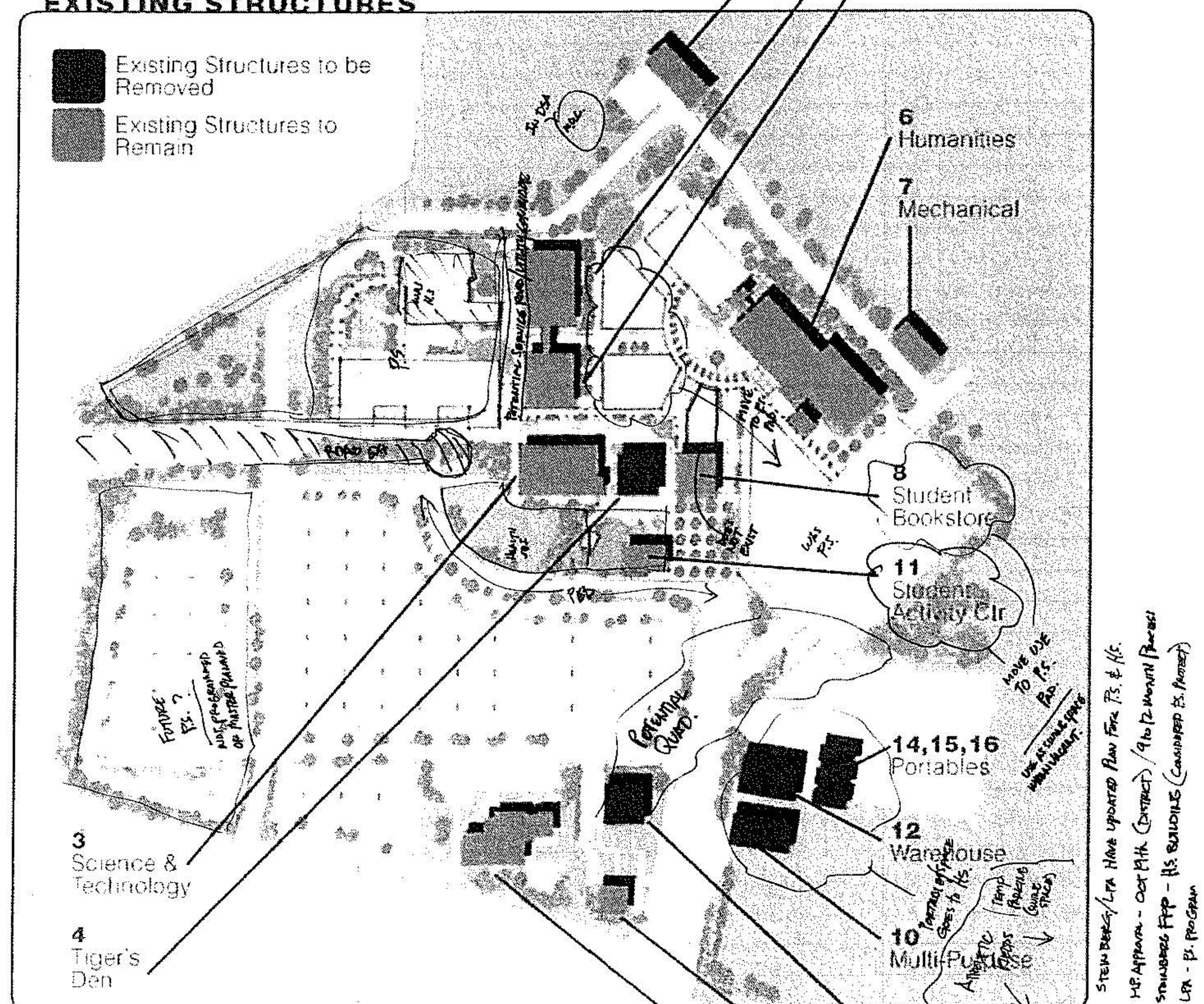
EXISTING STRUCTURES



HORIZON 1 - FACILITIES PLAN

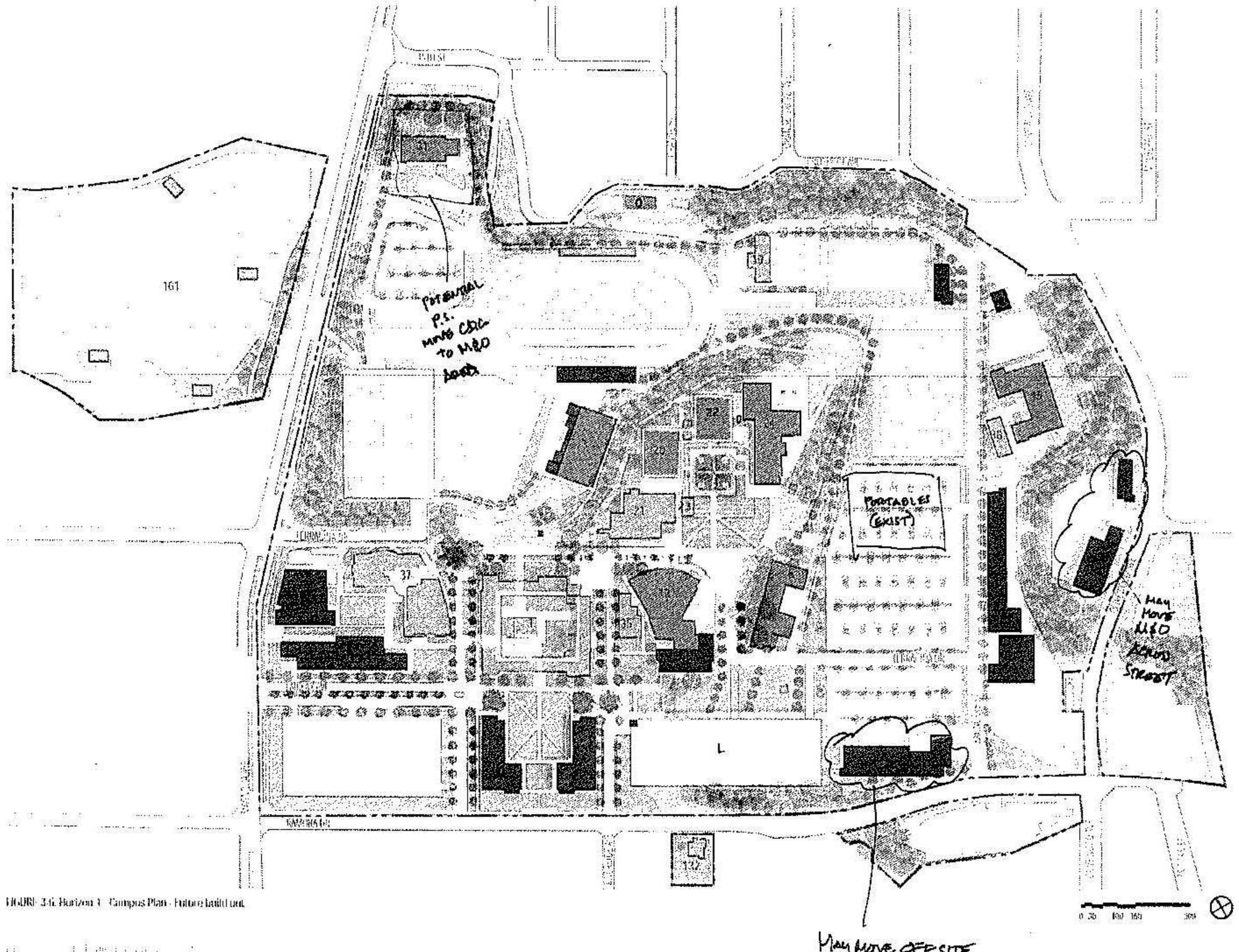


FIGURE 3-6: Horizon 1 - Campus Plan - Future build out

NEW BUILDINGS

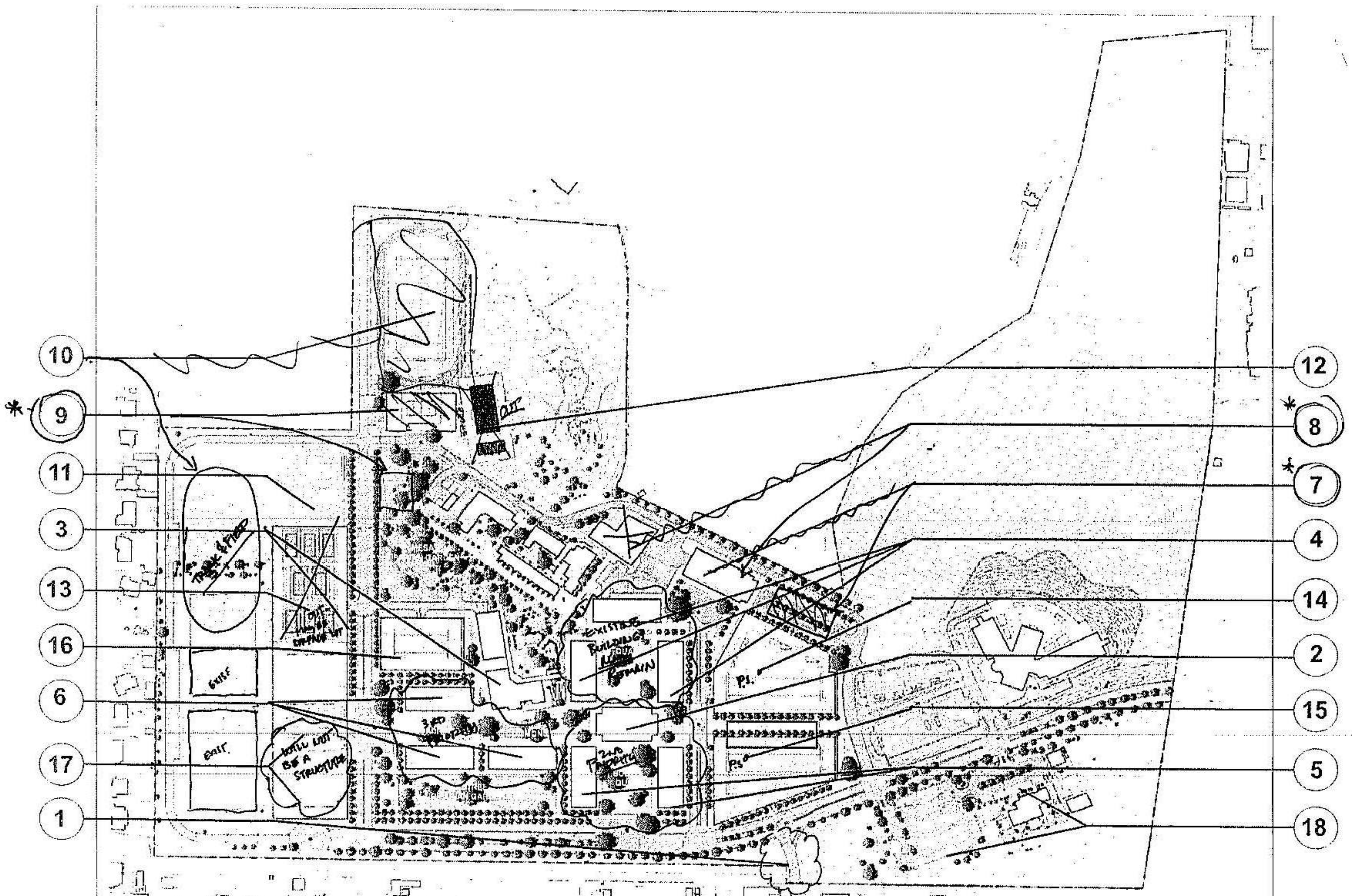
- A NURSING & SCIENCES 1
- B NURSING & SCIENCES 2
- C STADIUM
- D AQUATICS COMPLEX
- E ADMINISTRATION
- F STUDENT SERVICES
- G COSMETOLOGY
- H M&O SHIPPING
- I M&O OFFICES
- J APPLIED TECH CENTER
- K AUTO TECHNOLOGY
- L PARKING STRUCTURE
- M BAND BUILDING
- N MUSIC / LANDIS ADD
- O CAMPUS POLICE/SAFETY

EXISTING BUILDINGS

- 1 QUADRANGLE
- 3 RENO - WHEELOCK
- 6 RENO - (N) ART & CERAMIC
- 12 RENO - LANDIS AUDITORIUM
- 15 RENO - HUNTLEY GYM
- 19 CUTTER POOL
- 20 RENO - (N) CLASSROOM / IT
- 21 MLK HIGH TECH CENTER
- 22 RENO - (N) BUSINESS ED.
- 23 PLANETARIUM
- 24 RENO - STUDENT CENTER
- 31 RENO - CHILD DEVELOPMENT
- 35 MUSIC HALL
- 36 PILATES
- 37 DIGITAL LIBRARY
- 132 ALUMNI HOUSE
- 161 EVANS SPORTS BUILDINGS

LEGEND

- EXISTING BUILDINGS
- NEW BUILDINGS
- RENOVATION



The Norco Campus at 16,000 Students. *Simple two and three story rectangular classroom and lab buildings are arranged around simple rectangular quadrangles with grass and trees at the heart of campus. Athletics occupies the west side and northwest corner of campus and visual and performing arts the northeast corner of campus. Two and three level parking structures are situated close to the campus core on its east and west sides.*

* City does not want road - require General Plan Amendment
- Will limit buildout *
- Considering Sat. Campus.

(9) FPP done

MEETING MINUTES

Date:	**February 15, 2010 3:00 PM to 4:00 PM**
Location:	**RCCD Building – Third Floor Conference Room** **3845 Market Street** **Riverside, CA 92501**
Subject:	**RCCD – Infrastructure Utility Program Project** **Project Coordination Meeting**
Project:	**RCCD Infrastructure Utility Program Project**
Project No:	**1RCC020100**

Attendees:

Bart L. Doering – RCCD
Calvin Belcher - RCCD
Jeff Chess – Psomas
Bruce Kirby – Psomas

Introduction:

This project meeting took place on February 11, 2010 at RCCD Office to discuss the remaining items required to complete the Utility Program Study. The following are the discussion items originating at the meeting.

TOPIC / *COMMENTS*

1. REMAINING STEPS:

A. **Confirmed (MV) Master Plan** - *RCCD Confirmed that the Master Plan (Future Buildings Exhibit) for the Moreno Valley (MV) that includes the Proposed Campus Expansion Areas (in blue) is complete.*

B. **MV Assumptions** – *Psomas agreed to provide a list of "general utility requirements and assumptions for each of the "blue" items identified on the Exhibit.*

C. **MV Assumptions Confirmation** – *RCCD agreed to review and confirm these general assumptions.*

D. **Confirmed (NC) Master Plan** - *RCCD Confirmed the Master Plan (Future Buildings Exhibit) for the Norco Campus (NC) is complete.*

E. **Confirmed (RC) Master Plan** - *RCCD Confirmed the Master Plan (Future Buildings Exhibit) for the Riverside Campus (RC) is complete.*

F. **Future Buildings Exhibits** - *Psomas agreed to use these Master Plan Exhibits for all (3) Campuses and then analyze and update the recommendations for each Utility on each Campus.*

G. **Re-Issue DRAFT Utility Program Study** – *Psomas agreed to re-issue the Study for each Campus.*

H. **Review DRAFT Utility Program Study** – *RCCD agreed to a review meeting for each Campus Study to confirm limits of proposed Utilities (prior to Cost Estimate.)*

I. **Final DRAFT Utility Program Study** – *Psomas agreed to incorporate any comment and add Cost element to the Study and issue Final DRAFT*

J. **District Infrastructure Budget**– *RCCD shared that the District has established an Infrastructure Budget of $6-7M (including soft costs) for all three Campuses. Psomas agreed with RCCD that by inspection this budget is deficient. Remaining Soft Cost will include Final Master Planning and Construction Documents.*

K. **Prioritized Recommendations Summary** – *RCCD and Psomas agreed to a Meeting that will include Tildon-Coil, and review final costs and also provide a Prioritized List of Recommendations based upon available budgets, to be included in the final report.*

L. **Presentation of FINAL Study** – *RCCD and Psomas agreed to meet with each Campus representative to present their Report along with our priority list. This list will be edited or confirmed by the Campus Representative(s).*

M. **Issue FINAL Utility Program Study** – *Psomas agreed to issue Final FINAL Utility Program Study.*

2. OTHER ITEMS:

A. **Riverside Campus Sewer –** *Psomas to obtain location of recent sewer discovery at the Southwest corner of Campus related to the New Nursing Building.*

B. **Remaining Item Schedule** – *For efficiency, each Campus document will be updated on it's own schedule. Psomas to provide a Schedule to address the 'Remaining Items."*

Minutes Issued: February 18, 2009

The preceding minutes were prepared by Psomas and are interpretations of items discussed and decisions reached at the above referenced meeting. Any persons desiring to add or otherwise change the minutes, are asked to send their comments in writing to Bruce Kirby at Psomas (bruce.kirby @psomas.com) no later than one week following the date minutes were prepared; otherwise the minutes will stand as written.

DISTRIBUTION:

See attendees.: cc. Jason Howarth (Tildon-Coil)

ATTACHMENTS:

- Original Meeting Agenda
- Schedule for Remaining Items (to Follow)

MEETING MINUTES

Date: March 1, 2010 4:00 PM to 5:00 PM
Location: RCCD Building – Third Floor Conference Room
3845 Market Street
Riverside, CA 92501
Subject: RCCD – Infrastructure Utility Program Project
Project Coordination Meeting
Project: RCCD Infrastructure Utility Program Project
Project No: 1RCC020100

Attendees:

Bart L. Doering – RCCD
Calvin Belcher - RCCD
Bruce Kirby – Psomas

Introduction:

This project meeting took place on March 1, 2010 at RCCD Office to discuss the remaining item required to complete the Utility Program Study. The following are the discussion items originating at the meeting.

TOPIC / *COMMENTS*

1. **REMAINING STEPS:**

   A. **Confirmed (MV) Master Plan Assumptions** - *Psomas provided a list of "general utility requirements and assumptions for each of the "blue" items identified on the Exhibit. RCCD agreed with these assumptions (listed below.)*

   B. **(MV) Assumptions :**

   Per our meeting notes, here are the Assumptions for the Campus Expansion Areas (Blue items) on our Future Buildings Exhibit.

   A. New Landscape and Lighting Area - electrical lighting, and irrigation needs only.

   B. Pedestrian Pathway with Fire Access - electrical lighting needs for walkway lights, and irrigation (No sewer, fire water, tele, gas)

PSOMAS 2010 Iowa Avenue, Suite 101 Riverside, CA 92507 951.787.8421 951.682.3379 Fax www.psomas.com

Meeting Re: Riverside Community College District (RCCD) Infrastructure Upgrade Project – 1RCC020100

C. Park/ Benches - electrical lighting needs for walkway lights, and irrigation (No sewer, tele, gas)

D. Possible Quad Area - electrical lighting needs for walkway lights, and irrigation (No sewer, tele, gas)

E. 500 stall Parking Lot - electrical needs for parking lot lights, irrigation for islands, pavement drainage ,and emergency phones (No sewer, or gas)

F. (2-3) lane road widening - electrical roadway lighting, and re-alignment of backbone utilities to match new alignment (No sewer, tele, gas)

G. 1000-1500 seat Outdoor Amphitheater - outdoor concrete stepped amphitheater with minor 1,000 sf concession stand, one set of restrooms, event lighting, (sewer, water, gas, tele, and elect)

H. Gymnasium – Two basketball courts with bleachers on each side and includes concession stand, one set of restrooms, lighting, weight room, men & women locker rooms, coaches/ staff offices, equipment room, physical education classrooms. A 40,000 sf building is used. (sewer, water, gas, tele, and elect.)

I . Fields / Track (North) - Single 400 meter track with single football field. Include support bldgs such as one set of restrooms and minor 1,00 sf concession buildings. (sewer, water, gas, tele, and elect.)

J. Fields / Track (South) - Single baseball field. Include support bldgs such as one set restrooms and minor 1,000 sf concession buildings. (Sewer, water, gas, tele, and elect.)

These assumptions were confirmed for our purposes in establishing general scale demand calculations.

Minutes Issued: March 9, 2010

The preceding minutes were prepared by Psomas and are interpretations of items discussed and decisions reached at the above referenced meeting. Any persons desiring to add or otherwise change the minutes, are asked to send their comments in writing to Bruce Kirby at Psomas (bruce.kirby @psomas.com) no later than one week following the date minutes were prepared; otherwise the minutes will stand as written.

DISTRIBUTION:

See attendees.: cc. Jason Howarth (Tildon-Coil) : Ed Burch (P2S)

ATTACHMENTS:

None

MEETING MINUTES

Date: March 30, 2010 10:00 AM to 11:30 AM
Location: RCCD Building – Third Floor Conference Room
3845 Market Street
Riverside, CA 92501
Subject: RCCD – Infrastructure Utility Program Project
Review of City Campus DRAFT Study
Project: RCCD Infrastructure Utility Program Project
Project No: 1RCC020100

Attendees:
Bart Doering and Calvin Belcher – RCCD
Jason Howarth – Tilden / Coil - (Not Available)
Steve Bastian and Ed Burtch – P2S
Jeff Chess and Bruce Kirby – Psomas

Introduction:

This project meeting took place on March 30, 2010 at RCCD Office to review the DRAFT Utility Program Study for the City Campus. Also to discuss remaining steps required to complete the Utility Program Study fro all Campuses. The following are the discussion items originating at the meeting.

TOPIC / *COMMENTS*

1. **Overview of Each Section - DRAFT Utility Program Study:**

   A. **Table of Contents / Executive Summary / "Wet" Civil Utilities (Swr/Wtr/SD) Sections** -

   Psomas provided a description of each section in the report and received the following comments (below) from RCCD.

   B. **Mechanical / Electrical / Plumbing Sections** -

   P2S provided a description of each section in the report and received the following comments (below) from RCCD.

   C. **General Comments to Study and Exhibits (applies to all sections)** -

   RCCD provided input to the report which generated the following list to items:

- *Psomas to provide Minor updates to the Exhibit graphics in terms of bold / background / color / text height– for overall clarity of information.*
- *Psomas mentioned that FINAL Reports will be bound with hard covers with tabs at each section.*
- *Psomas to add Revision Box for each version of the Study through Final issuance.*
- *Psomas to prioritize the "Recommendation" sections for each utility.*
- *Psomas to provide DVD copy of Sewer Video to Bart (RCCD).*
- *Psomas to contact GKK and obtain current CD's for Nursing-Science Bldg (currently under constriction) and show as an existing feature.*
- *Psomas to contact Tilden-Coil to get current CD's for the Aquatic Center (currently under constriction) and show as an existing feature.*

2. **Next Steps – to finalize DRAFT Utility Program Study:**

   A. **Checklist Summary** -

   Psomas to compile all the Prioritized Recommendations from the Utility Study onto one Master Spreadsheet Checklist. This Checklist will be added as an Appendix to the Study and provided to the Campus Representatives for their review / approval / signature.

   B. **Apply Costs** -

   Once the Checklist is accepted, Psomas will apply costs to all the recommendations in the Study and add these as an Appendix to the Study.

   C. **Schedule** -

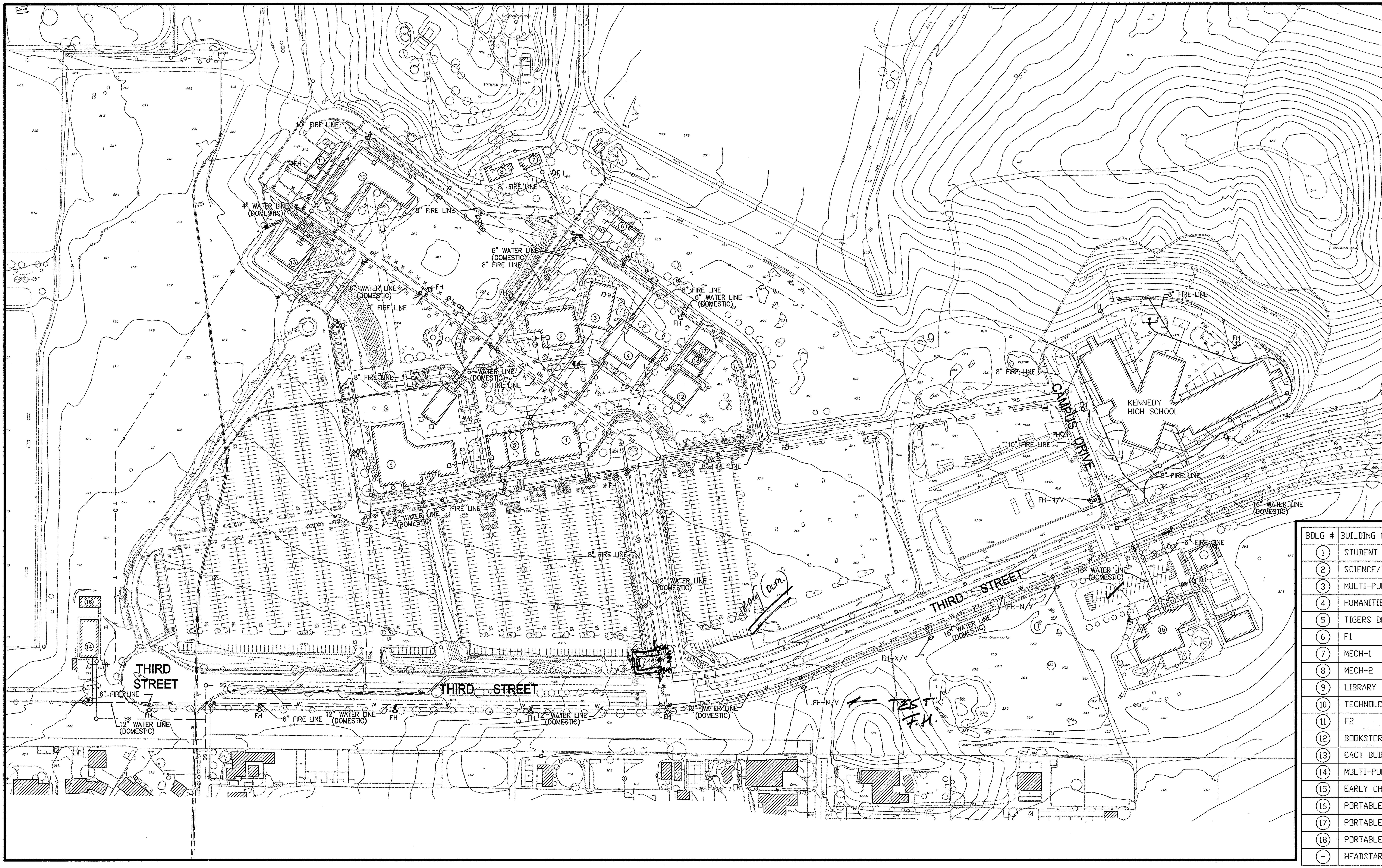
   Psomas will have the Updated City Campus Report (with Checklist) available 5/20 and will be ready to meet with the City College representative to get sign-off for the prioritization of recommendations.

Minutes Issued: April 5, 2010

The preceding minutes were prepared by Psomas and are interpretations of items discussed and decisions reached at the above referenced meeting. Any persons desiring to add or otherwise change the minutes, are asked to send their comments in writing to Bruce Kirby at Psomas (bruce.kirby @psomas.com) no later than one week following the date minutes were prepared; otherwise the minutes will stand as written.

DISTRIBUTION:

See attendees list



BDLG #	BUILDING NAME
1	STUDENT SERVICES
2	SCIENCE/TECHNOLOGY
3	MULTI-PURPOSE AUDITORIUM
4	HUMANITIES
5	TIGERS DEN
6	F1
7	MECH-1
8	MECH-2
9	LIBRARY
10	TECHNOLOGY
11	F2
12	BOOKSTORE
13	CACT BUILDING
14	MULTI-PURPOSE
15	EARLY CHILDHOOD EDCENTER
16	PORTABLE-1
17	PORTABLE-A
18	PORTABLE-B
-	HEADSTART

- 2nd day access for fire
Site walk 8/11/09
BK-SET

FW/DM
Water analysis base

GRAPHIC SCALE
Note: For reduced sized prints, original scale is in inches

Riverside Community College District

Norco Campus
Existing WTR Exhibit

PSOMAS

DATE: 7-27-2009 REVISED ON:
JOB No:1RCC020100
SHEET 1 OF 1

BDLG #	BUILDING NAME
1	STUDENT SERVICES
2	SCIENCE/TECHNOLOGY
3	MULTI-PURPOSE AUDITORIUM
4	HUMANITIES
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8	MECH-2
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11	F2
12	BOOKSTORE
13	CACT BUILDING
14	MULTI-PURPOSE
15	EARLY CHILDHOOD EDCENTER
16	PORTABLE-1
17	PORTABLE-A
18	PORTABLE-B
-	HEADSTART

SIDEWALK 8/11/09 BK SET

Sewer Analysis

SWR

GRAPHIC SCALE
Note: For reduced sized prints, original scale is in inches

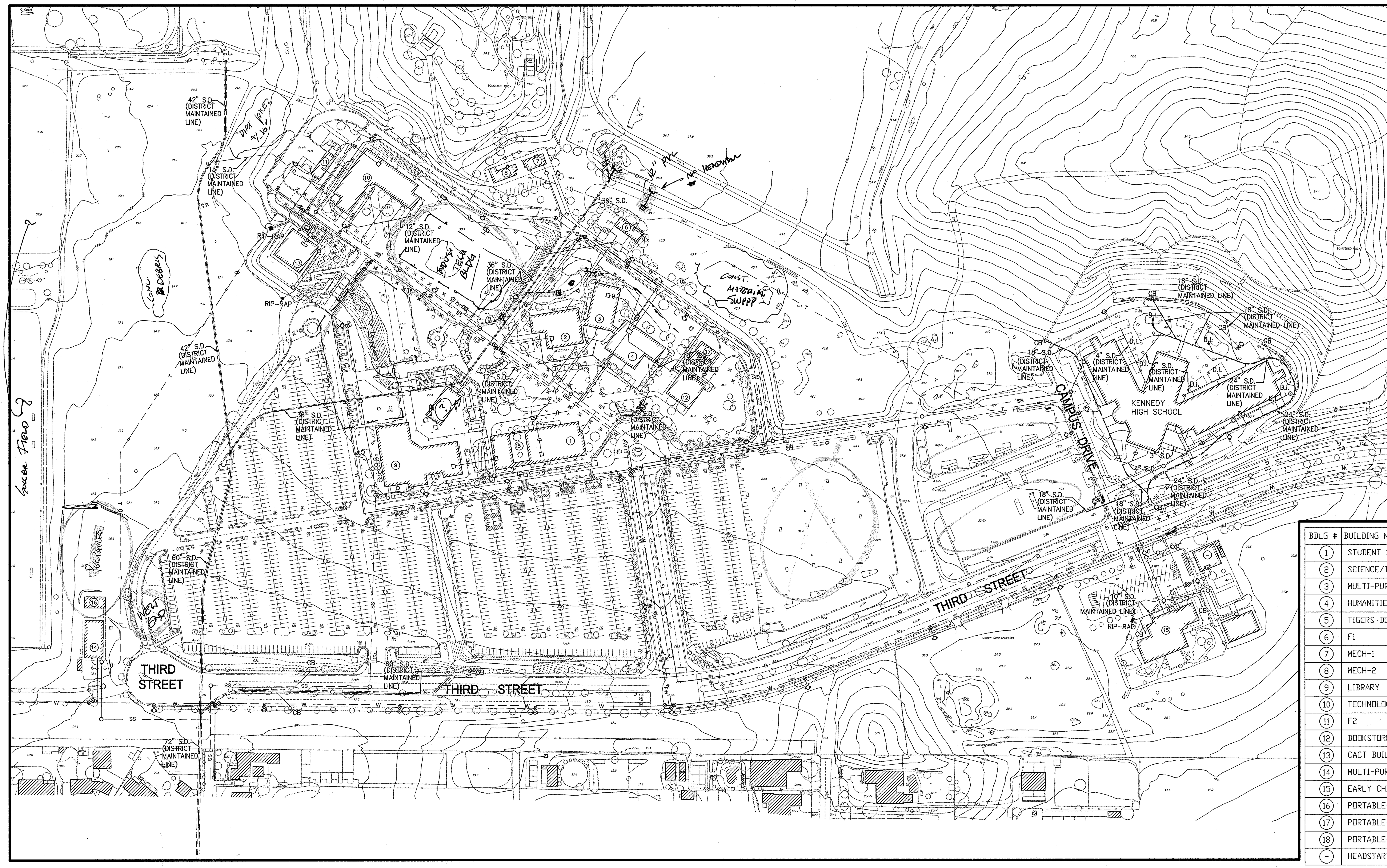
Riverside Community College District

Norco Campus
Existing SSWR Exhibit

PSOMAS

DATE: 7-27-2009 REVISED ON:
JOB No:1RCC020100

SHEET 1 OF 1



BDLG #	BUILDING NAME
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17	PORTABLE-A
18	PORTABLE-B
-	HEADSTART

GRAPHIC SCALE
Note: For reduced sized prints, original scale is in inches

Riverside Community College District

Norco Campus
Existing SD Exhibit
PSOMAS

DATE: 7-27-2009 REVISED ON:
JOB No:1RCC020100
SHEET 1 OF 1

APPENDIX B

Prioritized List and Summary of Proposed Recommendations

	PRIORITIZED LIST AND SUMMARY OF PROPOSED RECOMMENDATIONS	Estimated Construction Cost
SECTION 1 – SEWER SYSTEM		
1	Relocate existing mainline segment through the middle of campus new Building 12.	
2	Extend the mainline in Third Street to serve the proposed building in the middle of the campus.	
3	In order to provide a clear site for future development, remove the existing sanitary sewer mains currently serving any existing facilities to be demolished. Existing mainline systems can be cut and capped at the existing manholes.	
4	Remove the existing 4-inch sanitary sewer service laterals currently serving any existing buildings to be demolished.	
5	It is recommended that the college continue to further investigate the existing pipe condition and capacity to provide further recommendations for improvements as the campus expands.	
	SUBTOTAL:	**$343K**
SECTION 2 – WATER SYSTEM		
1	Install new 6-inch domestic water service loops to serve the future buildings, as needed. It is recommended that a second 12-inch domestic connection from the existing 12-inch water main in Third Street (near the cul-de-sac) be added during the next major expansion to provide redundancy and provide a secondary water source for maintenance or repair.	
2	Remove and/or relocate existing domestic water or fire water pipes that may be in conflict with new building footprints. Mainline water systems can be cut and capped at the proposed project limits.	
3	Install new fire hydrants as needed within 300 feet of proposed buildings per requirements.	
4	Review the California Building Code requirements for Fire service with the addition of each proposed building, since the requirements are based upon final building type, size, height, and occupancy use.	
	SUBTOTAL:	**$986K**
SECTION 3 – IRRIGATION WATER SYSTEM		
1	Proposed new irrigation piping shall be purple PVC pipe and maintain minimum horizontal and vertical clearances with adjacent potable water lines.	
2	Upgrade water sensor technology, as needed, during expansion projects to stay up to date on water saving technological advances.	
3	Install and maintain back flow prevention devices as needed to ensure water quality safety.	
	SUBTOTAL:	**$1,158K**
SECTION 4 – STORM DRAIN SYSTEM		
1	Relocation of the two mainlines from the confluence point (located at mid-campus), and upstream to each inlet point.	
2	Extension of the existing storm drain mainline in Third Street to the east, to address proposed buildings.	
	SUBTOTAL:	**$940K**
SECTION 5 – CHILLED WATER SYSTEM		
1	Retrofit existing large buildings that are served by chilled water with BTU monitoring capabilities.	
2	New buildings should be designed with air handlers instead of fan coils to make better use of air side economizers and also greater delta T's through the chilled water coils. This is essential for maximizing the cooling capacity of the chilled water TES tank while minimizing the size of the tank.	
3	New buildings should be provided with DDC controls for better monitoring and controlling energy usage.	
4	All new buildings should have BTU metering capabilities that tie into a central DDC system with robust energy management capabilities.	
5	An analysis of the cooling loads for current and future buildings reveals that the peak cooling capacity will need to be about 1,550 tons. For energy efficiency reasons an evaporative cooled chilled water plant is proposed.	
6	For maximum energy savings, peak demand reduction and reduced carbon footprint a chilled water Thermal Energy Storage (TES) tank is proposed. It would be located on the north side of the campus overlooking the campus. The TES can lower the required chiller capacity to about 1000 tons. During the peak cooling load of the day, cooling load can be partially or fully handled by the chilled water stored in the tank. The temperature of the chilled water in the tank will be lowered during off-peak hours when the ambient and wet bulb temperatures are lower, so the chillers operate more efficiently, and when electrical rates are lower.	
7	Existing air-cooled chillers could also be run at night in conjunction with the Storage Tanks when the ambient temperatures are lower and electric rates are lower. This would make the existing overall system efficiency better, but it would not be as efficient as water cooled state of the art chillers.	
8	Independent piping systems should be cross-connected and consolidated into a single piping system to take advantage of the thermal energy storage system sharing and shared pumping. Re-use as much of the existing buried piping as possible.	

Agreed and Accepted By: ____________________

	PRIORITIZED LIST AND SUMMARY OF PROPOSED RECOMMENDATIONS	Estimated Construction Cost
9	Piping distribution system will need to be relocated and upgraded to increase size and allow placement of new buildings over current pipe locations per our proposed site plan.	
10	Piping distribution system will need to be expanded to new buildings per our proposed site plan. The expansion can be phased to coincide with the pace of new building construction.	
	SUBTOTAL:	**$676K**
SECTION 6 – HEATING WATER SYSTEM		
1	The future buildings should be designed with local heating water systems. Those heating plants should have boilers that are 84% to 92% efficient with at least 4 to 1 turn down.	
2	Our recommendations are to retain the existing heating water system as much as possible. There is no need to retrofit existing buildings that are connected to the existing central heating water system with new local heating water systems. We recommend cross connecting the existing heating water systems at each plant and possibly removing some pumps. There appears to be excess boiler and pumping capacity. The equipment should be tied together with DDC controls and an energy management system.	
3	Existing remote buildings that have existing gas-fired heating equipment should remain as is. They are smaller loads and will not make much difference to the overall campus natural gas usage.	
	SUBTOTAL:	**$120K**
SECTION 7 – ELECTRICAL SYSTEM		
1	**Primary closed loop system** with new 15kV isolation switches at each building to enable isolation of feeders during a fault condition.	
2	It is recommended that a **new** campus owned primary 15kV metering section and **switchgear** be installed.	
3	A **Short Circuit / Arc Flash** study be conducted to coordinate the proposed system.	
4	Conduct a **coordination study** of the proposed system to effectively coordinate all protective devices in the campus.	
5	We recommend that **SCE be notified** every time a new load or building is added to the system.	
6	Southern California Edison has a very good reputation for maintaining their networks. The weak point in the distribution system is the single 5" conduit feeding the entire campus from a single substation. However, there have been not serious outages during the last 14 years of service. It would appear that based upon possible additional new buildings being added to the north of the service access road, the entire Edison feeder network may have to be relocated to clear this expansion. **We recommend** that planned **Buildings P2 and P3 on the north side of campus be relocated** to avoid the 12kV underground utility line that serves the campus. See future site plan.	
7	We recommended that Southern California Edison be requested to **upgrade the 500KVA transformer**. If any future loads are to be added to the east side of campus.	
8	If additional capacity (above 66,000 square feet) is required, it is recommended that Southern California Edison be requested to**upgrade the 1000KVA transformer**.	
9	The existing Southern California Edison 15kV, 1/0, XLP conductors currently have a load of 50 amps and a capacity of 150 amps allowing for the campus to be more than doubled in size before new conductors are required. However Table 7.2 shows a projected load of 216 amps on the 12kV service feeder and we recommend SCE be requested to **change out the primary conductors** the next time a transformer is replaced.	
10	We recommend the use of **proper digging equipment for trenching** any new electrical feeders as it is well known that the campus has a granite base. The amount of time and the rental of proper equipment should be included in the base bid of any job at Norco Campus where trenching is involved and not included in a change order as **"discovery"** after the fact.	
11	We recommend the use of a **wireless multi-metering system**. The system should have an energy software package for energy analysis, 3 phase wireless meter transceivers for wireless metering and be capable of metering at 480 volts as well as 208 volts.	
12	We recommend the use of **aluminum cables** rather than copper cables. Aluminum cables shall be used for all medium voltage cables and low voltage cables larger than 4/0 in an effort to save money.	
	SITE LIGHTING SYSTEM DESCRIPTION	
1	All existing post top fixtures and other decorative fixtures in the campus be replaced with a common cut off decorative fixture that will provide a visually comfortable environment and aesthetically blend with the architectural buildings in the campus. The cut off fixtures would also prevent glare. These new fixtures will be spaced to meet the current IES recommended light levels for pathways.	
2	A single lamp source is selected for illuminating roadways, parking lots, and pathways leading to the campus buildings. Since a high-pressure sodium lamp has a lower color temperature and provides a warm color, we recommend that this lamp be standardized for campus exterior lighting.	
3	Illumination levels of all roadways and parking lots in the campus are designed to meet the current recommended light levels by IES (an average of at least 0.5fc with a uniformity ratio of 4:1). This would include addition/ deletion of light fixtures (based on footcandle readings) to achieve the IES recommended light levels. This will not only provide a visually comfortable environment, but also a safe environment, since people always associate higher or greater luminance with safer surroundings.	
4	Provide a lighting control panel and photocells to control all light fixtures at the same time. If a control panel is not a viable solution then replace the existing time clocks with astronomical time clocks.	
5	Metal Halide lamps are used to highlight the architecture of buildings owing to their high color rendering index and high color temperature.	
6	Replace burned out lamps and ballasts.	
7	Trim the trees and obstructions.	
	SUBTOTAL:	**$3,312K**

Agreed and Accepted By: ______________________________

	PRIORITIZED LIST AND SUMMARY OF PROPOSED RECOMMENDATIONS	Estimated Construction Cost
SECTION 8 – TELECOMMUNICATIONS		
1	Provide new fiber optic cables from the new MDF/NOC to each building. Recommend size to be 24 strands single mode and 24 strands of 50mu multi-mode fiber optic cable to all major building and 12 strands single mode and 12 strands of 50mu multi-mode fiber optic cable to the smaller buildings. Provide new copper cable from the new MDF/NOC to all new buildings the Copper cable to be sized per building requirements or minimum of 25 pair per building.	
2	Provide fiber optic and copper tie cables from the new MDF/NOC to the existing MDF to allow for the use of the backbone cables feeding the existing building on campus.	
	SUBTOTAL:	**$3,125K**
SECTION 9 – CENTRAL PLANT		
	COOLING	
1	An analysis of the cooling loads for the buildings that will remain will require 325 tons of cooling. The new buildings will require about 1225 more tons of cooling load. The total cooling load of remaining buildings plus future buildings reveals that the peak cooling capacity will need to be about 1,550 tons. For energy efficiency reasons an evaporative cooled chilled water plant is proposed. A comparison of full load and part load efficiencies is shown in Figure 9 for current state of the art chillers.	
2	For maximum energy savings, peak demand reduction and reduced carbon footprint, a chilled water Thermal Energy Storage (TES) tank is proposed. It would be located on the north side of the campus overlooking the campus. The TES can lower the required chiller capacity to about 1000 tons. During the peak cooling load of the day, cooling load can be partially or fully handled by the chilled water stored in the tank. The temperature of the chilled water in the tank will be lowered during off-peak hours when the ambient and wet bulb temperatures are lower, so the chillers operate more efficiently, and when electrical rates are lower.	
3	(Alternate Option) Existing air-cooled chillers could also be run at night in conjunction with the Thermal Storage Tanks when the ambient temperatures are lower and electric rates are lower. This would make the existing overall system efficiency better, but it would not be as efficient as water cooled state of the art chillers.	
	HEATING	
1	The multiple heating systems of F1 and F2 could be cross-connected to create a single heating system, or the two heating systems at F1 could be combined and the two heating systems at F2 could be combined. This will make energy usage monitoring and control much easier and improve year round boiler plant efficiency.	
2	An analysis of the heating loads for the buildings that will remain and building P-4 that will take the place of the current Student Services building shows that the peak heating load will be about 2,290 mbh output. The current combined heating capacity of the boilers in building F1 and F2 is 8,120 mbh input. Existing buildings that will remain and are currently served by the present heating system should retain that heating system. There is no need to demolish that system and retrofit those buildings with an in-house system. Obviously, there is excess capacity. The College could demo and relocate some of the existing boilers to new buildings.	
3	Analysis of the heating loads for the future buildings reveals that the peak heating load will be 7,550 mbh output, or 9,000 input at 84% thermal efficiency. Future boilers should be located within each new building. Boiler redundancy should be reduced to 70 percent, instead of 100 per cent. We do not recommend extending or expanding the current heating systems to serve future loads. Some of the new buildings could re-use any of the existing boilers that are demoed.	
	SUBTOTAL:	**$5,839K**
SECTION 10 – NATURAL GAS SYSTEM		
1	Earthquake valves for emergency gas supply shut-off should be provided at each meter location on the downstream side of the regulator.	
2	Meter 1: Replace existing meter with a higher capacity meter having a max CFH output of no less than 20,000 CFH. Southern California Gas Company shall provide this service.	
3	Install new meter (#2) with a max. CFH output of no less than 20,000 CFH. Southern California Gas Company shall provide this service	
4	All buildings be sub-metered to monitor gas consumption and get a clear understanding of the total gas energy being spent at each of the buildings. This will help the campus better manage their energy budget and thus the operating costs at the campus.	
5	We recommend the use of proper digging equipment for trenching as it is well known that the campus has a granite base. The amount of time and the rental of proper equipment should be included in the base bid of any job at Norco Campus where trenching is involved and not included in a change order as “discovery” after the fact.	
	SUBTOTAL:	**$576K**

Agreed and Accepted By: ______________________

APPENDIX C

Conceptual Opinion of Cost

RIVERSIDE COMMUNITY COLLEGE DISTRICT

INFRASTRUCTURE UPGRADE PROJECT
UTILITY PROGRAM
NORCO CAMPUS

CONCEPTUAL OPINION OF COST

JYI# V1716A1

JUNE 2, 2010

PREPARED FOR:

PSOMAS

BY:

JACOBUS & YUANG, INC.
6477 Telephone Rd.
Suite #10
Ventura, CA 93003
Tel (213) 688-1341 or (805) 339-9434

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM		**JYI #:**	**V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA		**DATE:**	**02-Jun-10**
CLIENT: PSOMAS ASSOCIATES		**REVISED:**	
DESCRIPTION: CONCEPTUAL OPINION OF COST			

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	SUMMARY OF ESTIMATE				
					$
1.0	SANITARY SEWER SYSTEM	2,370	LF	145.02	343,703
2.0	WATER SYSTEM	7,450	LF	132.40	986,386
3.0	IRRIGATION WATER SYSTEM	34.21	ACRE	33,879.13	1,158,900
4.0	STORM DRAIN SYSTEM	3,070	LF	306.03	939,500
5.0	CHILLED WATER SYSTEM	5,180	LF	130.43	675,618
6.0	HEATING WATER SYSTEM	1,400	LF	85.53	119,737
7.0	ELECTRICAL SYSTEM	8,800	LF	376.34	3,311,819
8.0	TELECOMMUNICATIONS	11,320	LF	276.04	3,124,758
9.0	CENTRAL PLANT	4,500	SF	1,297.50	5,838,750
10.0	NATURAL GAS SYSTEM	6,860	LF	83.92	575,694
11.0	MISCELLANEOUS	1	LS	100,000.00	100,000
	SUBTOTAL				**17,174,865**
12.0	PRORATES:				
12.1	GENERAL CONDITIONS	8.80%			1,511,388
12.2	ESCALATION	3.82%			713,353
12.3	MARKET FACTOR - See Below				-
12.4	TRAFFIC MITIGATION	0.50%			96,998
12.5	DESIGN CONTINGENCY	15.00%			2,924,491
12.6	ESTIMATE CONTINGENCY	10.00%			2,090,971
	SUBTOTAL				**24,512,066**
12.7	BONDS + INSURANCES	2.00%			490,241
12.8	CONTRACTOR'S FEE	6.00%			1,500,138
	TOTAL OF ESTIMATED PRICE				**26,502,446**
	MARKET FACTOR	-5.00%			**(1,325,122)**
	TOTAL ESTIMATE CONSTRUCTION COST INCLUDING MARKET FACTOR				**25,177,323**
	OPTIONAL PRICING - See end of estimate for detailed backup				
	ELECTRICAL SYSTEM ALTERNATE - PER OPTION #2 SINGLE LINE				**(1,013,930)**
	CENTRAL PLANT ALTERNATE OPTION, USING (E) AIR-COOLED CHILLER				**(7,170,279)**

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM	JYI #:	V1716A1
LOCATION : NORCO CAMPUS - RIVERSIDE, CA	DATE:	02-Jun-10
CLIENT: PSOMAS ASSOCIATES	REVISED:	
DESCRIPTION: CONCEPTUAL OPINION OF COST		

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL

ESCALATION CALCULATION

BASE MONTH	May-10
CONSTRUCTION START MONTH	Feb-11
CONSTRUCTION DURATION (MONTHS)	14
MID POINT OF CONSTRUCTION	Sep-11
% ANNUAL ESCALATION	3.00%
ALLOWANCE FOR ESCALATION (TO MIDPOINT OF CONSTRUCTION)	3.82%

NOTES:

1) PRICES ASSUME COMPETITIVE BIDS FROM AT LEAST 4-5 RESPONSIBLE GENERAL CONTRACTORS
2) ESTIMATED COSTS ARE BASED ON PREVAILING WAGE RATES
3) NO COST ESCALATION IS INCLUDED BEYOND THE ASSUMPTIONS SHOWN ABOVE. IF THE PROJECT IS PROTRACTED BEYOND THE MID POINT SHOWN ABOVE, ADJUSTMENT NEEDS TO BE MADE TO THE ESTIMATE FOR INFLATIONARY & MARKET CONDITIONS AT THE TIME
4) THE ESTIMATE REFLECTS TYPICAL GENERAL CONTRACTOR'S COSTS FOR THE PROJECT, & DOES NOT INCLUDE SOFT COSTS SUCH AS A/E FEES, CONSTRUCTION & PROJECT MANAGEMENT FEES, CONSTRUCTION CONTINGENCY, OWNER TESTING & INSPECTION & QUALITY MANAGEMENT COSTS, LEGAL FEES, FINANCING CHARGES, OR ANY OTHER TYPICAL SOFT COSTS - IT IS NECESSARY FOR THE USER TO ADD SUCH SOFT COSTS, TO DETERMINE THE TOTAL PROJECT BUDGET.
5) PRICES ARE BASED ON PREVAILING WAGE RATES
6) ESTIMATE IS BASED ON UTILITY PROGRAM AS PREPARED BY PSOMAS, DATED 5/13/2010 AND RECEIVED 5/19/2010.

SPECIFIC EXCLUSIONS:

1) FIRE SPRINKLER RETROFIT OF BUILDINGS IS NOT INCLUDED, BUT LATERALS, VALVING & METERS ARE INCLUDED
2) NO COSTS ARE INCLUDED FOR ASBESTOS & OTHER HAZARDOUS MATERIAL ABATEMENT
3) RETROFIT (E) LARGE BUILDINGS THAT ARE SERVED BY CHILLED WATER W/ BTU MONITORING CAPABILITIES & TIE TO CENTRAL DDC SYSTEM IS NOT INCLUDED.
4) COST FOR REPLACING WALL METAL HALIDES IN BUILDINGS IS NOT INCLUDED
5) COST TO UPGRADE LIGHTING, HVAC, & SECURITY ACCESS TO (E) BUILDING BDF's IS NOT INCLUDED
6) HIGHER DESIGN AND ESTIMATE CONTINGENCIES ARE USED TO COVER UNCERTAINTY OF SCOPE. THE COST ESTIMATE WILL CHANGE WHEN MORE DEFINED SCOPE AND DRAWINGS BECOME AVAILABLE.
7) AIR-HANDLERS TO NEW BUILDINGS, DDC CONTROLS, & BTU METERING CAPABILITIES ARE NOT INCLUDED.
8) LOCAL HEATING WATER SYSTEMs TO FUTURE BUILDINGS ARE NOT INCLUDED.
9) CROSS CONNECTING EXISTING HEATING WATER SYSTEMS AT EACH PLANT & REMOVING SOME PUMPS & TIE W/ DDC CONTROLS & ENERGY MANAGEMENT SYSTEM ARE NOT INCLUDED.

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM	JYI #:	V1716A1
LOCATION : NORCO CAMPUS - RIVERSIDE, CA	DATE:	02-Jun-10
CLIENT: PSOMAS ASSOCIATES	REVISED:	
DESCRIPTION: CONCEPTUAL OPINION OF COST		

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL

OPINION OF COST

An Opinion of Cost is prepared from a survey of the quantities of work-items prepared from written or drawn information provided at the Conceptual or Schematic stage of the design.

Historical costs, information provided by contractors and suppliers, plus judgmental evaluation by the Estimator are used as appropriate as the basis for pricing.

Allowances as appropriate will be included for items of work which are not indicated on the design documents, provided that the Estimator is made aware of them, or which, in the judgement of the Estimator, are required for completion of the work.

JYI cannot, however, be responsible for items or work of an unusual nature of which we have not been informed.

BID

An offer to enter a contract to perform work for a fixed sum, to be completed within a limited period of time.

Jacobus & Yuang, Inc., however, cannot and does not guarantee that bids, or cost proposals for construction will not vary from this Opinion of Cost or Estimate.

MARKET CONDITIONS

In the current market conditions for construction, our experience shows the following results on competitive bids, as a differential from JYI final estimates:

Number of bids	Percentage Differential
1............	+ 25 to 50%
2-3..........	+ 10 to 25%
4-5..........	+ 0 to 10%
6-7..........	+ 0 to - 5%
8 or more....	+ 0 to -15%

Accordingly, it is extremely important to ensure that a minimum of 4-5 valid bids are received

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM | **JYI #: V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA | **DATE: 02-Jun-10**
CLIENT: PSOMAS ASSOCIATES | **REVISED:**
DESCRIPTION: CONCEPTUAL OPINION OF COST

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
1.0	SANITARY SEWER SYSTEM				$
	RELOCATE (E) MAINLINE SEGMENT THROUGH THE MIDDLE OF CAMPUS NEW BUILDING #12				
	DEMO WORK				
	SAWCUT (E) PAVING	1,820	LF	4.50	8,190
	DEMO/HAUL (E) PAVING DEBRIS	2,730	SF	4.00	10,920
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	510	SF	1.00	510
	P.O.D. (E) 8" SEWER LINE	3	EA	1,500.00	4,500
	TRENCH/REMOVE (E) SEWER MANHOLE	3	EA	900.00	2,700
	TRENCH/REMOVE (E) 8" SEWER LINE	1,080	LF	7.50	8,100
	RESTORE PAVING, MATCH EXISTING	2,730	SF	5.00	13,650
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	510	SF	5.50	2,805
	NEW WORK				
	SAWCUT (E) PAVING	440	LF	4.50	1,980
	DEMO/HAUL (E) PAVING DEBRIS	660	SF	4.00	2,640
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	1,950	SF	1.00	1,950
	NEW 8" SEWER LINE	870	LF	40.03	34,826
	P.O.C. TO EXISTING, 8"/8"	2	EA	812.50	1,625
	P.O.C. TO EXISTING, 8"/SSMH	1	EA	1,500.00	1,500
	RESTORE PAVING, MATCH EXISTING	660	SF	5.00	3,300
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	1,950	SF	5.50	10,725
	EXTEND THE MAIN LINE IN THIRD STREET TO SERVE THE PROPOSED BUILDING IN THE MIDDLE OF THE CAMPUS				
	SAWCUT (E) PAVING, STREET	510	LF	4.50	2,295
	SAWCUT (E) PAVING, ON SITE	470	LF	4.50	2,115
	DEMO/HAUL (E) PAVING DEBRIS	2,940	SF	4.00	11,760
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	120	SF	1.00	120
	NEW 8" SEWER LINE	590	LF	40.03	23,618
	BUILDING LATERALS, ASSUME 4"	430	LF	28.63	12,311
	ALLOWANCE, SSMH	1	EA	3,200.00	3,200
	ALLOWANCE, GRADE CLEANOUT	3	EA	650.00	1,950
	P.O.C. TO EXISTING, 8"/SSMH, STREET	1	EA	1,500.00	1,500
	BUILDING STUB	3	EA	375.00	1,125
	RESTORE PAVING, MATCH EXISTING, ON SITE	1,410	SF	5.00	7,050
	RESTORE PAVING, MATCH EXISTING, STREET	1,530	SF	7.50	11,475
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	120	SF	5.50	660
	REMOVAL OF (E) SANITARY SEWER MAINS CURRENTLY SERVING ANY EXISTING FACILITIES TO BE DEMOLISHED				
	SAWCUT (E) PAVING	200	LF	4.50	900
	DEMO/HAUL (E) PAVING DEBRIS	300	SF	4.00	1,200
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	120	SF	1.00	120
	P.O.D./CAP 8" SS LINE @ (E) MANHOLE	1	EA	1,500.00	1,500
	TRENCH/REMOVE (E) 8" SEWER LINE	140	LF	7.50	1,050
	RESTORE PAVING, MATCH EXISTING	300	SF	5.00	1,500
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	120	SF	5.50	660
	REMOVAL OF (E) 4" SANITARY SEWER LATERALS CURRENTLY SERVING ANY EXISTING FACILITIES TO BE DEMOLISHED				

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM | **JYI #: V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA | **DATE: 02-Jun-10**
CLIENT: PSOMAS ASSOCIATES | **REVISED:**
DESCRIPTION: CONCEPTUAL OPINION OF COST

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	SAWCUT (E) PAVING	560	LF	4.50	2,520
	DEMO/HAUL (E) PAVING DEBRIS	840	SF	4.00	3,360
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	690	SF	1.00	690
	P.O.D./CAP 4" SS LINE @ (E) 8" MAINS	4	EA	985.00	3,940
	TRENCH/REMOVE (E) 4" SEWER LINE	510	LF	8.00	4,080
	RESTORE PAVING, MATCH EXISTING	840	SF	5.00	4,200
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	690	SF	5.50	3,795
	SEWER SERVICE TO (N) BUILDING "P-1"				
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	600	SF	1.00	600
	BUILDING LATERAL, ASSUME 6"	200	LF	61.24	12,248
	ALLOWANCE, GRADE CLEANOUT	1	EA	325.00	325
	P.O.C. TO (E) SSMH	1	EA	1,250.00	1,250
	BUILDING STUB	1	EA	375.00	375
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	600	SF	5.50	3,300
	SITE SEWER FURTHER INVESTIGATION				
	FURTHER INVESTIGATION OF (E) CAMPUS WIDE SEWER PIPE CONDITION & CAPACITY TO PROVIDE FURTHER RECOMMENDATIONS FOR IMPROVEMENTS AS THE CAMPUS EXPANDS	1	LS	11,000.00	11,000
	ALLOWANCE FOR NEW BUILDING LATERAL PIPES, ASSUME 4"	710	LF	28.63	20,327
	ALLOWANCE FOR GRADE CLEANOUT	11	EA	325.00	3,575
	STUB & CAP FOR PROPOSED BUILDINGS	11	EA	375.00	4,125
	P.O.C. TO (E) SEWER MAINS	11	EA	1,250.00	13,750
	MISCELLANEOUS WORK				
	MISC. SEWER PIPING SYSTEM	1	LS	28,949.00	28,949
	PERMITS & TESTING	1	LS	14,474.50	14,475
	MISC. DEMO WORK	1	LS	5,789.80	5,790
	PROTECT-IN PLACE EXISTING UTILITIES	1	LS	2,500.00	2,500
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	2,500.00	2,500
	SUBTOTAL				**343,703**
2.0	WATER SYSTEM				$
	NEW 6" DOMESTIC WATER SERVICE LOOPS TO SERVE THE FUTURE BUILDINGS				
	DEMO WORK				
	SAWCUT (E) PAVING	2,400	LF	4.50	10,800
	SAWCUT (E) PAVING, STREET	140	LF	5.00	700
	DEMO/HAUL (E) PAVING DEBRIS	5,080	SF	4.00	20,320
	P.O.D. (E) 6" DW LINE	3	EA	1,000.00	3,000
	P.O.D. (E) 12" DW LINE	2	EA	2,100.00	4,200
	P.O.D. (E) 8" FW LINE	3	EA	1,250.00	3,750
	P.O.D. (E) 12" FW LINE	1	EA	1,710.00	1,710
	TRENCH/REMOVE (E) 6" DW PIPE	400	LF	6.50	2,600
	TRENCH/REMOVE (E) 12" DW PIPE	570	LF	8.50	4,845
	TRENCH/REMOVE (E) 8" FW PIPE	1,240	LF	7.50	9,300
	RESTORE PAVING, MATCH EXISTING, ON SITE	4,800	SF	5.00	24,000
	RESTORE PAVING, MATCH EXISTING, STREET	280	SF	7.50	2,100

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM		**JYI #:**	**V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA		**DATE:**	**02-Jun-10**
CLIENT: PSOMAS ASSOCIATES		**REVISED:**	
DESCRIPTION: CONCEPTUAL OPINION OF COST			

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	NEW WORK				
	SAWCUT (E) PAVING, ON SITE	2,180	LF	4.50	9,810
	SAWCUT (E) PAVING, STREET	300	LF	5.00	1,500
	DEMO/HAUL (E) PAVING DEBRIS	4,960	SF	4.00	19,840
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	2,800	SF	1.00	2,800
	NEW 6" DOMESTIC WATER PIPE	1,940	LF	47.35	91,859
	NEW 8" FIRE WATER PIPE	1,250	LF	58.92	73,650
	P.O.C. TO EXISTING, 6"/6"	2	EA	1,540.00	3,080
	P.O.C. TO EXISTING, 8"/8"	1	EA	1,985.00	1,985
	P.O.C. TO EXISTING, 6"/12", STREET	2	EA	2,500.00	5,000
	P.O.C. TO EXISTING, 6"/16", STREET	1	EA	3,450.00	3,450
	P.O.C. TO EXISTING, 8"/12", STREET	2	EA	5,800.00	11,600
	ALLOWANCE FOR BUILDING LATERAL PIPES, ASSUME 1 1/2" TO 4" DW SERVICE PIPES	1,050	LF	34.50	36,225
	STUB & CAP FOR PROPOSED BUILDINGS	16	EA	375.00	6,000
	THRUST BLOCKS	30	EA	550.00	16,500
	RESTORE PAVING, MATCH EXISTING, ON SITE	4,360	SF	5.00	21,800
	RESTORE PAVING, MATCH EXISTING, STREET	600	SF	7.50	4,500
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	2,800	SF	5.50	15,400
	RECOMMENDED 12" DW CONNECTION FROM THE (E) 12' WATER MAIN IN THIRD STREET TO PROVIDE A SECONDARY WATER SOURCE FOR MAINTENANCE OR REPAIR				
	SAWCUT (E) PAVING, ON SITE	900	LF	4.50	4,050
	SAWCUT (E) PAVING, STREET	180	LF	5.00	900
	DEMO/HAUL (E) PAVING DEBRIS	2,160	SF	4.00	8,640
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	2,560	SF	1.00	2,560
	NEW 6" DOMESTIC WATER PIPE	1,180	LF	48.25	56,935
	NEW 8" FIRE WATER PIPE	1,180	LF	58.92	69,526
	P.O.C. TO EXISTING, 6"/6"	1	EA	1,540.00	1,540
	P.O.C. TO EXISTING, 8"/8"	1	EA	1,985.00	1,985
	P.O.C. TO EXISTING, 6"/12", STREET	1	EA	2,500.00	2,500
	P.O.C. TO EXISTING, 8"/12", STREET	1	EA	5,800.00	5,800
	THRUST BLOCKS	6	EA	550.00	3,300
	RESTORE PAVING, MATCH EXISTING, ON SITE	1,800	SF	5.00	9,000
	RESTORE PAVING, MATCH EXISTING, STREET	360	SF	7.50	2,700
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	2,560	SF	5.50	14,080
	REMOVE AND/OR RELOCATE (E) DOMESTIC WATER OR FIRE WATER PIPES THAT ARE IN CONFLICT WITH NEW BUILDING				
	POD/REMOVE (E) BUILDING LATERAL PIPES, SAWCUT/REMOVE (E) PAVING THEN RESTORE BACK	750	LF	48.64	36,480
	P.O.D./CAP (E) PIPES	6	EA	375.00	2,250
	INSTALL (N) FIRE HYDRANTS AS NEEDED WITHIN 300 FT OF PROPOSED BUILDINGS				
	SAWCUT (E) ASPHALT PAVING	600	LF	4.50	2,700
	DEMO/HAUL (E) PAVING DEBRIS	900	SF	5.00	4,500
	ALLOWANCE FOR FIRE HYDRANT	1	EA	2,750.00	2,750
	REMOVE & RELOCATE (E) FIRE HYDRANT, ALLOWANCE	5	EA	2,000.00	10,000
	NEW 6" FIRE WATER PIPE	300	LF	46.34	13,902

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM		**JYI #:**	**V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA		**DATE:**	**02-Jun-10**
CLIENT: PSOMAS ASSOCIATES		**REVISED:**	
DESCRIPTION: CONCEPTUAL OPINION OF COST			

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	THRUST BLOCKS	12	EA	550.00	6,600
	RESTORE PAVING, MATCH EXISTING	900	SF	5.00	4,500
	REVIEW THE CALIFORNIA BUILDING CODE REQUIREMENTS FOR FIRE SERVICE WITH THE ADDITION OF EACH PROPOSED BUILDING				
	FIRE SERVICE TO PROPOSED BUILDING (ASSUME AV. 4" Ø X 100' + BFP + FDC)	16	EA	9,076.00	145,216
	MISCELLANEOUS WORK				
	MISC. WATER PIPING SYSTEM/VALVES & SPECIALTIES	1	LS	82,473.76	82,474
	TESTING & STERILIZATION	1	LS	45,360.57	45,361
	MISC. DEMO WORK	1	LS	23,814.30	23,814
	PROTECT-IN PLACE EXISTING UTILITIES	1	LS	5,000.00	5,000
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	5,000.00	5,000
	SUBTOTAL				**986,386**
3.0	IRRIGATION WATER SYSTEM				$
	IRRIGATION WATER IMPROVEMENTS				
	RE-ROUTING (E) IRRIGATION LINES THAT ARE IN CONFLICT WITH PROPOSED BUILDINGS, AND REPLACING OLD IRRIGATION PIPES AS NEEDED	1	LS	-	INCLUDED
	NEW IRRIGATION PIPING, PURPLE PVC	1	LS	-	INCLUDED
	UPGRADE WATER SENSOR TECHNOLOGY	1	LS	-	INCLUDED
	INSTALL & MAINTAIN BACKFLOW PREVENTION DEVICES	1	LS	-	INCLUDED
	LUMP SUM COST FOR THE ABOVE SCOPES (APPROXIMATE AREA OF PLANTING & IRRIGATION)	34.21	ACRE	32,625.00	1,116,000
	MISCELLANEOUS WORK				
	MISC. IRRIGATION WATER PIPING SYSTEM	1	LS	-	INCLUDED
	PERMITS & TESTING	1	LS	27,900.00	27,900
	MISC. DEMO WORK	1	LS	5,000.00	5,000
	PROTECT-IN PLACE EXISTING UTILITIES	1	LS	5,000.00	5,000
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	5,000.00	5,000
					1,158,900
4.0	STORM DRAIN SYSTEM				
	RELOCATION OF TWO (2) MAINLINES FROM THE CONFLUENCE POINT & UPSTREAM TO EACH INLET POINT				
	DEMO				
	SAWCUT (E) ASPHALT PAVING	720	LF	4.50	3,240
	DEMO/HAUL (E) PAVING DEBRIS	2,160	SF	5.00	10,800
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	5,100	SF	1.00	5,100
	P.O.D. (E) 36" SD PIPE	2	EA	3,500.00	7,000
	P.O.D. (E) 42" SD PIPE	2	EA	4,000.00	8,000
	TRENCH/REMOVE (E) 36" SD PIPE	410	LF	15.00	6,150
	TRENCH/REMOVE (E) 42" SD PIPE	800	LF	20.00	16,000
	RESTORE PAVING, MATCH EXISTING	2,160	SF	5.00	10,800
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	5,100	SF	5.50	28,050

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM	JYI #: V1716A1
LOCATION : NORCO CAMPUS - RIVERSIDE, CA	DATE: 02-Jun-10
CLIENT: PSOMAS ASSOCIATES	REVISED:
DESCRIPTION: CONCEPTUAL OPINION OF COST	

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	RELOCATION				
	SAWCUT (E) ASPHALT PAVING	600	LF	4.50	2,700
	DEMO/HAUL (E) PAVING DEBRIS	1,800	SF	5.00	9,000
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	5,940	SF	1.00	5,940
	NEW 36" STORMWATER PIPE	410	LF	176.87	72,517
	NEW 42" STORMWATER PIPE	880	LF	196.03	172,506
	P.O.C. TO EXISTING, 36"/36"	1	EA	2,437.50	2,438
	P.O.C. TO EXISTING, 36"/60"	1	EA	4,850.00	4,850
	P.O.C. TO EXISTING, 42"/42"	1	EA	6,500.00	6,500
	P.O.C. TO EXISTING, 42"/60"	1	EA	7,850.00	7,850
	RESTORE PAVING, MATCH EXISTING	1,800	SF	5.00	9,000
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	5,940	SF	5.50	32,670
	EXTENSION OF THE (E) STORM DRAIN MAINLINE IN THIRD STREET TO THE EAST, TO ADDRESS PROPOSED BUILDINGS				
	SAWCUT (E) PAVING, ON SITE	1,740	LF	4.50	7,830
	SAWCUT (E) PAVING, STREET	1,520	LF	5.00	7,600
	DEMO/HAUL (E) PAVING DEBRIS	9,780	SF	4.00	39,120
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	900	SF	1.00	900
	NEW STORMWATER PIPE, ASSUME 36"	560	LF	176.87	99,047
	NEW STORMWATER PIPE, ASSUME 42"	260	LF	196.03	50,968
	BUILDING LATERALS, ASSUME 18"	960	LF	158.10	151,776
	P.O.C. TO EXISTING, 18"/60", STREET	1	EA	3,850.00	3,850
	P.O.C. TO EXISTING, 42"/60", STREET	1	EA	7,850.00	7,850
	BUILDING STUB	2	EA	650.00	1,300
	SITE STUB	2	EA	1,200.00	2,400
	RESTORE PAVING, MATCH EXISTING, ON SITE	5,220	SF	5.00	26,100
	RESTORE PAVING, MATCH EXISTING, STREET	4,560	SF	7.50	34,200
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	900	SF	5.50	4,950
	MISCELLANEOUS WORK				
	MISC. STORM WATER PIPING SYSTEM	1	LS	42,950.08	42,950
	PERMITS & TESTING	1	LS	22,548.79	22,549
	MISC. DEMO WORK	1	LS	5,000.00	5,000
	PROTECT-IN PLACE EXISTING UTILITIES	1	LS	5,000.00	5,000
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	5,000.00	5,000
	SUBTOTAL				**939,500**
5.0	CHILLED WATER SYSTEM				
	RETROFIT (E) LARGE BUILDINGS THAT ARE SERVED BY CHILLED WATER W/ BTU MONITORING CAPABILITIES				
	LARGE BUILDINGS	4	EA	-	**N.I.C.**
	AIR-HANDLING UNITS, DDC CONTROLS, & BTU METERING CAPABILITIES TO NEW BUILDINGS				
	NEW BUILDINGS	16	EA	-	**N.I.C.**
	CHILLED WATER PIPE DISTRIBUTION				
	SAWCUT (E) ASPHALT PAVING	4,100	LF	4.50	18,450
	DEMO/HAUL (E) PAVING DEBRIS	10,250	SF	5.00	51,250
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	2,700	SF	1.00	2,700

Prepared by Jacobus & Yuang, Inc.

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM	JYI #: V1716A1
LOCATION : NORCO CAMPUS - RIVERSIDE, CA	DATE: 02-Jun-10
CLIENT: PSOMAS ASSOCIATES	REVISED:
DESCRIPTION: CONCEPTUAL OPINION OF COST	

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	NEW 4" CHWS PIPE + INSULATION	700	LF	62.75	43,925
	NEW 4" CHWR PIPE + INSULATION	700	LF	62.75	43,925
	NEW 6" CHWS PIPE + INSULATION	1,220	LF	78.40	95,648
	NEW 6" CHWR PIPE + INSULATION	1,220	LF	78.40	95,648
	NEW 8" CHWS PIPE + INSULATION	570	LF	92.00	52,440
	NEW 8" CHWR PIPE + INSULATION	570	LF	92.00	52,440
	NEW 10" CHWS PIPE + INSULATION	100	LF	114.00	11,400
	NEW 10" CHWR PIPE + INSULATION	100	LF	114.00	11,400
	VALVE VAULT	5	EA	1,500.00	7,500
	P.O.C. TO EXISTING, 4"/4"	2	EA	1,400.00	2,800
	P.O.C. TO EXISTING, 6"/6"	2	EA	2,100.00	4,200
	P.O.C. 10" TO NEW VAULT	2	EA	2,500.00	5,000
	BUILDING STUB	13	EA	550.00	7,150
	RESTORE PAVING, MATCH EXISTING	10,250	SF	5.00	51,250
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	2,700	SF	5.50	14,850
	MISCELLANEOUS WORK				
	MISC. CHWS/R PIPING SYSTEM/VALVES & SPECIALTIES	1	LS	42,898.20	42,898
	PERMITS & TESTING	1	LS	30,743.71	30,744
	MISC. DEMO WORK	1	LS	10,000.00	10,000
	PROTECT-IN PLACE EXISTING UTILITIES	1	LS	10,000.00	10,000
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	10,000.00	10,000
	SUBTOTAL				**675,618**
6.0	HEATING WATER SYSTEM				
	LOCAL HEATING WATER SYSTEM TO FUTURE BUILDINGS				
	FUTURE BUILDINGS	16	EA	-	**N.I.C.**
	CROSS-CONNECTING (E) HEATING WATER SYSTEMS AT EACH PLANT & REMOVING SOME PUMPS & TIE W/ DDC CONTROLS & ENERGY MANAGEMENT SYSTEM				
	NOT INCLUDED			-	**N.I.C.**
	HEATING WATER PIPE DISTRIBUTION				
	SAWCUT (E) ASPHALT PAVING			-	SEE CHILLED WATER
	DEMO/HAUL (E) PAVING DEBRIS			-	SEE CHILLED WATER
	REMOVE PORTION OF (E) PLANTING/IRRIGATION			-	SEE CHILLED WATER
	NEW 4" HHWS PIPE + INSULATION	700	LF	62.85	43,995
	NEW 4" HHWR PIPE + INSULATION	700	LF	62.85	43,995
	VALVE VAULT				SEE CHILLED WATER
	P.O.C. TO EXISTING, 4"/3"	2	EA	1,200.00	2,400
	P.O.C. 4" TO NEW CENTRAL PLANT #2	2	EA	1,200.00	2,400
	RESTORE PAVING, MATCH EXISTING			-	SEE CHILLED WATER
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING			-	SEE CHILLED WATER
	MISCELLANEOUS WORK				-
	MISC. HHWS/R PIPING SYSTEM/VALVES & SPECIALTIES	1	LS	6,959.25	6,959
	PERMITS & TESTING	1	LS	4,987.46	4,987
	MISC. DEMO WORK	1	LS	5,000.00	5,000
	PROTECT-IN PLACE EXISTING UTILITIES	1	LS	5,000.00	5,000
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	5,000.00	5,000

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM		JYI #:	V1716A1
LOCATION : NORCO CAMPUS - RIVERSIDE, CA		DATE:	02-Jun-10
CLIENT: PSOMAS ASSOCIATES		REVISED:	
DESCRIPTION: CONCEPTUAL OPINION OF COST			

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	SUBTOTAL				**119,737**
7.0	ELECTRICAL SYSTEM				$
	PRIMARY CLOSED LOOP SYSTEM - OPTION #1				
	MAIN METERBOARD				
	15 KV MAIN METERBOARD & SWITCHGEAR, 4 SECTIONS, ENCLOSED, WP	1	EA	95,000.00	95,000
	EXTRA FOR GROUND FAULT INTERRUPTER	1	EA	14,250.00	14,250
	EXTRA FOR METERING SECTION	1	EA	40,000.00	40,000
	EQUIPMENT GROUNDING	1	EA	1,500.00	1,500
	SELECTOR SWITCH				
	SS #1 THRU SS #14, NEMA-3R + PAD	14	EA	10,000.00	140,000
	EQUIPMENT GROUNDING	14	EA	750.00	10,500
	TRANSFORMERS				
	TRANSFORMER, 45 KVA, NEMA-3R + PAD	1	EA	7,875.00	7,875
	TRANSFORMER, 75 KVA, NEMA-3R + PAD	3	EA	12,375.00	37,125
	TRANSFORMER, 150 KVA, NEMA-3R + PAD	1	EA	23,625.00	23,625
	TRANSFORMER, 225 KVA, NEMA-3R + PAD	12	EA	34,875.00	418,500
	TRANSFORMER, 300 KVA, NEMA-3R + PAD	9	EA	46,125.00	415,125
	TRANSFORMER, 500 KVA, NEMA-3R + PAD	1	EA	66,150.00	66,150
	TRANSFORMER, 1000 KVA, NEMA-3R + PAD	1	EA	77,400.00	77,400
	EQUIPMENT GROUNDING	28	EA	1,500.00	42,000
	ELECTRICAL MANHOLES				
	EMH	15	EA	3,850.00	57,750
	PRIMARY CONDUIT				
	(1) - 4" PVC CONDUIT	860	LF	24.87	21,388
	CONDUIT POC TO (E) EMH	1	EA	850.00	850
	CABLING & POC			-	BY SCE CO
	12 KV FEEDERS, "F1" & "F2"				
	FEEDER "F1" - 4" PVC CONDUIT + ALUMINUM WIRES	2,660	LF	49.47	131,590
	FEEDER "F2" - 4" PVC CONDUIT + ALUMINUM WIRES	2,350	LF	49.47	116,255
	P.O.C. TO (E) ELECTRICAL PULLBOX	6	EA	2,000.00	12,000
	P.O.C. (E) 12 KV FEEDER TO (N) SELECTOR SWITCH	1	EA	1,250.00	1,250
	P.O.C. (E) 12 KV FEEDER TO (N) EMH	2	EA	1,250.00	2,500
	P.O.C. (E) 12 KV FEEDER TO (N) 15KV METERBOARD	1	EA	1,500.00	1,500
	P.O.C. (N) 12 KV FEEDER TO (E) U/G PULLBOX	1	EA	1,200.00	1,200
	BUILDING STUB	16	EA	550.00	8,800
	TRANSFORMER FEEDERS				
	45 KVA FEEDER, PVC	90	LF	11.96	1,076
	75 KVA FEEDER, PVC	450	LF	23.93	10,769
	150 KVA FEEDER, PVC	10	LF	32.56	326
	225 KVA FEEDER, PVC	920	LF	56.65	52,118
	300 KVA FEEDER, PVC	1,150	LF	84.45	97,118
	500 KVA FEEDER, PVC	30	LF	140.60	4,218
	1000 KVA FEEDER, PVC	100	LF	246.01	24,601
	SWITCHBOARD FEEDERS				
	600A SWITCHBOARD FEEDER, GRC	40	LF	254.99	10,200
	600A SWITCHBOARD FEEDER, PVC	80	LF	174.25	13,940

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM		JYI #:	V1716A1
LOCATION : NORCO CAMPUS - RIVERSIDE, CA		DATE:	02-Jun-10
CLIENT: PSOMAS ASSOCIATES		REVISED:	
DESCRIPTION: CONCEPTUAL OPINION OF COST			

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	800A SWITCHBOARD FEEDER, PVC	40	LF	216.67	8,667
	3000A SWITCHBOARD FEEDER, PVC	20	LF	448.52	8,970
	P.O.C. TO (E) BUILDING SWITCHBOARD + EXTERIOR WALL PENETRATION	7	EA	1,000.00	7,000
	TRENCH & DUCBANK				
	SAWCUT (E) PAVING	8,380	LF	4.50	37,710
	DEMO/HAUL (E) PAVING DEBRIS	8,380	SF	5.00	41,900
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	5,720	SF	1.00	5,720
	CONCRETE DUCTBANK	7,150	LF	54.00	386,100
	RESTORE PAVING, MATCH EXISTING	8,380	SF	5.00	41,900
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	5,720	SF	5.50	31,460
	OTHER RECOMMENDATIONS				
	SHORT CIRCUIT/ARC FLASH STUDY, ALLOWANCE	1	LS	15,000.00	15,000
	WIRELESS MULTI-METERING SYSTEM (w/ energy software package for energy analysis, 3 phase wireless meter transceivers for wireless metering and be capable of metering 480V & 208V), ALLOWANCE	1	LS	35,000.00	35,000
	SITE LIGHTING SYSTEM ALLOWANCES				
	REPLACE ALL (E) POST TOP FIXTURES & OTHER DECO FIXTURES W/ A COMMON CUT-OFF DECO FIXTURES THAT WILL PROVIDE A VISUALLY COMFORTABLE ENVIRONMENT & PREVENT GLARE, AND SPACED TO MEET THE CURRENT "IES" LIGHT LEVELS FOR PATHWAYS (ALLOWANCE BASED ON 5% OF SITE AREAS HAVING LIGHTED PATHWAYS: APPROX. GROSS SITE = 3,720,000SF x 5% = 186,000 SF)	1	LS	186,000.00	186,000
	SINGLE-LAMP SOURCE FOR ILLUMINATING ROADWAYS, PARKING LOTS, & PATHWAYS, HIGH-PRESSURE SODIUM LAMPS (ALLOWANCE BASED ON 18% OF SITE AREAS HAVING LIGHTED ROADS & PARKING LOTS: APPROX. GROSS SITE = 3,720,000SF x 18% = 669,600 SF - ASSUME (E) LIGHTS GET CHANGED TO HPS TYPE)	1	LS	167,400.00	167,400
	LIGHTING CONTROL PANEL & PHOTOCELLS TO CONTROL ALL LIGHT FIXTURES AT THE SAME TIME	1	LS	178,500.00	178,500
	WALL METAL HALIDES IN BUILDINGS	1	LS	-	**N.I.C.**
	REPLACE ALL BURNOUT LAMPS & BALLASTS (ASSUME SITE AREAS ONLY)	1	LS	2,500.00	2,500
	TRIM THE TREES & OBSTRUCTIONS	1	LS	8,160.00	8,160
	MISC. ELECTRICAL SYSTEM	1	LS	126,396.24	126,396
	PERMITS, TESTING & COMMISSIONING	1	LS	64,937.62	64,938
	SUBTOTAL				**3,311,819**
8.0	TELECOMMUNICATIONS				
	TELECOM CONDUITS & MANHOLES				
	(2) - 4" PVC CONDUIT	2,170	LF	44.15	95,806
	(3) - 4" PVC CONDUIT	6,040	LF	66.23	400,029
	(6) - 4" PVC CONDUIT	2,510	LF	132.46	332,475
	(9) - 4" PVC CONDUIT	600	LF	172.00	103,200

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM | **JYI #: V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA | **DATE: 02-Jun-10**
CLIENT: PSOMAS ASSOCIATES | **REVISED:**
DESCRIPTION: CONCEPTUAL OPINION OF COST

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	CPB, 5'L X 3'W X 4'D	7	EA	3,290.00	23,030
	CPB, 7'L X 4'W X 4'D	3	EA	4,320.00	12,960
	CMH, 12'L X 6'W X 7'D	9	EA	11,880.00	106,920
	P.O.C. TO (E) MANHOLE, (2) - 4" C.O.	1	EA	554.00	554
	P.O.C. TO (E) MANHOLE, (3) - 4" C.O.	4	EA	654.00	2,616
	P.O.C. TO (E) 6-4" STUB, (6) - 4" C.O.	2	EA	954.00	1,908
	P.O.C. TO (E) MANHOLE, (9) - 4" C.O.	1	EA	1,104.00	1,104
	P.O.C. TO (E) BUILDINGS + PENETRATION	5	EA	554.00	2,770
	NEW BUILDING STUB	16	EA	750.00	12,000
	TELECOM FIBER & TERMINATIONS				
	(1) - 12 FOSM/12 FOMM CABLES	2,910	LF	8.66	25,201
	(1) - 24 FOSM/24 FOMM CABLES	8,170	LF	10.82	88,399
	(3) - 24 FOSM/24 FOMM CABLES	1,580	LF	29.21	46,152
	(4) - 24 FOSM/24 FOMM CABLES	800	LF	36.79	29,432
	(9) - 24 FOSM/24 FOMM CABLES	180	LF	77.90	14,022
	(11) - 24 FOSM/24 FOMM CABLES	210	LF	83.31	17,495
	(1) - 12 FOSM/12 FOMM CABLES TO (E) CONDUIT	210	LF	8.66	1,819
	(1) - 24 FOSM/24 FOMM CABLES TO (E) CONDUIT	2,500	LF	10.82	27,050
	(15) - 24 FOSM/24 FOMM CABLES TO (E) CONDUIT	210	LF	105.50	22,155
	(18) - 24 FOSM/24 FOMM CABLES TO (E) CONDUIT	620	LF	116.86	72,453
	FIBER P.O.C. TO (E) BUILDING EQUIPMENT	13	EA	455.31	5,919
	FIBER P.O.C. TO "NOC" - (2) - 12FOSM/12FOMM + (26) - 24FOSM/24FOMM	1	LS	1,200.00	1,200
	TELECOM COPPER				
	25 PR COPPER	2,380	LF	3.00	7,140
	50 PR COPPER	5,570	LF	5.70	31,749
	100 PR COPPER	470	LF	10.80	5,076
	200 PR COPPER	2,030	LF	20.40	41,412
	300 PR COPPER	200	LF	28.80	5,760
	600 PR COPPER	180	LF	46.80	8,424
	1200 PR COPPER	430	LF	86.40	37,152
	1700 PR COPPER	80	LF	122.40	9,792
	900X, 750XW, 150Xdd	180	LF	108.00	19,440
	50 PR COPPER CABLES TO (E) CONDUIT	1,000	LF	6.84	6,840
	100 PR COPPER CABLES TO (E) CONDUIT	590	LF	12.96	7,646
	900 PR COPPER CABLES TO (E) CONDUIT	230	LF	32.10	7,383
	COPPER P.O.C. TO (E) BUILDING EQUIPMENT	13	EA	364.25	4,735
	COPPER P.O.C. TO MDF - (1) - 1700 PR	1	LS	950.00	950
	TRENCH & DUCBANK				
	SAWCUT (E) PAVING	11,280	LF	4.50	50,760
	DEMO/HAUL (E) PAVING DEBRIS	11,280	SF	5.00	56,400
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	7,520	SF	1.00	7,520
	CONCRETE DUCTBANK	9,400	LF	75.00	705,000
	RESTORE PAVING, MATCH EXISTING	11,280	SF	5.00	56,400
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	7,520	SF	5.50	41,360
	OTHER SCOPES				

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM | **JYI #: V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA | **DATE: 02-Jun-10**
CLIENT: PSOMAS ASSOCIATES | **REVISED:**
DESCRIPTION: CONCEPTUAL OPINION OF COST

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	ALLOWANCE FOR MAJOR UPGRADE & EXPANSION TO (E) MDF TO MEET THE NEEDS OF THE PROPOSED BUILDINGS AND THE MODERNIZATION OF THE EXISTING BUILDINGS	1	LS	110,000.00	110,000
	ALLOWANCE FOR RELOCATING & UPGRADING OF (E) NETWORKING OPERATING CENTER "NOC"	1	LS	250,000.00	250,000
	MISC. ELECTRICAL SYSTEM	1	LS	145,880.38	145,880
	PERMITS, TESTING & COMMISSIONING	1	LS	61,269.76	61,270
	SUBTOTAL				**3,124,758**
9.0	CENTRAL PLANT				$
	CENTRAL PLANT, OPTION #1				
	NEW CP-1 BUILDING	4,500	SF	300.00	1,350,000
	CENTRAL PLANT M,P,& E EQUIPMENT (INCLUDES COOLING TOWER + CHILLER)	1,550	TON	2,500.00	3,875,000
	THERMAL STORAGE TANK	1	EA	400,000.00	400,000
	MISCELLANEOUS WORK				
	PERMITS, TESTING & COMMISSIONING	1	LS	193,750.00	193,750
	MISC. DEMO WORK	1	LS	10,000.00	10,000
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	10,000.00	10,000
	SUBTOTAL				**5,838,750**
10.0	NATURAL GAS SYSTEM				
	DEMOLITION				
	P.O.D. GAS PIPES	5	EA	273.75	1,369
	CAP (E) 3" GAS PIPE	1	EA	319.38	319
	REMOVE (E) U/G GAS PIPINGS + SAWCUT/REMOVAL OF (E) PAVING + RESTORATION	1,210	LF	33.51	40,547
	NEW GAS PIPINGS				
	1 1/2" Ø GAS PIPE	1,010	LF	19.10	19,291
	2 1/2" Ø GAS PIPE	2,120	LF	25.98	55,078
	3" Ø GAS PIPE	1,170	LF	30.98	36,247
	4" Ø GAS PIPE	150	LF	35.97	5,396
	P.O.C. TO EXISTING	2	EA	161.50	323
	SAWCUT (E) PAVING, ON SITE	5,340	LF	4.50	24,030
	DEMO/HAUL (E) PAVING DEBRIS	5,340	SF	4.00	21,360
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	3,560	SF	1.00	3,560
	RESTORE PAVING, MATCH EXISTING, ON SITE	5,340	SF	5.00	26,700
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	3,560	SF	5.50	19,580
	GAS METERS				
	REMOVE & REPLACE (E) GAS METER #1, 3" + PRV/SEISMIC ASSEMBLY	1	EA	3,750.00	3,750
	NEW GAS METER #2, 4" + PRV/SEISMIC ASSEMBLY	1	EA	10,575.00	10,575
	GAS SUB-METERS TO (E) BUILDING + PRV/SEISMIC ASSEMBLY, 1 1/2" - 2 1/2"	1	EA	3,600.00	3,600
	GAS SUB-METERS TO (N) BUILDING + PRV/SEISMIC ASSEMBLY, 1 1/2" - 2 1/2"	13	EA	3,600.00	46,800

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM		**JYI #:**	**V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA		**DATE:**	**02-Jun-10**
CLIENT: PSOMAS ASSOCIATES		**REVISED:**	
DESCRIPTION: CONCEPTUAL OPINION OF COST			

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	WORK BY GAS COMPANY INCLUDING CUTTING & PATCHING TO (E) PAVING				
	3" MPG, ON SITE	1,170	LF	35.20	41,184
	3" MPG, STREET	1,240	LF	47.35	58,714
	P.O.C. TO EXISTING, ON SITE	1	EA	950.00	950
	P.O.C. TO EXISTING, STREET	2	EA	1,850.00	3,700
	SAWCUT (E) PAVING, ON SITE	720	LF	4.50	3,240
	SAWCUT (E) PAVING, STREET	2,560	LF	5.50	14,080
	DEMO/HAUL (E) PAVING DEBRIS	3,280	SF	4.00	13,120
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	1,540	SF	1.00	1,540
	RESTORE PAVING, MATCH EXISTING, ON SITE	720	SF	5.00	3,600
	RESTORE PAVING, MATCH EXISTING, STREET	2,560	SF	7.50	19,200
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	1,540	SF	5.50	8,470
	MISCELLANEOUS WORK				
	MISC. GAS PIPING SYSTEM/VALVES AND FITTINGS	1	LS	39,815.49	39,815
	MISC. DEMO WORK	1	LS	7,500.00	7,500
	PROTECT-IN PLACE EXISTING UTILITIES	1	LS	7,500.00	7,500
	PERMITS, TESTING & COMMISSIONING	1	LS	27,056.87	27,057
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	7,500.00	7,500
	SUBTOTAL				**575,694**
11.0	MISCELLANEOUS				$
	ALLOWANCE FOR ADDITIONAL RESTORATION TO EXISTING SITE CONDITIONS DISTURBED DURING CONSTRUCTION	1	LS	100,000.00	100,000
	SUBTOTAL				**100,000**
	ADDITIVE ALTERNATES				
1	**ELECTRICAL SYSTEM ALTERNATE - PER OPTION #2 SINGLE LINE**				
	ADD WORK				
	MAIN METERBOARD				
	15 KV MAIN METERBOARD & SWITCHGEAR, 4 SECTIONS, ENCLOSED, WP	1	EA	95,000.00	95,000
	EXTRA FOR GROUND FAULT INTERRUPTER	1	EA	14,250.00	14,250
	EXTRA FOR METERING SECTION	1	EA	40,000.00	40,000
	EQUIPMENT GROUNDING	1	EA	1,500.00	1,500
	SELECTOR SWITCH				
	SS #1 THRU SS #9, NEMA-3R + PAD	9	EA	10,000.00	90,000
	EQUIPMENT GROUNDING	9	EA	750.00	6,750
	TRANSFORMERS				
	TRANSFORMER, 112.5 KVA, NEMA-3R + PAD	1	EA	18,000.00	18,000
	TRANSFORMER, 150 KVA, NEMA-3R + PAD	2	EA	23,625.00	47,250
	TRANSFORMER, 225 KVA, NEMA-3R + PAD	10	EA	34,875.00	348,750

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM		**JYI #:**	**V1716A1**
LOCATION : NORCO CAMPUS - RIVERSIDE, CA		**DATE:**	**02-Jun-10**
CLIENT: PSOMAS ASSOCIATES		**REVISED:**	
DESCRIPTION: CONCEPTUAL OPINION OF COST			

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	TRANSFORMER, 300 KVA, NEMA-3R + PAD	4	EA	46,125.00	184,500
	TRANSFORMER, 500 KVA, NEMA-3R + PAD	1	EA	66,150.00	66,150
	TRANSFORMER, 1000 KVA, NEMA-3R + PAD	1	EA	77,400.00	77,400
	EQUIPMENT GROUNDING	19	EA	1,500.00	28,500
	ELECTRICAL MANHOLES				
	EMH	8	EA	3,850.00	30,800
	PRIMARY CONDUIT				
	(1) - 4" PVC CONDUIT	860	LF	24.87	21,388
	CONDUIT POC TO (E) EMH	1	EA	895.00	895
	CABLING & POC			-	BY SCE CO
	12 KV FEEDERS, "F1" & "F2"				
	FEEDER "F1" - 4" PVC CONDUIT + ALUMINUM WIRES	1,520	LF	49.47	75,194
	FEEDER "F2" - 4" PVC CONDUIT + ALUMINUM WIRES	1,680	LF	49.47	83,110
	P.O.C. TO (E) ELECTRICAL PULLBOX	1	EA	2,000.00	2,000
	BUILDING STUB	16	EA	550.00	8,800
	TRANSFORMER FEEDERS				
	75 KVA FEEDER, PVC	500	LF	18.10	9,050
	112.5 KVA FEEDER, PVC	110	LF	24.73	2,720
	150 KVA FEEDER, PVC	70	LF	32.56	2,279
	225 KVA FEEDER, PVC	670	LF	56.65	37,956
	300 KVA FEEDER, PVC	880	LF	84.45	74,316
	500 KVA FEEDER, PVC	30	LF	140.60	4,218
	1000 KVA FEEDER, PVC	20	LF	246.01	4,920
	P.O.C. TO (E) U/G PULLBOX	1	EA	850.00	850
	SWITCHBOARD FEEDERS				
	3000A SWITCHBOARD FEEDER, PVC	20	LF	350.00	7,000
	3000A SWITCHBOARD FEEDER, GRC	30	LF	370.00	11,100
	P.O.C. TO (E) BUILDING SWITCHBOARD + EXTERIOR WALL PENETRATION	2	EA	1,000.00	2,000
	TRENCH & DUCBANK				
	SAWCUT (E) PAVING	6,880	LF	4.50	30,960
	DEMO/HAUL (E) PAVING DEBRIS	6,880	SF	5.00	34,400
	REMOVE PORTION OF (E) PLANTING/IRRIGATION	4,600	SF	1.00	4,600
	CONCRETE DUCTBANK	5,740	LF	54.00	309,960
	RESTORE PAVING, MATCH EXISTING	6,880	SF	5.00	34,400
	RESTORE PLANTING/IRRIGATION, MATCH EXISTING	4,600	SF	5.50	25,300
	DEDUCT WORK				
	DEDUCT OPTION #1 ELECTRICAL WORK	(1)	LS	2,527,924.70	(2,527,925)
	SUBTOTAL				**(691,658)**
	ADD PRORATES PER BASE ESTIMATE	46.6%			**(322,271)**
	TOTAL ESTIMATED COST THIS ITEM				**(1,013,930)**
2	**CENTRAL PLANT ALTERNATE OPTION, USING (E) AIR-COOLED CHILLER**				
	ADD WORK				
	ALLOWANCE FOR MODIFICATION TO EXISTING AIR-COOLED CHILLER	1	LS	100,000.00	100,000
	THERMAL STORAGE TANK	1	EA	400,000.00	400,000

Prepared by Jacobus & Yuang, Inc.

PROJECT: INFRASTRUCTURE UPGRADE PROJECT - UTILITY PROGRAM	**JYI #: V1716A1**
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CLIENT: PSOMAS ASSOCIATES	**REVISED:**
DESCRIPTION: CONCEPTUAL OPINION OF COST	

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL
	PERMITS, TESTING & COMMISSIONING	1	LS	50,000.00	50,000
	MISC. DEMO WORK	1	LS	5,000.00	5,000
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	1	LS	5,000.00	5,000
	DEDUCT WORK				
	NEW CP-1 BUILDING	(4,500)	SF	300.00	(1,350,000)
	CENTRAL PLANT M,P,& E EQUIPMENT (INCLUDES COOLING TOWER + CHILLER)	(1,550)	TON	2,500.00	(3,875,000)
	THERMAL STORAGE TANK	(1)	EA	400,000.00	(400,000)
	PERMITS, TESTING & COMMISSIONING	(1)	LS	(193,750.00)	193,750
	MISC. DEMO WORK	(1)	LS	10,000.00	(10,000)
	GENERAL PROTECTION ALLOWANCE, WORK AREA LIMIT	(1)	LS	10,000.00	(10,000)
	SUBTOTAL				**(4,891,250)**
	ADD PRORATES PER BASE ESTIMATE	46.6%			**(2,279,029)**
	TOTAL ESTIMATED COST THIS ITEM				**(7,170,279)**

PSOMAS

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